MINISTRY OF HIGH EDUCATION AND SCIENTIFIC RESEARCH

HIGHER NATIONAL SCHOOL OF MANAGEMENT

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Thesis of Final Study

Thesis presented from Master Management of E-Government

The importance of measuring the smart city project's performance

Case: The Wilaya of Algiers

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June 2019

Abstract

The “smart city” is obviously a major concern which city of tomorrow will face. The problem about that is that the theory connected with this concept is blurring and vague. From there, how is it possible to know if a city is “smart” or not? How can we measure the performance of a city? Is there any tool to do that? Cities should find answers to these questions if they want to become “smart cities” or to improve their “smartness”. This Master thesis deals with this context. The goal of this thesis was to establish a mean to know if a city could be named “smart” or not and to provide tools to evaluate its performance on this field. Because of this, tools imply key performance indicators (KPI).

Keywords: Smart City, sustainable, KPIs, performance.

Résumé

La «ville intelligente» est évidemment une préoccupation majeure de la ville de demain. Le problème à ce sujet est que la théorie liée à ce concept est floue et vague.

À partir de là, comment est-il possible de savoir si une ville est «intelligente» ou non? Comment pouvons-nous mesurer la performance d'une ville? Y a-t-il un outil pour le faire? Les villes devraient trouver des réponses à ces questions si elles veulent devenir des «villes intelligentes» ou améliorer leur «intelligence». Ce mémoire traite de ce contexte. L'objectif de cette thèse était d'établir un moyen de savoir si une ville pouvait être qualifiée d‟ "intelligente" ou non et de fournir des outils pour évaluer ses performances dans ce domaine. De ce fait, les outils impliquent des indicateurs clés de performance (KPI).

Mots-clés: ville intelligeante ; les indicateurs KPI, performance.

ملخص

من الواضح أن "المدينة الذكية" هي مصدر قلق كبير ستواجهه مدينة الغد. المشكلة في ذلك هي أن النظرية المرتبطة بهذا المفهوم غامضة. من هناك ، كيف يمكن معرفة ما إذا كانت المدينة "ذكية" أم لا؟ كيف يمكننا قياس أداء المدينة؟ هل هناك أي أداة للقيام بذلك؟ ينبغي أن تجد المدن إجابات على هذه الأسئلة إذا كانت تريد أن تصبح "مدن ذكية" أو لتحسين "ذكائها". و في هذا السياق تناولنا بحثنا هذا وكان الهدف من هذه الأطروحة هو إنشاء وسيلة لمعرفة ما إذا كان يمكن تسمية مدينة "ذكية" أم لا ، وتوفير أدوات لتقييم أدائها في هذا المجال. لهذا السبب ، تتضمن الأدوات مؤشرات الأداء الرئيسية.

الكلمات المفتاحية: المدينة الذكية؛ مؤشرات الاداء؛ الاداء.

Acknowledgement:

I thank God for giving me the will, the power and the patience to accomplish this work. I wish to express my deepest gratitude to my supervised, Mr.AMOKRAN Mustafa, and my co-supervised, Mr.HOCINI Hatem, for their invaluable help, follow-up, precious advices and their interests in my research work.

I am so grateful to Mr. MEZHOUDA Abdelmalik and all the teachers I had the pleasure of having during my training at the National Higher School of Management. My sincere thanks also go to ENSM librarians for their understanding and help.

To my dear and admirable PARENTS, who have always been present for me and who have always supported me in my life. To my brother AYOUB, and the better sisters in the world ASSALA and NIHED.

In addition I would like to express my gratitude to the staff of smart city Algiers, Especially the chief of the project "Smart City Algiers" Ms.SLIMANI Fatiha for her attention and help for the last minute favors.

Finall; to all those who have contributed near or far to the realization of this work.

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GENERAL INTRODUCTION

1- Background

Nowadays, it is undeniable that the concept of smart city is gaining momentum. This phenomenon is spreading more and more because, in today's society, the urbanization of cities is exponentially increasing. In 2014, the United Nations (2014) estimated that 54% of the world's population lived in an urban environment and that this proportion would increase to 66% by 2050. By comparison, this figure was equal to 30% in 1950. In the same vein, the report requested by the European Parliament (2014) indicates the same estimates, even going as far as quantifying them in real terms, that is to say an increase of 60 million numbers of urban residents. This concentration of the population leads logically to urban and social problems. As the number of inhabitants in cities increases, cities must be smarter. This means that the quality of life in an urban center is not only defined by its physical capital but also by a heap other variables such as access to communication, technologies, mobility, the well-being of the city dweller, etc. It is on these bases that this concept of "smart city" intervenes.

The large number of characteristics constituting a smart city leads to a large number of definitions of it. So it is sometimes difficult to know whether a city is really smart or not. This question raises the problem of evaluating the performance of a city at the level of its intelligence.

Indeed, we often use the notion of performance in the classic economic world to assess the competitiveness of a company, to evaluate its operation or to compare a set of companies with each other. To do this, there are a number of performance indicators (KPI[1]) for analyzing an organization. Therefore, why not mix these different concepts and list them in a set of KPIs, features, etc.? Allowing checking if a city can be characterized from intelligent and to what level.

Some cities have taken the train of smart cities at its beginning as for others, they will have to take it on. In these various cities already involved, we note in particular Barcelona, Amsterdam, New York, Singapore, Moscow, etc. They are in front of smart development but that does not mean they are the only ones. Indeed, the number of "smart city" projects in the

[1] KPI : key performance indicator

world is immeasurable. These different cities are rather examples to follow; they are "flagship cities[2]".

2- Purpose and Statement of Research

In the previous section, the context in which the notion of a smart city is introduced has been set out in order to imagine the different issues and the different environmental modifications that the cities of tomorrow will have to face.

Admittedly, there are already a large number of writings on these smart cities that come to define, explain their operation, their strategies, etc. There is not the purpose of this research. The idea behind this work is to establish an analysis of the different performance indicators, to list the most interesting as to the problem studied, in order to know if a city can be considered as intelligent and to what extent. This objective can be translated according to the problematic or the main research question of this work:

Is it possible to define whether a city is smart and to measure its performance?

Before answering this central question, it is necessary to answer these questions:

- ✓ What is a smart city?
- ✓ How can performance be defined in general?
- ✓ What is a performance indicator?
- ✓ What are the existing indicators?
- ✓ Which indicators will be representative of the problem studied?
- ✓ ……

3- Contribution and approach

The desired contribution of this work was to allow anyone wishing to establish whether or not a city was smart and to establish its performance according to a number of relevant indicators. The hypotheses raised behind this approach are:

1-It is possible to evaluate whether a city can be considered as intelligent while evaluating its performance at the smart level.

2- It is possible to assess whether a city can be considered as intelligent while evaluating its performance at sustainable level

[2] Flagship city: means the model city.

3- It is possible to evaluate whether a city can be considered as intelligent while evaluating its performance on a smart and sustainable level.

The concept of "smart city" being very broad and still vague for certain, this work started with an upgrade on what is a "smart city" by listing a no exhaustive list of the different existing definitions. Indeed, there are so many definitions that depending on the field of application and activity, it may differ from another. A study of the literature on this subject has therefore been undertaken and has proved useful. This made it possible to establish a global definition on which the work was based for the rest of the analysis.

For the sake of clarity and to be sure that the various concepts discussed are understood by all, the concept of performance has also been studied in its generality.

In the same vein, the definition of a performance indicator was also discussed in this section.

Once the different theoretical concepts were well detailed and explained, a no exhaustive list of the different performance indicators was drawn up according to the different readings and analyzes that existed (literature review).

Following this, a field study proved necessary in order to obtain a more in-depth analysis. Thanks to a qualitative study with different experts, a short list of adequate and insightful KPIs has been drawn up. These different experts have been drawn up. These different experts were selected according to the "triple helix"[3] model. This means that the panel included both academic, private and public sector stakeholders.

Finally, to complete the analysis, a discussion of the different results obtained was undertaken in order to obtain an adequate answer to the research question and to confirm or refute the established hypothesis. A proposal for a solution has been proposed.

The workflow can be likened to the funnel technique. Indeed, as a first step, all the general concepts necessary for a good understanding of the measurement of the performance of a "smart city" were discussed. Then, a field study made it possible to obtain results and the study of these made it possible to analyze the issue raised in the research question to arrive at a result.

[3] The concept of "triple helix" is logic of dynamic interdependence between the 3 traditional poles that are, academia, industry and government. This theory comes from Etzkowitz (2000). This model must facilitate the transition to the knowledge economy (Laval University).

CHAPTER 1:

Literature Review and Conceptual Framework

This chapter is reserved for the literature review of the performance assessment tools of a smart city in the first part; while in the second part we detail the concepts related to the smart city and the concepts related to the performance and indicator in a conceptual frame.

1.The literature review:

The smartness of cities is a modern concept that represents a new approach to urban development by highlighting the integration of information and communication technologies (ICT) in the management of the city in order to meet its requirements in an efficient way. The idea of the smartness of a city is to set up a development of the city using technologies to improve the quality, performance and interactivity of urban services while reducing as much as possible the costs in money, resources and time as well as improving relations between governance and citizens. The literature review made it possible to read the various existing writings about the definition, the dimensions and the performance of a "smart city" and performance indicators already reported up to now.

1.1 Definitions:

An article published by (Vito Albino, Rosa Maria Dangellco and Umberto Berardi 2015) aspires to clarify the significance of the word ‘smart’ in the context of cities through an approach based on an in-depth literature review of relevant studies as well as official documents of international institutions; so, this study showed how cities can be considered “smart” by reviewing definitions, components, and measures of performance of cities. It also identifies the major dimensions and the central elements characterizing a smart city. The various metrics of urban smartness are reviewed to show the necessity for a shared definition of what constitutes a smart city, what its features are, and how it performs in comparison to traditional cities. Furthermore, performance measures and initiatives in a few smart cities are identified. Definitions of smart cities are now including qualities of people and communities as well as ICTs, several dimensions and elements characterizing a smart city emerged from the analysis of the existing literature. The results show how intricate the measurement of a smart city is. Some attempts to produce all-embracing indexes have been reviewed. However, the aim it was not to define a new framework for the assessment of the smartness of a city, since the authors believe that such an assessment should be tailored to a certain city’s vision. A universal fixed system may be difficult to determine and describe with the variety of characteristics and specific elements of cities worldwide; but it has been made clear that the definitions posed by particular cities calling themselves “smart cities” lack universality. A

smart city assessment must take into account that cities have several priorities and visions for achieving their objectives, but they must promote an integrated evolution of different aspects, both soft and hard. On the other hand, the authors expounded the problems of many ranking systems that led to a loss of information on the complexity of smart cities..

According to another researcher (Sotiris Zygiaris 2012) The focus purpose to address the smart innovation ecosystem characteristics that clarify the assembly of all smart city notions into green, integrated, instrumented ,interconnected, open, intelligent, and innovating layers composing a planning framework called, Smart City Reference Model. Since cities come in different sizes and forms, the model could be adopted and used in an extent of smart policy paradigms that embrace the green broadband, and urban economies. These paradigms address global sustainability challenges at a local context. The planners of smart cities could use the reference model to determine a definition of a smart city and describe the smart innovation characteristics in each one of the six layers. Some of smart cities, such as Amsterdam, Edinburgh, and Barcelona are examined to measure their entirety in relation to the Smart City Reference Model; the conceptual reference model proposed is used as an analytical framework to analyze smart city plans for those cities. Smart city planners could reduce a six layer planning agenda based on the local features and priorities of a city. The outcomes of this research could be used by smart city planners to stop unsustainable investments and to construct upon the socio-technical complementarities in the smart city plan of action.

The notion of "smart city", although more and more well-known, remains still quite recent, so there is not yet a large number of books concerning performance. Anyway, it was still possible to analyze some studies on this topic.

1.2 The European Commission (2015): Performance indicators for cities:

According to the European Commission (2015), urban sustainability indicators are tools that enable actors building urban strategies to gauge the environmental impact and socio-economic policies implemented. They therefore allow identify and diagnose problems and then build answers based on them. The desired effect is to measure the success of "smart" interventions (commission European Union, 2015). A certain number of indicators have already been put forward and tested in real cities by different organizations. These indicators will include themes such as environment, governance, income, economic opportunities,

entrepreneurship, health, etc. But the real challenge for cities is to identify which tools their correspond most to their needs and goals. Every city is different, so it is difficult to find a perfect balance in measurement tools. The goal of the European Commission through its report (2015) is to propose a guide, as complete as possible with all available tools. It should be noted that these indicators are largely focused on the environment.

The European Commission has identified a series of performance indicators for cities. In this study, they are divided into two categories; the first includes measurable indicators and those with an easy-to-use structure. The second one, other useful tools and they concern the following three dimensions: environment, economy and society.

The following table lists those in the first category:

Indicators	**Operation and / or characteristics**
City Blueprint	The aim is to provide the various European planners with the basic knowledge for sustainable water management in the urban area environment and thus contribute to overall sustainability. This tool is composed of 24 indicators all related to water (Annex 1).
EEA Urban Metabolism Framework	It's a set of 15 good and easy indicators to measure. They provide continuous monitoring of the metabolism of the city. (Annexe 2). It allows an easy and fast comparison of several cities.
European Green Capital Award	It’s an award offered to the European city (of at least 100.000 inhabitants) that has the best environmental engagement. This rating is based on 37 indicators distributed on 9 categories’ urban environmental sustainability (annexe 3).
Global City Indicators Facility	The tool covers all aspects of urban life with a focus on social dimension of sustainability. These indicators do not include pollution or air quality indicators. They are divided into several categories such as governance, the economy, technology, innovation, etc. (Annexe 4).
Indicators for Sustainability	The indicators were constructed from case studies on several major international cities and of different sizes. The basic indicators are common, flexible, easy to understand and to implement and cover

	several objectives of the sustainable city (Annex 5)
Reference Framework for Sustainable Cities	This tool will help European cities to fulfill the objectives of Leipzig[4] Charter on Sustainable Cities. There are 30 key indicators but also 300 other additional indicators. They cover mainly the economy, society, the environment and the governance (Annex 6).
STAR[5] Community Rating System	These indicators present were developed by a strategic committee and continue to be adjusted when necessary. The tool includes aspects of economic, environmental and social issues. Human well-being and the quality of life are put forward while giving less importance to waste management and transport. (Annex 7).
Urban Ecosystem Europe	This tool is an evaluation of 32 European cities. Of this evaluation, the researchers developed a set of indicators (25) with particular attention to local governance and quality of life, but the indicators are directly or indirectly almost all aspects of urban sustainability (Annex 8).
Urban Sustainability Indicators	This tool was developed in the wake of the Cities Charter for sustainability (Aalborg[6] Charter10). (Annex 9).

table 1.

This first table has already shown a large number of possible tools for measuring the performance of a city but there are still other tools in the study of the commission (2015), these are included in the Annexes (Annex XII). They are however more difficult to measure and implement, less obvious, not as comprehensible, but still remain interesting. This report places a strong interest in the "sustainable city "rather than the" smart city ".

In the study “New Key Performance Indicators for a Smart Sustainable City” (Hara M., Nagao T., Hannoe S., Nakamura J., 2015), the authors propose KPIs based on the Gross Social Feel-Good Index to evaluate a "smart sustainable city". The goal of this research was

[4] The "Leipzig Charter on the Sustainable European City" is a document of the Member States which has been drawn up with wide participation of European interest groups. Ministers in charge of urban development in the Member States have taken stock of the challenges, perspectives and different historical, economic, social and ecological origins of European cities and agreed on a set of common principles and concepts for Urban Development Policy (2007).

[5] STAR: Sustainability Tools for Assessing & Rating Communities

[6] The Aalborg Charter was signed at the 1st European Conference of Sustainable Cities held in 1994 in Aalborg, Denmark. Cities that sign this charter are morally committed to establishing a local agenda 21 following a number of directions and principles. Adherence to this charter is a voluntary act on the part of the communities (1994).

to propose a new set of key performance indicators and to evaluate methods of improvement via technological solutions of the environment, society and the economy while respecting the quality of life of citizens.

The indicators developed are based on the following principles:
- The evaluation of the criteria is done according to the "Triple bottom line".
- The same unit of measurement for each evaluation criterion.
- Indicators can be used to evaluate various ranges of "smart" Sustainable cities "with different goals.

For simplicity, the indicators have been divided into four layers; the first is composed of four sub-layers: environment, society, economy and satisfaction. In the second layer, only the company point has been divided into three under layers (safety, health and comfort). The other points kept the same name. The third layer consists of the topics the indicators target. Finally; the fourth layer indicates the necessary data to get the indicators. These different layers are represented in the table next (Hara M., Nagao T., Hannoe S., Nakamura J.2015, 4).

1st Layer (Unit: Monetary Value)	2nd Layer (Unit: Monetary Value)	3rd Layer (Unit: Monetary Value)	4th Layer Examples (Unit: Monetary Value, %, Time, Weight, *etc.*)
Environment	Environment	Environment/natural resource	Amount of GHG emissions, waste, resource depletion (water, underground resources *etc.*), toxic substances, biodiversity
		Energy	Resource depletion, amount of consumption, sustainability of electricity supply, utilization rate of renewable energy
Economy	Economy	Cost performance	Cost: deployment, operation, maintenance, benefit: financial effect, profit, employment rate, enterprising rate, online billing rate
Society	Safety	Accident	Accident rate (victims, damaged objects), damage cost
		Natural disaster	Damage rate (victims, damaged objects), damage cost
		Crime	Damage rate (victims, damaged objects), damage cost
		Information security	Information accessibility, information leakage rate, information importance, damage cost
	Health	Health management	activity level, nursing care cost, social security cost
		Prevention of illness	Morbidity (incidence rate, prevalence, fatality rate), medical expenses
		Medical treatment	Mortality, morbidity, medical expenses
		Stress	Morbidity, medical expenses
	Comfort	Diverse opportunities	Labor force participation rate, number of tourists, frequency of visit, purchase rate, leisure time, means of transportation
		Barrier free	Usage ratio (number of people, frequency), user demographics
		Simplicity	Usage ratio (number of people, frequency), willingness to use, satisfaction level with equipment
		Ubiquitous	Service area, service penetration ratio, service duration
Satisfaction	Satisfaction	Citizens' degree of satisfaction	Willingness to pay

1.3 The ISO[7] 37120 (2014): Battery of key indicators.

The ISO (International Standard Organization) has clearly understood this need for measuring the performance of a smart city.

[7] ISO (International Organization for Standardization) is an international, non-governmental, independent organization, whose 161 members are the national standards bodies of 162 countries. Through its members, the Organization brings together experts who share knowledge to develop voluntary, consensus-based, international Standards relevant to the market, supporting innovation and providing solutions to global issues.

This is seen and translated into the elaboration of a norm[8]. This norm bearing the name "The smart city standards" and the ISO reference 37120 was developed in 2014 to present key indicators to assess urban services and the quality of life of a city in order to inform managers, decision-makers, stakeholders, on the different issues of the smart city. Even if he it is clear that we must invest in cities, but we must do it efficiently. This is where ISO 37120. The problem with the different existing indicators is that they are often not standardized, consistent or comparable.

The ISO 37120 standard has defined 17 different themes in which we can find a battery of indicators. The indicators are divided into two types by theme: "core" and "Support" (should). The themes are as follows and the analysis made of them comes from the Smart Cities council[9]. For chaste theme, they are illustrated in a chart from the ISO 37120 standard.

- Economy (Annex 10)

The economy is not only the key to attracting or retaining employees and residents but it is also essential for a region to remain competitive. Indicators of this theme will therefore help cities to measure their competitiveness.

- Education (Annex 11)

Education is perhaps one of the most important indicators according to the Smart Cities Council. Indeed, it boosts scientific and economic development. it permits to individuals individual enrichment and personal growth. It is difficult to find a job without a minimum of education and therefore allow his family or himself to live decently.

- Energy (Annex 12)

It is certain that energy has a significant impact on many aspects of the life of everyday. Although there are many aspects to consider on this topic, ISO 37120 focuses on the energy efficiency of a city, its availability and mix.

- Environment (Annex 13)

[8] Les Normes internationales sont des rouages indispensables. Elles établissent les spécifications de premier ordre pour les produits, les services et les systèmes dans une optique de qualité, de sécurité et d'autonomie. Elles jouent un rôle prépondérant pour faciliter le commerce international.
[9] Le Smart Cities Council est un ensemble de conseillers promouvant la ville intelligente et durable (http://www.smartcitiescouncil.com)

The main interest of this theme is focused on the quality of the air. Indeed, according to WHO[10], air pollution causes an estimated 3.7 million premature deaths each year millions of people around the world.

- Finance (Annex 14)

Cities are looking to improve their infrastructure to improve the quality of life of their citizens, to become more competitive which would attract new inhabitants, jobs ... The problem is that it is extremely expensive. Finances of a city are therefore an important point to measure. The ISO standard will help decision makers to better measure the risks of their investments.

- Fire Rescue and Emergency Response (Annex 15)

Security in a city plays an important role for the well-being of its inhabitants. This sense of security can be strengthened through a sufficient number of emergency services. Moreover, their presence can generate some education and awareness of the population in this regard.

- Governance (Annex 16)

A high voting rate is important for a healthy democracy. If the rate is low, the will of the population may not be represented and in this case, well-being would be negatively impacted. Participatory governance is required in a smart city ". This theme measures civic engagement of the city, integrity and honesty of elected officials.

- Health (Annex 17)

This theme measures key health indicators including lifespan, health ... These indicators show that there is a high quality of life and this is an incentive for new residents as well as for the economy. It is clear that health plays an important role on the quality of life.

- Leisure (Annex 18)

The importance of this theme is very limited compared to the 16 others. Moreover, it is the only do not that doesn't have at least one "core" indicator. There is no need to go further on this subject

- Security (Annex 19)

[10] WHO : World Heath Organisation .

Security in a city plays a lot on well-being. Crime scares but an increased presence of security services and their quality may diminish this Impression of insecurity.

- Shelter (Annex 20)

Well-being in a city can also be measured by its dwellings. Indeed, the more poor neighborhoods with buildings in dilapidated states, the more quality of life will be lower. With the growing urbanization, this theme is likely to take more and more importance.

- Waste (Annex 21)

Waste is a common part of a city. The more inhabitants there are, the more there will be waste. It is therefore important to be able to measure different aspects and impacts of these on the everyday environment. Waste management is a major challenge in the Urban development.

- Telecommunications and innovation (Annex 22)

Innovation is at the heart of growth. Cities looking for a sustainable future and must invest their resources in policies that foster innovation public and private. The indicators in the standard measure Internet connections per capita, mobile internet ... This reflects the intensity of the city's communications. The purpose of these indicators is also to approximate the propensity of innovation.

- Transport (Annex 23)

Transport is essential in the development of smart cities. Whether it is the economy, the well-being or the environment, all are impacted by them. That's why smart politics is more than necessary. The standard is intended to help this management of transport.

- Urban planning (Annex 24)

The development of urban green spaces brings benefits for the city, whether in terms of well-being, health, air quality, water, greenhouse gases, etc. ISO 37120 therefore logically insists on this theme. Urban developments have to make life easier for people and to improve the quality of life.

- Wastewater (Annex 25)

Wastewater has a dramatic and measurable effect on public health. They cause serious and fatal diseases. Their treatment is therefore essential to ensure a pleasant urban life.

- Water and sanitation services (Annex 26)

Access and services related to drinking water are also extremely important.

This theme is in the same style as the previous theme. These could have been put together.

All themes (including 100 indicators) present in ISO 37120 have been reviewed. It is nevertheless important to specify that the ISO standard does not propose a definition for the "smart city" but indicators measuring its performance and quality. It is obvious that almost all the present indicators are useful for evaluating the performance of a city, but they say very little about technology.

Outside, in most existing theories, the role of ICTs is almost central. These indicators do not indicate whether they are involved or not. Once again, a critical and objective look is essential when using these tools. It is also interesting to mention that the standard explains the detail of how to calculate each indicator and that these have been developed in order to make the reporting easy and inexpensive whatever the size of the targeted city.

1.4 The ITU[11] (2014): Battery of key indicators

ITU has also released its battery of indicators to measure the performance of a "smart sustainable city" (2014). This institution specializes in ICTs, but it also puts forward technological indicators, but also takes into consideration the other characteristics. Thus, the following diagram (ITU, 2014, p.4) shows the areas in which it has established measurement tools:

[11] ITU is the United Nations specialized agency for information and communication technologies.

Figure 1: Diagram shows the areas in which it has established measurement tools. (ITU,2014,p.4)

The proposed KPI series therefore focuses on ICT at the center and also covers productivity, environmental sustainability, physical infrastructure, quality of life and, equity and social inclusion. But, it does not cover all the indicators studied in the ISO 37120 standard.

Next, each field of study was subdivided into indicator categories as shown in the following table (ITU, 2014, p.5).

Domains:	Scope of the indicators:
ICT	- Networks and access - Services and platform information - Security and confidentiality of news - Electromagnetic field
Productivity	- Capital investment, - Inflation, Exports / imports, Household income / consumption, Saving, Trade, Innovation, Economy of knowledge employment.

Environmental sustainability	Air quality, CO2 emission, Energy, Water, soil and noise
Physical infrastructure	- Infrastructure /connection to services, running water ,Infrastructure /connection to services, waste, Infrastructure /connection to services, electricity, Infrastructure /connection to services, waste management, Infrastructure /connection to services, know, Infrastructure /connection to services, health, Infrastructure /connection to services, transport, Infrastructure /connection to services, road infrastructures
Quality of life	- Education, Health, Public security, Comfort and amenities
Equity and social inclusion	Openness and citizen participation, Governance, Social and cultural equality for access, services and infrastructure, Income inequality / consumption

table 2.

It is therefore clear that despite the relatively recent interest of smart cities, there is already a certain set of tools to measure its performance. But as the definition of this concept remains unclear, each tool evaluates performance based on different criteria. We must therefore be careful when using them and methodically analyze the results obtained.

In addition, many tools are built under the "smart sustainable city" vision. This can lead to some confusion.

1) Conceptual framework:

2.1 Smart city concepts:

2.1.1 Origin of the "smart city" movement:

As explained in the general introduction to this work, global urbanization is growing more and more every year. By 2030, 6 out of 10 people will live in urban areas (European Parliament, 2014). This is reflected in particular in the following figures. In 1910, the world's urban population was 19%. It then increased to 33% in 1950, that is to say that about 724 million people were considered as inhabitants of an urban environment. The threshold of 50% was reached around 2006.

This map (http://www.statistiques-mondiales.com, 2012) represents the percentage by country of the population living in an urban environment. In other words, this number of people is growing by almost 60 million each year.

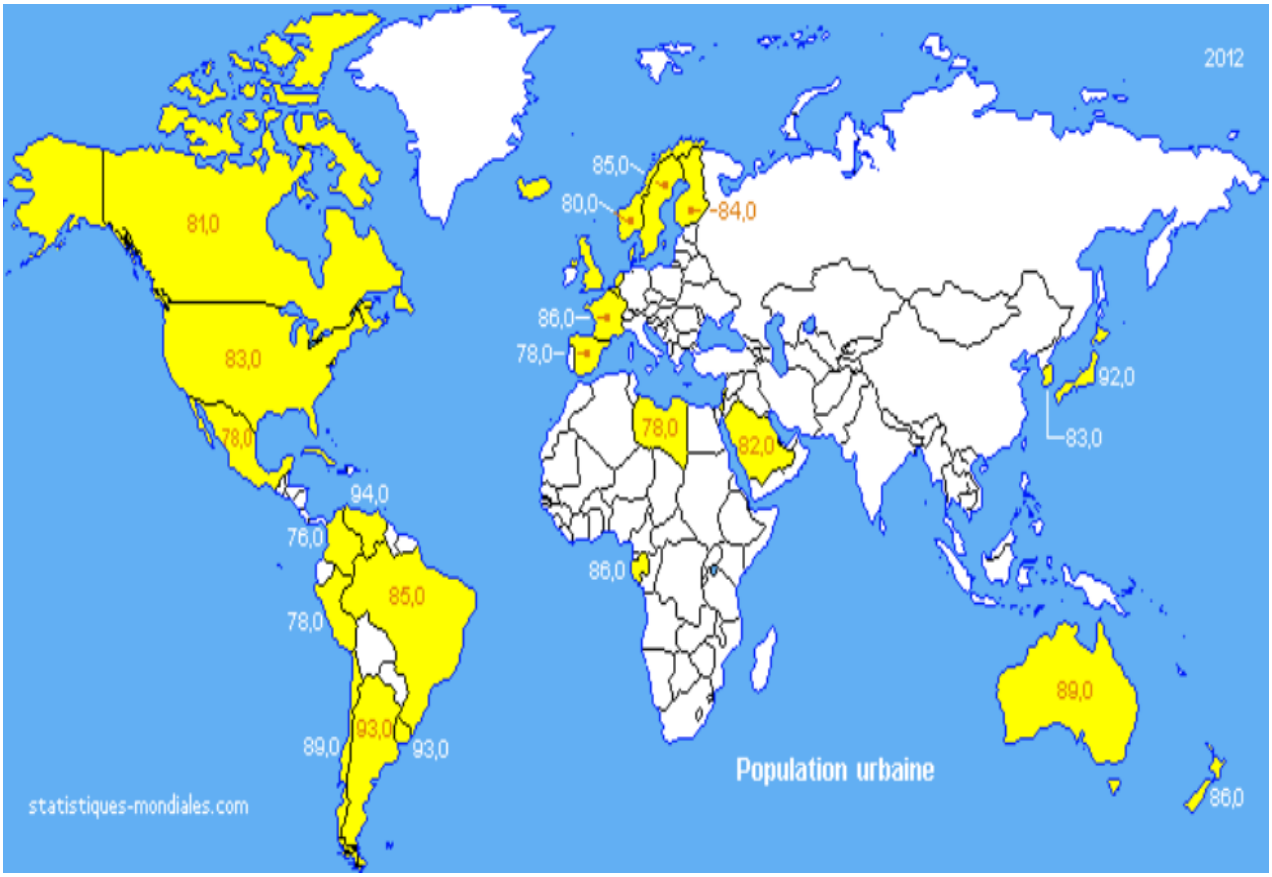


Figure 02: The percentage by country of the population living in an urban environment

One of the highest rates of this urbanization is that of Belgium. Indeed, it is 98% (Eurostat, 2014). This graph perfectly shows this demographic trend (Kominos N, 2011).

Figure 03 : Urban and rural population s of the world 1950 – 2050

As the planet becomes more and more urban, it brings a lot of new problems and new challenges. This trend requires new ways of managing the complexity of planning a more intense urban life (European Parliament, 2014). For example, new ways of targeting overcrowding, consumption energy, environmental protection, etc.

It is in this context that smart cities have emerged. We expect from them to contribute to these challenges and provide efficient solutions in which they support the knowledge[12]'s economy, that they offer quick solutions to urbanization in developed and developing countries. But the questions that arise are:

- How should they do it?

- What resources are mobilized to respond to these challenges?

- Which processes?

It is urgent to understand the sources and pilots that will help ensure better efficiency of the management of these cities (Kominos N, 2011).So smart cities are not just a modus operandi

[12] "The knowledge-based economy is essentially a sector of production and service activities based on knowledge-intensive activities. (Dominique Foray, Introduction, The Discovery "The Knowledge Economy", 2009, p.3)

for the simple future development of urban centers but they are seen as key strategic elements to cope with inequalities, poverty, unemployment, the use of energy, etc. (European Parliament, 2014). Moreover, this development will also play an important role in competitiveness of a smart city compared to its competitors.

For example, many other competing regions with Europe (for example, China) are making investments in this area. This trend should not be missed if the European Union wants to remain competitive in the long term.

2.1.2 Origin of the expression:

The term was used for the first time in 1990. The focus was then on the growth of ICT (Information and Communication Technologies) in modern urban infrastructure (Albino, Berardi, & Dangelico, 2015).

According to (Breux and Diaz 2017), the term smart city has three major origins:

• IBM made the term popular in 2009 after identifying cities as a promising potential market, seeing it as an opportunity for ICT development (Breux and Diaz, 2017).

• (Nam and Pardo 2011) identified a multitude of expressions parallel to that of the smart city and classified them according to three central factors: human, institutional and technological1. According to these authors, a city is called smart when, depending on the relationship between these three factors, investments in human / social capital and IT infrastructure sustain growth and improve the quality of life through participatory governance.

• The particularly favorable context in which this term has developed has given it considerable success. According to (Sajhau 2015), the question of smart cities makes sense in the face of the junction of three current phenomena: increasing urbanization, the ecological challenge (climate change and awareness of the scarcity of resources), and the digital revolution. (Breux and Diaz 2017) still talk about the phenomena of budget reduction and **increasing competition between cities.**

2.1.3 Definitions of the Smart City:

There is no single definition of the smart city. This may depend on several factors such as the context in which it is used, the underlying characteristics, the time, etc. To illustrate this point, the following table contains a series of different definitions that can be found in the literature:

Definition :	Author:	Dated:
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.R	2000
A city where the ICT strengthen the freedom of speech and the accessibility to public information and services.	Partridge	2004
A city well performing in a forward-looking way in economy, people, governance, mobility, environment, and living, built in the smart combination of endowments and activities of self-decisive, independent and aware citizens.	Griffinger	2007
A city that gives inspiration, shares culture, knowledge, and life, a city that motivates its inhabitants to create and flourish in their own lives.	Rios	2008
A city is smart when investments in human capital, social capital, and traditional and modern infrastructures allow sustainable economic growth, better quality of life and sound management of natural resources, through participatory governance.	Caragliu et al	2009
The use of information and communication technologies (ICTs) in a city's infrastructure and services - administration, education, medical services, public safety, real estate, transportation - makes the city more smart, connected and efficient.	Washburn et Sindhu	2009
An instrumented, interconnected, and intelligent city. 1.Instrumentation; enables the capture and integration of live real-world data through the use of sensors, kiosks, meters, personal devices, appliances, cameras, smart phones, implanted medical devices, the web, and other similar data-acquisition systems, including social networks as network of human sensors. 2. Interconnected; mean the integration of those data into an	IBM	2010

enterprise computing platform and the communication of such information among the various city services. 3.Intelligent; refers to the inclusion of complex analytics, modeling optimization, and visualization in the operational business processes to make better operational decisions.		
The design of a "smart" city is developing as a strategy to alleviate the problems arising from urban population growth and the rapid urbanization of cities.	Chourabi et al.	2012
Smart cities combine various technologies to reduce their impact on the environment and offer a better quality of life to citizens. This is not however not just a technical challenge. The realization of a smart city is a multidisciplinary challenge, reconciling city officials, innovative solutions, national and EU policy makers, academics and finally Civil Society.	Smart City and Communities,	2013
"Smart Cities" are systems of systems that present systems digital nerve, intelligent responsiveness and optimization of each level of system.	MIT	2013
A smart city is a city seeking to tackle public issues through ICT-based solutions on the basis of a multitude of stakeholders including partnership is based on municipal power.	Parliament European (Smart Mapping City)	2014
Various decision-making areas related to the quality of life on the preference for savings, or obtaining the best long-term expenses-effects ratio, while considering the systemic approach to solving a given problem. Smart city is a novel concept aimed at managing cities (urban areas) in a modern way, using the latest technical means offered by advanced technologies (including IT), according to the environmentally-friendly principles and while maintaining the tendency to save resources and achieve the expected results.	Sikora-Fernandez & Stawasz, 2016	2016
An answer, based on digital technologies and data, the challenges facing urban areas: security, pollution, energy wastage, climate change, rapid urbanization, inequalities and social exclusion ... It pursues an essential objective: to improve the quality of life of citizens.	Terra Nova	2018

table 3.

In the same vein, as its English name "smart city" (term used most of the time) but this term is not the only one that is used in the literature. The different names that can also be used are for example:

- Intelligent City: "Intelligent cities are territories with high capability for learning and innovation, which is built-in the creativity of their population, their institutions of knowledge creation, and their digital infrastructure for communication and knowledge management" (Komninos)

- Virtual City: "Virtual City concentrates on digital representations and manifestations of cities" (Schuler)

- Learning City : "The term 'learning' in 'learning cities' covers both individual and institutional learning. Individual learning refers to the acquisition of knowledge, skills and understanding by individual people, whether formally or informally. It often refers to lifelong learning, not just initial schooling and training. By learning, individuals gain through improved wages and employment opportunities, while society benefits by having a more flexible and technological up-to-date workforce" (OECD)[13]

- Knowledge City: "A Knowledge City is a city that aims at a knowledge- based development, by encouraging the continuous creation, sharing, evaluation, renewal and update of knowledge. This can be achieved through the continuous interaction between its citizens themselves and at the same time between them and other cities' citizens. The citizens' knowledge-sharing culture as well as the city's appropriate design, IT networks and infrastructures support these interactions" (Ergazakis)

- Sustainable City: " is an innovative city that used information and communication technologies (ICTs) and other means of improve quality of life, efficiency of urban operation and services , and competitiveness, while ensuring that is meets the needs of present and future generations with respect to economic, social environmental as well as cultural aspect." (ITU and UNECE, 2015)

- Wired City: Wired cities refer literally to the laying down of cable and connectivity not itself necessary smart" (Hollands)

- Digital City: "The digital city is as a comprehensive, web-based representation, or reproduction, of several aspects or functions of a specific real city, open to non-experts.

[13] NRCD: National River Conservation Directorate Ministry of Environment.

The digital city has several dimensions: social, cultural, political, ideological, and also theoretical" (Couclelis)

- Green City : Green City follows the Green Growth which is a new paradigm that promotes economic development while reducing greenhouse gas emissions and pollution, minimizing waste and inefficient use of natural resources and maintaining biodiversity" (OECD)

- Smart community: "A geographical area ranging in size from neighborhood to a multi county region whose residents, organizations, and governing institutions are using information technology to transform their region in significant ways. Co-operation among government, industry, educators, and the citizenry, instead of individual groups acting in isolation, is preferred" (California Institute)

- Information city: "Digital environments collecting official and unofficial information from local communities and delivering it to the public via web portals are called information cities" (Anthopoulos and al)

- Ubiquitous city: "Ubiquitous city (U- City) is a further extension of digital city concept. This definition evolved to the ubiquitous city: a city or region with ubiquitous information technology" (Anthopoulos and al).

Therefore, it is quite clear that the definition of this concept remains rather vague and that there is a multitude of different representations for a "smart city".

The aim of this section was therefore to obtain a global definition that serves as a clear basis for further research. This is why it was necessary to go through literature. Here is a series of existing definitions accompanied by their characteristics.

In his article, R. Hollands (2008) states a number of different definitions, but what interests him most are the different elements present in these. Indeed, in the beginning of his article, he wonders about the definitions and the elements that make up these. According to him, there are several difficulties to define this concept of "smart city".

Firstly, there are so many different terms for naming a smart city such as smart, information, green ,sustainable, digital, etc. From this comes a first difficulty. Indeed, each term has a different definition that will borrow certain characteristics from another, or who will contradict it. This will create conflicts. Another problem in differentiating these definitions is that some cities will use this concept as a marketing tool for self-promotion.

We must succeed in distinguishing a city becoming really smart from a city just trying to stamp the smart label. Finally, the third problem is that the terms used are by definition indivisible and have a positive connotation. Which city would not want to be creative, smart or innovative?

Kominos (2002), in its attempt to delimit this concept pinned four different meanings of the term "smart city".

The first takes the use of a fairly large set of electronic and digital tools by communities and cities. This meaning will correctly assemble the different terms of Hollands (Hollands , 2008) with the ideas of "cyber-city", city based on knowledge, digital city, etc. The second is about the use of information technology to transform life and work into a smart medium through fundamental means. The third is simply to say that a "smart city" is the implementation of information and communication technologies. The fourth will see the city as a territorial space that will interconnect ICTs and citizens to enhance innovation, learning, knowledge and problem solving.

In the end, Kominos sees the "smart city" as a territory with a great capacity for learning and innovation that is built around the creativity of its population, public institutions and digital infrastructures for communication.

But this vision, although encompassing the various stated terms hides some problems. For example, the different meanings of the terms stated above are different and are hardly compatible. Or, the use of technologies is rightly pointed out in each definition but not with the same implication of these.

In some cases, technology will be the main vector of the definition, while in others it will be a feature with little impact.

It is clear that when we try to define what is "smart" in a "smart city", information technology, innovation, governance, communities and sustainability will be features that will often come back permanently but in different proportions and with different interrelations.

In their article "Smart Cities in Europe" (2011), A. Caragliu & Nijkamp attempt to shed light on the elusive definition of the "smart city". To do this, they tried to obtain a global definition by providing more qualitative evidence by comparing the characteristics obtained and certain indicators such as wealth or GDP in purchasing power for example.

As stated earlier, it is clear that the concept of smart city has become fashionable in recent times and that technological infrastructure is designated as its most important characteristic and as a driver of urban growth although we also speak of the role of capital. human, education and environmental interest.

To successfully define this concept, A. Caragliu & Nijkamp (2011) reviewed the existing literature and identified six characteristics of "smart cities":

1) "The use of an infrastructure network to improve economic and political efficiency and enable social, cultural and urban development" (Hollands, 2008: 308).

This point highlights the idea of a "connected" city as a model of core development and connectivity as a source of growth.

2) "An Underlying Focus on Urban Development Led by the Economic World" (Hollands, 2008: 308).

3) "Strong emphasis on the goal of achieving social inclusion of different urban residents. (A. Caragliu & Nijkamp, 2011). That is to say the extent to which social classes benefit from a technological integration of their urban fabric.

4) "A focus on the crucial role of high technology and the creative industries of long-term urban growth" (Hollands, 2008: 309).

5) "A profound focus on the role of social capital in urban development" (Coe et al., 2001). A smart city would be a city whose community has learned to learn, adapt and innovate. People must be able to use technology if they want to be able to benefit from it.

6) "A major strategic element of smart cities is social and environmental sustainability" (A. Caragliu & Nijkamp, 2011).

In addition to these latter points, other criticisms have been made of this "smart city" concept (Hollands, 2008).

- The goal of the smart city concept can lead to an underestimation of the possible negative effects of the development of new technological and network infrastructures necessary for a city to become intelligent.

- This attraction for technology may lead to ignoring other means of promising urban development.

To arrive at a final definition, A. Caragliu & Nijkamp were also inspired by six axes classifying the different themes of "smart cities". These axes are: smart economy; smart mobility; smart environment; smart people; smart living; and smart governance (Giffinger & Cie, 2007). These axes are based on theories of regional competitiveness, transport, ICT, natural resources, social and human capital, quality of life and participation of the population in society. The final definition adopted by A. Caragliu & Nijkamp is therefore: "A city is smart when investments in human and social capital, traditional investments and investments in modern communication infrastructure (ICT) support economic growth. And quality of life, with rational management of natural resources, through participatory governance.

One of the best-known models for the smart city concept is Nam T. and Pardo dating from 2011. As in most existing works, this one insists that there is a multitude of definitions of the smart city at the level of its name or its characteristics. In order to arrive at a definition, Nam and Pardo tried to establish the different meanings that the word "smart" could take in "smart city". They then listed a series of "working definitions" The authors of these definitions are: Nam and Pardo,.Washburn, Griffinger, Natural Resources Defense Council, Hall R., IBM, Rios, Partridge.

2.1.4 Dimensions (the main components):

Nam and Pardo have come to the conclusion that a smart city has three main components: the technological dimension, the human dimension and the institutional dimension. And that, by analyzing all the different types of city existing in the literature.

These dimensions give way to three categories of factors with the same name (technological factors, institutional factors and human factors). The "smart city" would therefore be at the intersection of these three types of factors as shown in diagram below (Nam and Pardo, 2011).

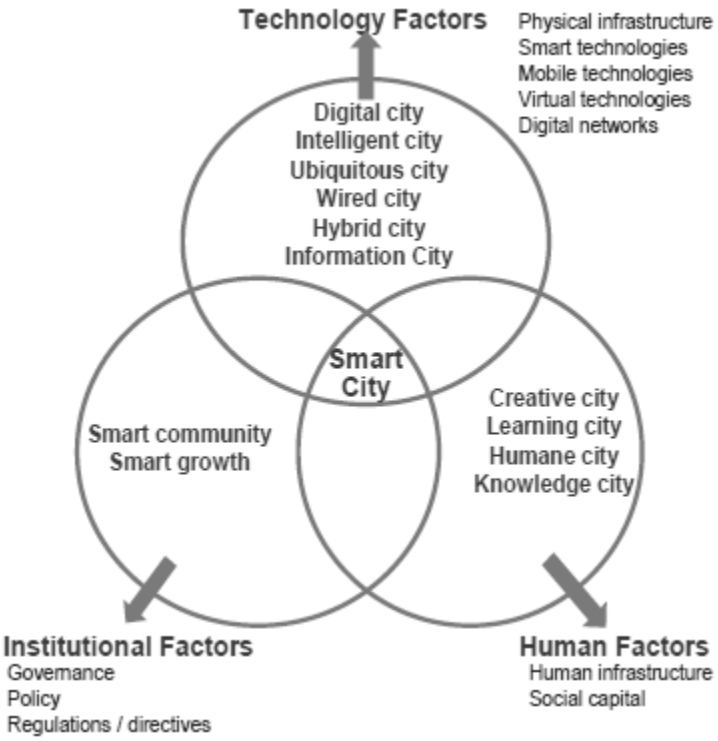


Figure 04: The three big components of Smart City‟s factors (Pardo and Nam,2011)

Technology is an important part of being a "smart city" because the use of ICTs is transforming life and work into a smart environment. Well-functioning infrastructures are absolutely necessary to become a smart city, but they are not enough. These are only prerequisites because without a real will of public institutions, the private sector, citizens, etc. to collaborate together, a smart city cannot see the day.

Human factors will come to add to the technological factors. The role of human infrastructure, human capital and education is also important. To develop, the "smart city" will need "smart people". This concept incorporates factors such as affinity to lifelong learning, ethnic and social plurality, flexibility, creativity, openness, and so on. The category of human factors therefore puts focus on social learning, education and creativity.

Government support is fundamental for the implementation of a smart city. This category will take over the role of government, the relationship between government and non-political actors, support policies, a transparent and participative policy, etc. It is necessary to establish an administrative environment (initiatives, structure and commitment) to support the development of a "smart city".

The success factors of a smart city can be divided into eight categories. These are briefly explained and illustrated below. These factors are essential to understanding how a "smart city" works.

2.1.5 The success factors:

- Management and organization: Very few studies address the subject of management and organization as important factors for the proper functioning of a "smart city". The table below shows the different challenges that must be faced and the different strategies to apply.

Challenges	Strategies
• Project size • Manager's attitudes and Behavior • Users or organizational diversity • Lack of alignment of organizational goals and project • Multiple or conflicting goals • Resistance to change • Turf and conflicts	• Project team skills and expertise • Well-skilled and respected IT leader (technical and social skills) • Clear and realistic goals • Identification of relevant stakeholders • End-user involvement • Planning • Clear milestones and measurable deliverables • Good communication • Previous business process improvement • Adequate training • Adequate and innovative funding • Current or best practices review

Figure 05: The different challenges that must be faced and the different strategies

- Technology: A smart city relies on a large number of technological tools to be effective. ICTs are one of the main drivers for the success of a smart city initiative. Despite the certain advantages of technology, its impact remains unclear. Indeed, it can very well improve the quality of life but it can also increase inequalities and encourage a digital divide. The table below shows the technological challenges

Dimension	Challenges
IT skills	• IT training programs • Lack employees with integration skills and culture
Organizational	• Lack of cross-sectoral cooperation • Lack of inter-departmental coordination • Unclear vision of IT management • Politics • Culture issues

Figure 06 : The technological challenges

Governance: In "smart city" projects, it is important to have a coherent and competent governance. It is also essential to show maximum transparency. Indeed, governance is based on a partnership between the public sector, the private sector and citizens. Therefore, a lack of cooperation and transparency would have a negative impact on the "smart city".

- Political context: this has a non-negligible impact on the "smart city". It is essential that it should be stable and supportive. Transforming a city into a smart city requires time and involvement from each stakeholder. The political context, although difficult to measure and observe, remains one of the most essential factors for the smooth running of a smart city initiative. Special attention needs to be paid to different laws and rules that could become barriers to non-compliance.

- Communities and population: urban citizens are at the center of smart cities. For the successful realization of a smart initiative city ", their involvement is paramount. It must be kept in mind that the purpose of this type of initiative is, among other things, to improve the li

- Economy: This is one of the major drivers for a "smart city". The more a city has a competitive economy, the more it will be inclined to implement a "smart city" project.

- Infrastructures: Technology is one of the success factors for a "smart city". That's why it needs infrastructure to be efficient. The more infrastructure a city enjoys, the more likely it

will be to bring it to smart city. When we talk about infrastructure, it means: installations for optical fiber, Wi-Fi networks, wireless hotspots, etc. vying for better living conditions of citizens.

Dimension	Challenges
IT infrastructure	• Lack of integration across government systems • Existing internal systems have restrictions regarding their integrating capabilities • Lack of knowledge regarding interoperability • Availability and compatibility of software, systems and applications
Security and privacy	• Threats from hackers and intruders • Threats from viruses, worms and Trojans • Privacy of personal data • High cost of security applications and solutions • accessibility
Operational cost	• High cost of IT professionals and consultancies • High cost of IT • Cost of installation, operation and maintenance of information systems • Cost of training

- Natural environment: one of the important points of a "smart city" is to use technology to ensure sustainability and better manage natural resources. It is therefore logical that the environment plays a role.

Thanks to all these factors, it was possible to establish a structure around which a "smart city" initiative could emerge. This structure schematizes with the "smart city" in the center and the factors of success gravitating around.

Each factor influences others but is also influenced by others. The factors are proposed according to two categories of influence. Those furthest away from the center are those who will first have an impact on factors near the center (technology, organization and politics) before exercising one on the "smart city" initiative. The more central factors will have a greater role in the success of the initiative compared to others (see diagram below).

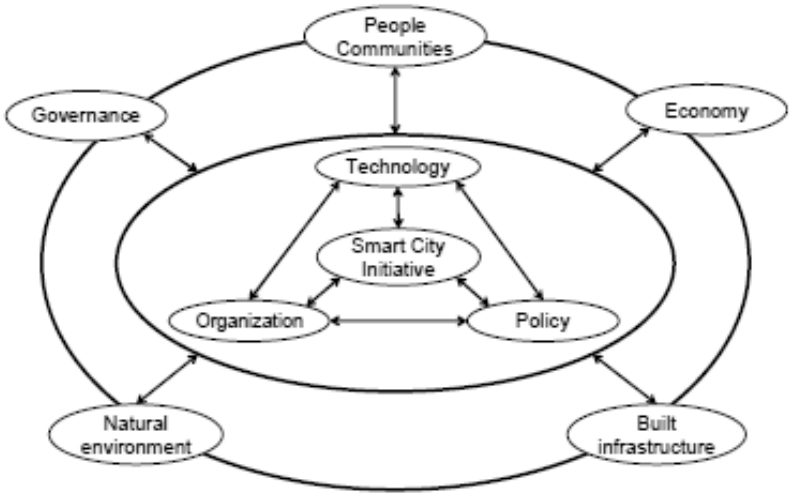


Figure 07: The success factors of smart city

2.1.6 The Smart City Characteristics:

In the framework of Horizon 2020 (H2020), the European Parliament published a report (2014) on smart cities in Europe. In this context, the study returns to a global definition of the "smart city". As in a multitude of researches, the authors agree on the fact that there are different definitions. The European Parliament has noted a few .Through the help of all these definitions; the parliament has established its own definition: a "smart city" is a city seeking to tackle the public problems of society through ICT-oriented solutions based on partnerships between multiple stakeholders (citizens, authorities, companies, etc.). In its definition, it rests on the six dimensions of Giffinger published in 2007. These six characteristics stated earlier in this work can be defined as follows (Desdemoustier, 2015):

The Smart Living dimension: takes the aspects of quality of life in the city, health, housing, tourism, the smart living will raise questions about social cohesion, social capital, quality and availability of housing. It is therefore closely linked to the lifestyles and solutions put in place for a healthy and safe life.

- The Smart Economy dimension: will involve all aspects of economic competitiveness, i.e. innovation, entrepreneurship, productivity, the labor market, etc. It will analyze the physical and virtual links, the exchanges of goods and services, without forgetting the products of knowledge between the local and globalized world. It will often lead to the development of an ecosystem of actors.

- The Smart People dimension: will encompass all that is related to the person, it can range from the skills of this one, to his education, to the management of his knowledge, in this dimension, it is very important to put focus on creativity and innovation. People must be able to make decisions and to be full players.

- The Smart Governance dimension: will involve partnerships between the private, public and civil sectors with the main use of ICTs to achieve common objectives. This dimension encompasses the services and interactions of city organizations to make its operation more efficient. Participatory decision-making and e-Governance are key issues within this dimension. In this dimension, it is very important to gather a large amount of data from all the actors of the city to establish intelligent processes and interoperability.

- The Smart Environment dimension will induce an intelligent management of energy resources (for example via renewable energies). The natural and heritage resources must be managed in a balanced way, pollution must be reduced, and this is where this dimension comes into play. It is necessary to develop a green urbanism. This dimension will therefore take all that is related to ecology and environmental sustainability.

- The Smart Mobility dimension as its name suggests will concern mobility within the city. It's about setting up a modern transport system to improve the efficiency of citizens' movements, information, services, goods, etc. Access to real-time information is also an important point of this dimension.

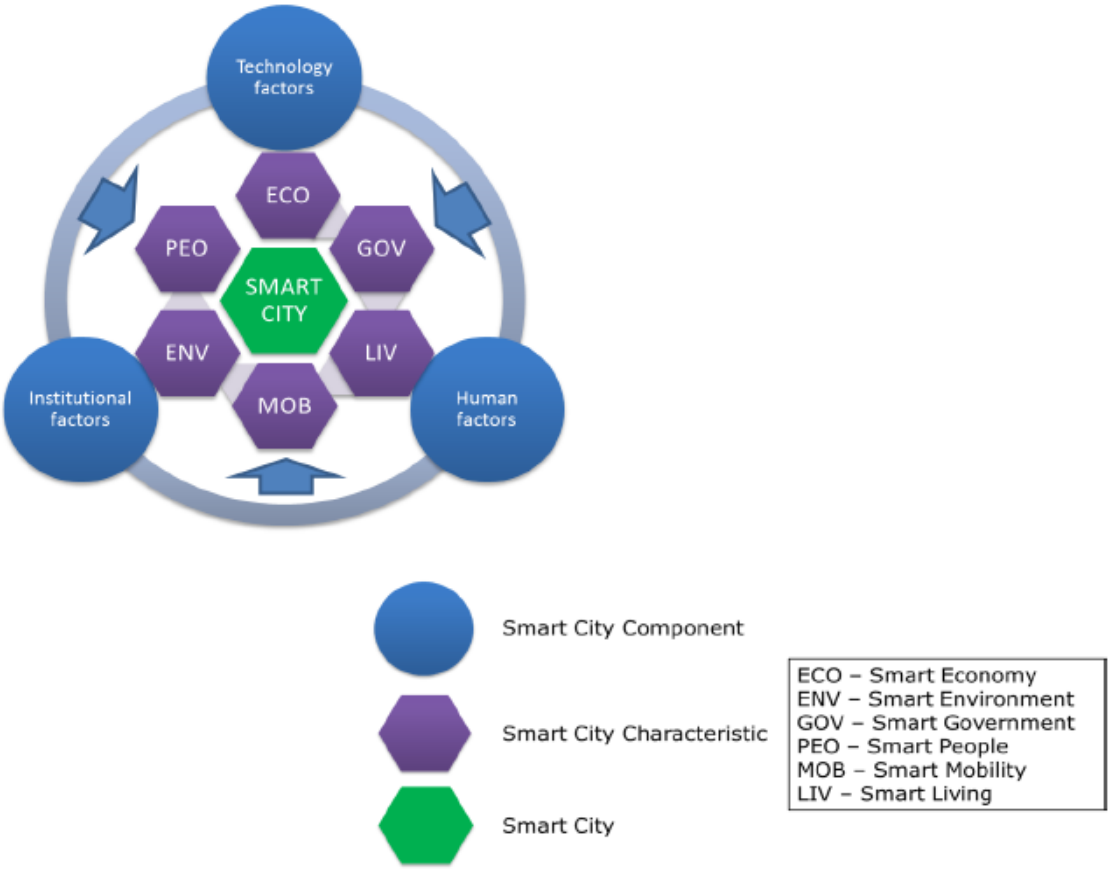


Figure 8: Characteristics and big components of smart city

2.1.7 Smart City Projects Challenges:

Smart city projects challenges include the classical projects challenges and other certain challenges emerging from the complexity and innovative nature of smart city projects. These challenges make partners, managers and city head (city leader) to come up with innovative solutions. The challenges that might come towards managers include:

- The technological challenges:

Smart city projects depend frequently on technology. However, fulfilling digital infrastructure is challenging because of the lack of knowledge about ICT systems and compatible software, the privacy and security problems where systems may get hacked or infected by viruses etc., the high cost of maintaining, operating and installing IT systems and the cost of training and recruiting IT specialists.

- The financial challenges:

Smart city projects require big financial resources to adapt technology to the city existing infrastructure which is more expensive than building a new smart city. The major challenges are finding who can fund the project, choosing the right investment that will create long-term benefits, efficiencies and outcomes, the way to avoid huge investments that generate long-term benefits and focusing on short-term, and the need for innovative business, operating and finance models in order to transference from pilot projects into full-scale projects.

- Lack of collaboration among governmental restraints and different stakeholders:

Smart city projects require collaboration between private organizations, public institutions, NGOs, citizens, etc. which augment the complexity of these projects. The major challenges are poor communication and coordination between these participants, the leadership style, lack of policies for open data that enables sharing across departments and organizations, lack of support from both local government and city administration, the time taken by organizations involved in the project to make decisions and breaking down silos that block the success of the project.

- The Managerial challenges:

One of the challenges of smart city projects is their scope and size where two types of projects can be defined; Greenfield projects which are big, long-term, and usually starts from zero and Brownfield projects which are smaller sized projects, short-term and fast implemented are usually built on existed infrastructure and are preferred by investors for producing fast revenues. Another challenge is leadership style and manager's technical and social talents. Similarly, the lack of comprehending solutions that leads to poor decisions. Also, the lack of educated and qualified teams who can work in these complex and high-tech projects, resistance to change and inadequate training are also of the smart city projects challenges. Moreover, the variety of the project's relevant stakeholders creates conflicts about who will govern and finance or who will capture the created value. Finally, having numerous goals that do not align with the project vision can be challenging, also, miscommunication of the project's objectives to the local community.

- The social challenges:

Smart city projects need to engage citizens and create a common understanding of the key objectives, challenges, and opportunities between all smart city project participants. The major challenges lie in how to motivate and involve citizens in smart city projects, measure and express the value created by the smart city project for citizens, the digital divide in the city and change the behavior and thinking of citizens to what's called "smart thinking".

2.1.8 The political and legal issues of the smart city:

- ✓ Legal issues:

An intelligent city is the translation of an urban evolution and an adaptation of the city to new realities.

According to Gwendal Le Grand, head of the CNIL's computer expertise department, the concept of a smart city is to "screen the city (and people) with sensors, network these sensors (thanks to telecommunications operators). The objective being to provide new services, to improve the quality of life, to have a more sustainable city ..."

The use of these data sensors, the creation of infrastructures and the administrative organization of these cities of a new type give rise to legal questions.

- ❖ Protection of private life:

Protecting the privacy of the people whose data is collected to make a smart city work is a must. How to reconcile collection, use of personal data and respect for the right to privacy?

The example of geolocation shows the advantages and disadvantages of a smart city.

This technique allows you to track the movements of one or more people through a phone. The latter, in fact, emits continuous waves collected by relay antennas.

The telecommunications operators owning these antennas are therefore able to locate in space the persons whose telephone number they hold. They are thus able to adapt their offer to the movements of their customers.

They are also likely to communicate these data, previously anonymized, to third parties, merchants for example, who can also adjust their activity profile of people passing near their shop.

But this location encroaches on the private domain of people, because even if anonymisation is a guarantee of the right to respect for private life, it is not, according to experts, a very reliable technique, and it is easy to find the identity of a person by overlapping data.

The protection of privacy is a major issue because the right to privacy is a fundamental right recognized by national and international texts.

The question of respect for privacy raises the question of another question: who owns these data, or, in other words, what is the legal status of these data?

- ❖ Legal status of the data:

Personal data characterizes a person. They are held by legal persons (telecommunications operators, public social services, hospitals, etc.). But who is legally the owner? The question is not settled.

The smart city being built on a multitude of data, it would be interesting to determine who owns it. This is to frame their use and possible reuse. If we identify the owner of a data, he alone can subsequently, without dispute possible, use this data as he sees fit.

The Council of State, in its report on the digital and fundamental rights, has taken a position not to recognize a property right on these data. It advocates the recognition of other rights, such as a right to control the use of data that concern us.

- ❖ Liability issues:

New liability law issues are likely to emerge as part of building a smart city.

Indeed, when it comes to road traffic, the question is essential. Autonomous vehicles are intelligent cars that can drive themselves, without the driver having anything to do, thanks to the fact that they are connected to a central system helping him to make his choice (change of line, etc. . .).

If an accident is caused by interconnected urban devices, who is to blame? Multiple stakeholders would be likely to be held liable (local public authority which is responsible for regulating traffic, company having manufactured the intelligent system ...).

Beyond the protection of privacy and the attribution of responsibility in case of accident, other legal issues, related to the "administrative" organization of the smart city, appear.

- Public contracts:

The organization of the current city is based on numerous public contracts concluded to operate public services. Today, these gas, electricity and water supply services are organized in a segmented way, thanks to the conclusion of various public service delegations.

However, an intelligent city, composed of infrastructures operating on a mass of data, will have to entrust to a single operator a set of tasks that are outsourced today.

"General contracting" will be born, which will not necessarily be adapted to the public contractual law as it exists, as well as to the law of the regulation of the public services and to the right of the competition.

In addition, a smart city is a city that relies on innovative processes.

According to Jean-Bernard Auby, professor of public law at Sciences-Po Paris, director of the "Mutations of Public Action and Public Law" Chair, public procurement law and innovation do not necessarily work well together.

Indeed, the city that wants to develop a new infrastructure or intelligent system will look for a company to design this infrastructure or system. The companies launched by the city will need to experiment, to test solutions. Consequently, the contractual relations will have to be established in two stages: a first contract of order of the system and a second contract of setting up of this system. This seems complicated because the company that will have designed a system will not necessarily be the one that will be retained at the end of the design phase.

- ✓ Political issues:

Political considerations must be considered in the context of the operation of a smart city:

- ❖ How far can we go in terms of data usage? Living in an interconnected data environment can lead us to question the permanent control over our person and our private life. The interconnected institutions of the city have a lot of information about us; they can be perceived as a "big brother", and thus at the origin of attacks on our individual liberties.

- ❖ It is therefore necessary to legislate, to supervise the development of these new services, these new infrastructures. However, today, we do not legislate, so as not to block developments, which cannot, ultimately, constitute a perennial situation.

- ❖ Finally, the question of the level of control of these smart cities is raised today. According to Jean-Bernard Auby, "at a certain level, a level of coordination, regulation and steering is needed".

The most relevant level would be that of local authorities, although some advocate for a national regulation of data stocks, with the creation of a large public national public data service.

2.1.9 The strength of the smart city (three big promises):

« LA VILLE INTELLIGENTE Origine, définitions, forces et limites d'une expression polysémique Sandra Breux et Jérémy Diaz »

The popularity of the smart city rests on the idea that it would be a response to several challenges, already mentioned above, that meet contemporary cities. In this sense, as Kitchin (2016) points out, the smart city would bring its share of promises.

The smart city would be the bulwark of chaos. The city would become more efficient because rationalized by the supply of data that can control the city, make it more controllable and especially more responsive. "Then it's a more sober city. It is not so much the smart city that makes it so, but the importance of technology, because it allows municipal governments to operate more efficiently and effectively (Meijer & Thaens, 2016).

- An efficient, streamlined and leading city:

It's also about leadership, as Michael Flowers, head of the data management department in New York, points out: "A data-driven city is a city that is delivering better services. Transparency, open data, and innovation are all important parts of the modern civic identity which is focused on strengthening its position as a tech leader. However, being a data-driven city is really about more efficiently and effectively delivering the core services of the city: smarter, risk-based resource allocation, better sharing of information agency-to-agency to facilitate smart decision-making, and using the data in a way that integrates in the established day-to-day frontline workers. Being data-driven is not primarily a challenge of technology; it is a challenge of leadership and organizational leadership "(Beyond Transparency, 2016)

- A more stimulating city where life is good:

The smart city aims, among other things, to improve the quality of life, governance, the development of urban policy, etc. It is even envisaged that new information technologies "produce" more "intelligent" citizens who, in turn, will adopt smarter behaviors. "The smart city must 'attract smart people'. For this, it must offer a rare experience for the creative class (Florida, 2002) or city dwellers of the world's metropolises "(Morvan, 2016, 114).Others see the use of new technologies as a means to foster social innovation, social justice, civic engagement and hacktivism, as well as transparent and accountable governance (Townsend 2013, Kitchin 2014). . Understood in this sense, the smart city would also reduce inequalities between social groups (Kitchin, 2016). The "smart city" is then approached as a political project (March & Ribera-Fumaz, 2014). It is in this perspective that some open the debate on the right to the smart city in the digital turn of urban policies (Wiig & Wyly, 2016).

- A sustainable city:

The smart city is first and foremost a digital city, but it also allows the fusion between digital and environment, "supposed to gradually eliminate governance errors and bad human behavior, due to lack of data and feedback on behaviors, in order to achieve a goal of reducing energy consumption and hence low-carbon economy "(Felli, 2015: 156). The smart city would indirectly enable people to adopt more environmentally friendly behaviors through data and move urban societies to an energy transition. However, if the promises of the smart city are numerous, they also present a number of limits that should be detailed.

2.2 Performance and indicator-related concepts:

In this section of the work, the notion of overall performance has been explained. Be careful that this performance is defined relative to a company and not to a city. The performance and its measurement tools are therefore explained here in a global perspective. However, a parallelism between a company and a city is quite possible with some adjustments.

First, the performance clearly has a financial dimension. But this is not the only one to consider in a long time. This was to ensure the sustainability of the company and to obtain the desired turnover by the shareholding. However, it is clear that for some years now, there have been more comprehensive approaches to performance that take into account the social and environmental dimensions. The interaction between the company and its stakeholders is growing. Corporate responsibility is no longer limited only to shareholders, but opens up to these new players. It is in this concept that the overall performance comes (Dohou A. and Berland N., 2007).

2.2.1 The triangle of performance: (Gilbert's model):

For a long time, the classic approach has been imposed, simplifying the issue of performance, uniting individuals around a single objective determined in high places. This

practical approach is still widely used, especially in the NICs; New Industrial Countries with rapid industrial growth.

To summarize this approach, a global model can be presented; it is the model of Gilbert (1980) which is declined through the triangle of the performance.

Figure 9: The Model of Gilbert (1980)

The results-to-results segment defines effectiveness and whether the company is efficient enough to achieve its goals. The segment between results and means defines the efficiency and makes it possible to know if the company reaches its objectives with less costs and means.

The segment between means and objectives is the relevance and whether the company has the right means to achieve its objectives.

This system is called "short loop" and allows a simplified representation of the rational approach by giving an important place to the basic notions of classical analysis.

2.2.2 Financial performance:

Performance is a concept used for many years in the world of management. Its origin comes from the French language during the 19th century. We can define the word as the result of an action, to see the success or defeat (Bourguignon, 1995).

As far as the economic world is concerned, its definition remains vaguer. In their work, Dohou A. and Berland N. (2007) use a definition of Bourguignon (2007). The performance can be defined as the achievement of organizational objectives, regardless of the nature and variety of these objectives. « This realization can be understood in the strict sense (result, outcome) or in the broad sense of the process that leads to the result (action)...»

(Bourguignon, 2000). It is necessary to recall (Lebas, 1995) that performance can only exist if it is measured. It is therefore necessary to set objectives and compare them to the results (Bouqin, 2004). As Bourguignon (2000) has said, the one who achieves his objectives performs well.

To know if one has reached the desired level of performance, one must know how to evaluate it. According to Bouquin (2004), the goal of a company is to obtain its resources at a lower cost in order to provide the most cost-effective services and products possible and to maximize productivity. To do this, the objectives must be clearly defined. It often happens that there is a plurality of objectives and that they are in contradiction with each other (Dohou A. and Berland N., 2007). It is therefore important to identify which objectives to measure and which ones have the greatest influence on the company's performance.

It is also possible to measure performance via the average-performance ratio (Dohou A. and Berland N., 2007). But for that, it is necessary that the relation between the two notions present in the ratio is well known. This can sometimes cause problems and thus make the efficiency calculation fail. This financial logic that wants to obtain the most results with the least possible resources is disputed.

Financial logic being challenged, companies are forced to supplement the notion of performance with other criteria such as social responsibility[14], stakeholders, etc. (Dohou A. and Berland N., 2007). This is where the broader notion of performance emerges.

2.2.3 Overall approach to performance:

When the overall approach to performance is put forward, it is not only financial performance but also societal performance. This societal performance is based on the "Triple Bottom Line", that is, economic prosperity, respect for the environment, respect and improvement of social cohesion (Pesqueux, 2002). This concept therefore takes into account the three dimensions of sustainable development (Dohou A. and Berland N., 2007). According to this

[14] CSR definition according to the European Commission: "CSR is a concept that refers to the voluntary integration by companies of social and environmental concerns into their business activities and their relations with their stakeholders" (Green Paper, July 2001). p.8).

vision, we must highlight and balance the three dimensions (economic, ecological and social) within the company. It is in this vision that comes the overall performance of the company.
In their book, Dohou A. and Berland N. (2007) cite respectively Baret (2006) and Germain (2004) to define global performance: the overall performance of companies "is defined as the aggregation of economic, social and environmental performances or "is formed by the meeting of financial performance, social performance and societal performance".

For the purpose of the study conducted here, the vision of performance that has been retained is that of identifying a balance between the different dimensions of economic, social and environmental performance and between stakeholders. This definition seems to be the most logical and most in line with the definition of "smart city".

2.2.4 Performance indicators as measurement tools:

In this work, it is the performance indicators that have been chosen to measure performance. It is true that there are a whole series of other ways to evaluate it (Voyer P., 2009) but the aim of the study was to establish a list of performance indicators for smart cities. .

To set indicators that are relevant and consistent with the desired subject, the "SMART" method must be followed. That is, the objectives that are targeted by the indicators must have the characteristics of this method. The word "SMART" is used as an acronym for:

- Specific: the indicator must be related to the desired objective. It must remain simple and there must be the means to achieve it.

- Measurable: an indicator can only exist if it is measurable.

- Ambitious: if the indicator is not ambitious enough, its contribution and relevance may have a small added value compared to the desired objective.

- Realistic: the objective of the indicator must be achievable. If it is inaccessible, then it will be impossible to get a consistent result.

- Temporal: an indicator must have a limit in time to have coherence.

It is therefore clear that the objectives of an indicator must be set in a "SMART" way so that the indicator provides real added value.

In the same vein, there are other important points to consider when using indicators (Food and Agriculture Organization of the United Nations, 2002):

- Without good data, based on a rigorous control, it is not possible to develop indicators. Measuring performance involves setting clear goals.
- Different people living in different places have different values. Indicators must therefore be adaptable and flexible according to these characteristics.
- Indicators evolve over time.
- Indicators reduce uncertainty but do not eliminate it.

It is clear, therefore, that indicators are undeniable tools for measuring performance, but they must not be chosen, put in place, used and interpreted without critical and objective judgment.

2.2.5 Types of indicators: " European commission 2015"

For evaluating Smart City Projects we are means the degree to which these projects contribute to reaching city objectives with regard to smart sustainable development. That means that the goal is on impact indicators.

Impact indicators are applicable to all types of projects in all contexts: For instance, an indicator in the framework could be 'the reduction in greenhouse gas emissions', whether for e.g. introducing electric vehicles or by isolating dwellings. The number of electric vehicles introduced or dwellings insulated, is then less relevant, making the indicator framework suitable for evaluation of many types of projects in different contexts.

Impact indicators also leave space for the cities to find their own solutions to achieve a certain performance, instead of prescribing the way they should reach that or the measures that have to be taken/implemented. The latter ones have the risk to lower the possibility for innovative solutions to achieve the same target, and might be outdated within a few years.

By focusing the indicators on impacts instead of sectors, also cross-sectoral solutions can be readily evaluated. The indicator framework will not implicitly put a concentrate on isolated, sector specific solutions.

“Typology of indicators, according to stage in the process:”(European commission 2015)

- ✓ Input indicators:

These indicators refer to the resources needed for the implementation of an activity or intervention, measuring the quantity, quality, and timeliness of resources. Policies, human resources, materials, financial resources are examples of input indicators.

- ✓ Process indicators:

Process indicators refer to indicators to measure whether planned activities took place. Examples include holding of meetings, conduct of training courses, and distribution of smart meters.

- ✓ Output indicators:

Output indicators add more details in relation to the product (“output”) of the activity, e.g. the number of smart meters distributed, the area of roof that has been isolated, the number of electric busses in the system.

- ✓ Outcome indicators:

Measuring the intermediate results generated by project outputs. Outcome indicators refer more specifically to the objectives of an intervention that is its ‘results’, its outcome. These indicators refer to the reason why it was decided to conduct certain interventions in the first place. They are the result of both the “quantity” (“how many”) and quality (“how well”) of the activities implemented. Often they are ‘coverage indicators’ measuring the extent to which the target population has been reached by the project.

Example: the outcome of a thermal isolation programmer could be the number of well-isolated dwellings as percentage of the total number of dwellings covered by the programme.

- ✓ Impact indicators:

Measuring the quality and quantity of long-term results generated by programme outputs (e.g. measurable change in quality of life, reduced energy use, reduced air pollutant emissions and (even a more distant impact) improved air quality).

Usually it is easier to define and measure simple output indicators, as impact indicators can be complex, costy, and more difficult to measure. However, output indicators constitute a nearly endless collection of measures describing all kinds of project outputs. Impact indicators are fewer in number as they relate to a more limited collection of policy goals. ”(European commission 2015)

A disadvantage of impact indicators is that impacts are only apparent after the project has been implemented and is in full use, which might take a few years. In addition numerous contextual factors can influence the final impact reached. Nevertheless the impact is the only measure that counts for reaching policy goals.

The CITY keys evaluations will be based on either the projected impacts for planned smart city projects, or on monitoring results for completed projects. Methodologies for calculating the impact compared to a reference situation without the project have been developed and tested for other assessment systems (Eurbanlab, 2014; ITU L1440, ITU L.1430).

In an assessment of a specific project, the project description will contain the information on the characteristics of the project, accompanied by a description of input variables (investment, operating costs, efforts to plan, design and realize the project) and of outputs (e.g. number of buildings retrofitted, number of smart meters installed, number of apps linked to smart meters, capacity battery storage units, number of electric vehicles (buses, taxis, scooters, vehicles operated by the city administration, etc.), number of charging stations, number of smart street lights, number of bus stops with real time departure information, etc., etc., depending on the precise nature of the project), since that type of output/outcome information is often needed to calculate impact results (i.e. no information is lost).

2.2.6 Key Performance Indicators focus:(European commission 2014)

The origin of Key Performance Indicators (KPI’s) is in business administration. Key Performance Indicators provide businesses with a tool for measurement (DEFRA, 2006). They are quantifiable metrics that reflect the performance of a business in the context of achieving its wider goals and objectives. KPIs help businesses to implement strategies by linking various levels of an organization or a project with clearly defined targets and benchmarks. Gradually the use of the term Key Performance Indicators has extended beyond business and industry to government administrations.

The difference between all kinds of other indicators or progress measures is that Key Performance Indicators are directly related to an organization's strategy and are critical for its successful execution of its strategy. KPI's are always tied to a goal, a target or an objective.
In essence two questions are leading for the definition of KPI's in organizations and also for smart city project implementation:

- ✓ Are we doing the right things? Or how effective is the organization, whereby the indicator reflects the degree to which smart city projects conform to the requirements or expectations;
- ✓ Are we doing things right? Or, how efficient is the organization, whereby the indicator reflects the degree to which smart city projects deliver the expected impact at minimum resource costs.

As KPI's focus on these 'key' measures that are important for understanding the impacts of smart city projects, they prevent lengthy reports on many less relevant aspects.

2.2.7 Criteria for selecting indicators:

In general, indicators (and even more so KPI's) should express as precisely as possible to what extent an aim, a goal or a standard has been reached or even surpassed. Data that are not linked to standards or specific goals of projects can be used as quantitative background information (e.g. the size of the project in million Euro), but are not suited for evaluative purposes. Often, however, various indicators are available to assess the progression towards a certain goal. Scanning the existing indicators sets for CITY keys resulted in long lists of potential indicators per subtheme. To evaluate these criteria and make a shortlist of indicators for discussion with partners, a set of criteria was used, based on the criteria used by the CIVITAS framework:

1. RELEVANCE; each indicator should have a significant importance for the evaluation process. That means that the indicators should have a strong link to the subthemes of the framework.
Further the indicators should be selected and defined in such a way that the implementation of the smart city project will provide a clear signal in the change of the indicator value. Indicators that are influenced by other factors than the implementation of the evaluated

project are not suited. Indicators that provide an ambiguous signal (if there is doubt on the interpretation of e.g. an increase in the indicator value) are equally not suited.

2. COMPLETENESS; the set of indicators should consider all aspects of the implementation of smart city projects. KPI's can be selected according to the People, Planet, Prosperity and Governance themes (and for project indicators also from the Propagation theme), which framework is fairly comprehensive in describing public policy goals.

3. AVAILABILITY; Data for the indicators should be easily available. As the inventory for gathering the data for the indicators should be kept limited in time and effort, the indicators should be based on data that either:
- are available from the project leader or others involved in the innovation case that is being evaluated,
- Or can easily be compiled from public sources,
- Or can easily be gathered from interviews, maps, or terrain observations.
Indicators that require, for instance, interviews of users or dwellers are not suited as the large amounts of data needed are too expensive to gather. The same holds for indicators that require extensive recalculations and additional data, such as footprint indicators, and some financial indicators. The current selection contains, however, a few footprint type indicators that might be expected to become common in the near future (e.g. reduction in indirect CO2 emissions).

4. MEASURABILITY; the identified indicators should be capable of being measured, preferably as objectively as possible. For the majority of indicators in the People, Governance and Propagation themes, quantitative measurability is limited. Social sciences provide approaches to deal with qualitative information in a semi-quantitative way (Abeyasekera, 2005).

5. RELIABILITY; the definitions of the indicators should be clear and not open for different interpretations. This holds for the definition itself and for the calculation methods behind the indicator.

6. FAMILIARITY; The indicators should be easy to understand by the users. For a large number of indicators we have relied on indicators from existing indicator sets, that generally

comply with this requirement. For new indicators a definition has been developed that has a meaning in the context of existing policy goals.

7. NON-REDUNDANCY; Indicators within a system/framework should not measure the same aspect of a subtheme.

8. INDEPENDENCE; Small changes in the measurements of an indicator should not impact preferences assigned to other indicators in the evaluation. In general we have kept to this principle, but given the political attention for both improving energy efficiency and reducing carbon dioxide emissions, we have included both indicators. As the current energy system is still largely based on fossil fuels, there is a direct relation between a reduction in the use of energy and the reduction of the emission of carbon dioxide. This will lead to a certain extent to double counting the impact.
The long list of project indicators derived from existing frameworks and respective scores on these criteria can be obtained from the authors.

2.2.8 E-Government Development Index (EGDI):

"Mathematically, the E-Government Development Index (EGDI) is a weighted average of normalized scores on the three most important dimensions of e-government, namely: scope and quality of online services (Online Service Index, OSI), status of the development of telecommunication infrastructure (Telecommunication Infrastructure Index, TII) and inherent human capital (Human Capital Index, HCI). Each of these sets of indices is in itself a composite measure that can be extracted and analyzed independently (See Figure).
EGDI =1/3 (OSI normalized +TII normalized + HCI normalized)." (UNITED NATIONS E-GOVERNMENT SURVEY 2016)

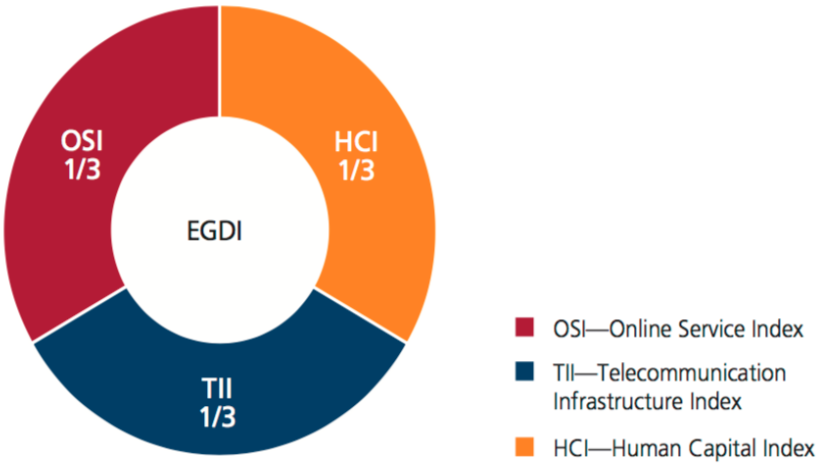


Figure 10: The three components of the E-Government Development Index (EGDI)

1) Telecommunication Infrastructure Index (TII):

"The Telecommunication Infrastructure Index (TII) is an arithmetic average composite of five indicators:

1- estimated internet users per 100 inhabitants;

2- Number of main fixed telephone lines per 100 inhabitants;

3- Number of mobile subscribers per 100 inhabitants;

4- Number of wireless broadband subscriptions per 100 inhabitants; and (v) number of fixed broadband subscriptions per 100 inhabitants. The International Telecommunication Union is the primary source of data in each case. " (UNITED NATIONS E-GOVERNMENT SURVEY 2016)

The definitions of the five components of TII1 are:

1. Internet users (per 100 inhabitants) refer to individuals who used the Internet from any location in the last three months.

2. Main fixed telephone lines (per 100 inhabitants) refers to telephone lines connecting a customer's terminal equipment (e.g., telephone set, facsimile machine) to the public switched telephone network (PSTN), which has a dedicated port on a telephone exchange. This term is synonymous with the terms main station or Direct Exchange Line (DEL), which are commonly used in telecommunication documents. It may not be the same as an access line or a subscription.

3. Mobile subscribers (per 100 inhabitants) are the number of subscriptions to mobile service in the last three months. A mobile (cellular) telephone refers to a portable telephone

subscribed to a public mobile telephone service using cellular technology, which provides access to the PSTN. This includes analogue and digital cellular systems and technologies such as IMT-2000 (3G) and IMT-Advanced. Users of both post-paid subscriptions and prepaid accounts are included.

4. Wireless-broadband subscriptions refers to the sum of satellite broadband, terrestrial fixed wireless broadband and active mobile-broadband subscriptions to the public Internet.

5. Fixed broadband subscriptions (per 100 inhabitants) refers to fixed subscriptions to high-speed access to the public Internet (a TCP/IP connection), at downstream speeds equal to, or greater than, 256 Kbit/s. This includes cable modem, DSL, fiber-to-the-home/ building, other fixed (wired)-broadband subscriptions, satellite broadband and terrestrial fixed wireless broadband. This total is measured irrespective of the method of payment.

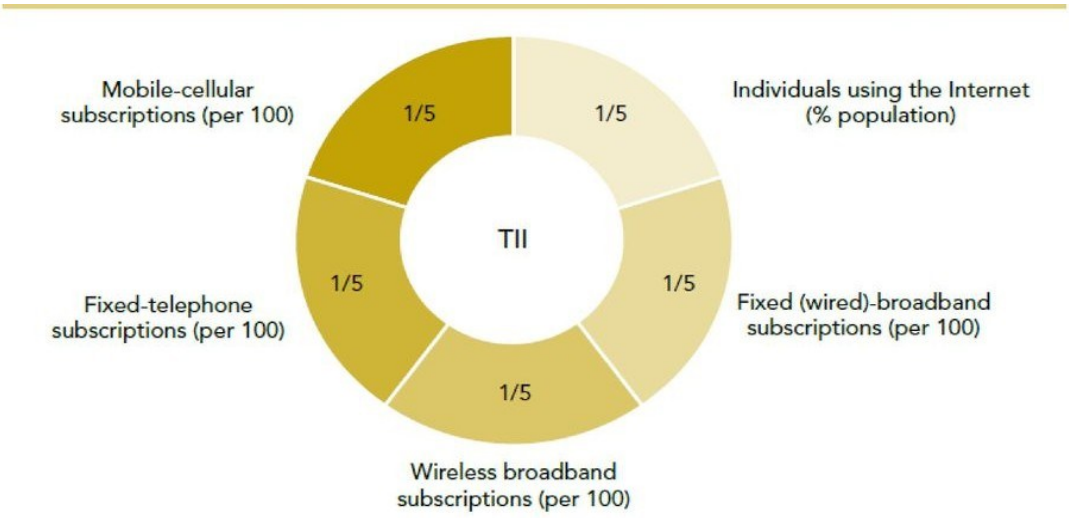


Figure11: Telecommunication Infrastructure Index (TII) and its components.

2) Human Capital Index (HCI):

The Human Capital Index (HCI) consists of four components, namely:

(i) Adult literacy rate;

(ii) The combined primary, secondary and tertiary gross enrolment ratio;

(iii) Expected years of Schooling; and (iv) average years of schooling. (See Figure)

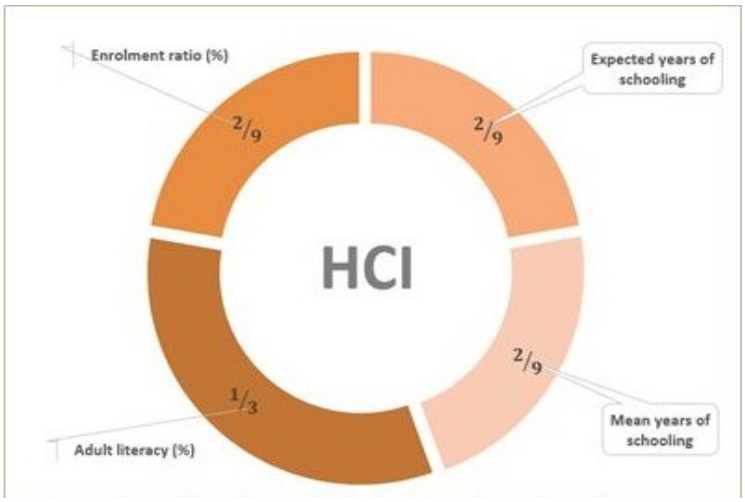


Figure 12: Human Capital Index (HCI) and its components:

The definitions of the four indicators of HCI are:

1. Adult literacy is evaluated as the rate of people aged 15 years and above who can, with understanding, both read and write a short simple statement on their everyday life.

2. Environment ratio is evaluated as the combined primary, secondary and tertiary gross enrolment ratio, of the total number of students enrolled at firstly, secondary and tertiary level, regardless of age, as a percentage of the population of school age for that level.

3. Mean years of schooling (MYS) provides the old number of years of education completed by a country's adult population (25 years and older), excluding the years spent repeating grades

4. Expected years of educating is the total number of years of schooling that a child of a certain age can expect to reach in the future, assuming that the probability of his or her being in school at any particular age is equal to the current enrolment ratio age.

"Adult literacy and environment ratio has been used for the past Surveys since 2002. Recognizing that education is the fundamental pillar in supporting human capital, the 2014 Survey introduced two new components to the human capital index (HCI), namely (i) expected years of schooling; and (ii) mean years of schooling. The preliminary statistical study commissioned by DESA/ DPADM validated the use of the new HCI, accentuating that

the two new components has strengthened the HCI and it does not introduce any error" (UNDESA, 2014).

3) Online Service Index (OSI):

"After the initial assessment, the evaluations by the two researchers on each country were compared and questions with discrepancies were reviewed again by the researchers. The third phase, from July to August, was the final review by the Data Team
Coordinators who analyzed all the answers and, where needed, carried out further review and verification processes using multiple methods and sources. The scores were then sent for approval by a senior researcher. Through this multilevel approach, all surveyed sites were thoroughly assessed by at least three people, one of who has years of experience in assessing public sector online services, and reviewed by one of the Data Team Coordinators.
Once the evaluation phase was completed, the statistics team produced the first draft of the OSI ranking. The data was extracted from the platform and the raw OSI scores were created. Rankings were compared with previous OSI scores, and any discrepancies were reviewed thoroughly." (UNITED NATIONS E-GOVERNMENT SURVEY 2016)

Each question roll recalls for a binary response. Every positive answer generates a new ;more in depth question, across the patterns. The outcome is an enhanced quantitative
Study with a wider range of point distributions reflecting differences in levels of e-government development among countries.

CHAPTER 2:

Methodological Framework

In order to apply the theoretical knowledge presented in the first chapter, we did a three-month practical internship in the Wilaya of Algiers.
for this purpose we have divided this chapter into three sections:

- section 1: Research methodology
- section 2: Presentation of the host organization "The Wilaya of Algiers"
- section 3: Presentation of the project "smart city Algiers"

1. Research Methodology:

In this chapter we will address the epistemological stance that frames our research as well as the methodological approach adopted, then the data collection instruments, finally the measurement scales and the limits of this research.

1.1 Epistemological approach:

This research work draws its foundations from an epistemological framework of a constructivism paradigm; it induces an inductive reasoning of verification.
The nature of our problematic attempts to establish whether a city is smart or not and to measure its performance according to a number of relevant indicators. So that we push to reach our research objectives that we presented in our problematic and thus tested the hypotheses.
In fact the literature review and the conceptual framework allowed us to induce the performance of a smart city by the KPIs. Therefore, confirmation of this goal requires us to adopt the constructivist paradigm.

1.2 Methodological approach:

To best answer the research question of this thesis, a qualitative study was conducted. It is indeed the one that best meets the needs of the work. The poorly quantifiable target data made a quantitative study obsolete. This methodology will allow a better understanding of the problem targeted by the chosen sample (Malhotra, 2010). The diversity of the sample is the key to this type of methodology (Kotler, 2009). Although often accompanied by an inductive approach, the qualitative work can be based on preliminary theories (Deslauriers, 1991).

According to Strauss, as long as a previously defined theory does not block the freedom of discovery in the field, it is perfectly plausible to combine qualitative research and theory preliminary; it is on this basis that the study was conducted.

1.3 Description of the sample:

In this type of study, a sample of up to ten participants is considered sufficient to arrive at a relevant result (Creswell, 1998). The purpose of this thesis was not to obtain a statistical representativeness as it would be in a quantitative study but to produce information and to allow analysis of it as pointed out by Guba and Lincoln (Deslauriers, 1991). The sample was made up of eight people despite the fact that twelve people were contacted.

The eight respondents were chosen in such a way that several sectors are represented according to the definition of "smart city". There are stakeholders from the public and private sectors (The state “Wilaya” of Algiers, Ministry of ICT, SEAAL, Jil'FCE, ACSE, ENSI). There are various important sectors in the "smart city" area.

In this section, each speaker has been described in the form of a summary table:

Name	Place of work	function
Slimani Fatiha	The Wilaya of Algiers.	The chief of the smart city project ;An adviser to the Wali of Algiers, in charge of investment, startup and smart city Algiers project.
Riad Hartani	The Wilaya of Algiers.	An adviser to the Wali of Algiers, doctor in artificial intelligence.
Taouch hamidallah	Investment and Algiers smart city cell in the Wilaya of Algiers.	Manager and Collaborator.

Bahia Zerouati	Investment and Algiers smart city cell in the Wilaya of Algiers.	Collaborator in the smart city Algiers project
Benslama Meriam	The Algerian Center for social entrepreneurship "ACSE"	Director of the organization.
Nabila Saad	Ministry of Telecommunications and Technology Post and Digital.	Director of Society Development and Information.
Mohamed Skander	Jil'FCE+ Algiers's Wilaya.	President of jil'FCE, adviser to the Wali of Algiers.
Belkheir Mohammed Chems Eddine	Higher School of Computer Science.	President of scientific club of the school, co-founder of two startups, intern in CEVITAL "sentiment analysis on social networks"

table 4.

1.4 Collection of information:

In order to obtain the necessary information and arrive at credible results we have chosen to gather information on the subject through several available topics : books, articles, international publications, thesis, memory, reports, etc. ... ... and in order to qualify and measure the performance of the smart city project through primary data in order to know what is the importance is the KPIs on measuring the performance of the smart city project.

We choose two data collection modes:

- Direct interviews (face-to-face) at the level of the wilaya and outside the wilaya with economic actors integrated into the ecosystem of the smart city Algiers project? With an average duration of 15 minutes for each respondent.
- Online (an email that has been sent to other actors)

So, there are two types of approach for a qualitative study: "the direct approach" and "the indirect approach". In the first, the interviewee knows the purpose of the interview while in the second; he does not really know (Malhorta, 2010). During the study carried out here, it was the direct interview that was, and more particularly, the in-depth interview. Indeed, there are two types of direct interview: the one in depth and the one in group. Since the goal for this research was to gather opinions from different horizons, it was easier to conduct in-depth individual interviews than those in a group. It is easier to understand the motivations and ideas of stakeholders in an individual interview (Kotler, 2006). The interviewer had a maintenance guide to keep a thread in the conversation but also to leave a few freedoms to the interviewee so that he can freely explain his point of view. So it was semi-directive interviews. The guide used is in the appendices **Annex 27**. This guide was endorsed by the proponent.

1.5 Conduct of the interview:

As explained in the previous point, the interview was conducted according to a guide and was semi-directive. But before starting the questions on the topic of work, the interviewer began his interview by asking the interviewee to introduce himself. This helped to understand in what context the conversation was going to unfold.

Secondly, the various questions in the guide were asked according to the answers and the course of the interview. This means that the interview as a whole was fairly free and that it was possible to discuss broader topics than the simple questions asked. This was the goal behind this rather short questionnaire. Finally, the interviewee had the opportunity to add what he found interesting freely at the end of the interview.

1.6 Content Analysis:

The content analysis of a qualitative research is composed of three parts. The first is pre-analysis, followed by material exploration, and the third is processing and interpretation (Wanlin P., 2007).

In the pre-analysis section, the information obtained during the interviews was re-transcribed (Annex 28) in order to allow a better exploration of the material in the second section. In this second part, the information was processed according to the problem studied. Thus, the data was ready to be objectively analyzed and interpreted according to the established research hypothesis.

1.7 Report of the qualitative study:

In order to better visualize the results of the qualitative study undertaken in this work, they were grouped by section in order to have a clearer and more synthetic vision of the different opinions of the interviewees.

2.1 How do you think a smart city can be defined?

- What are the important characteristics?

- How would you establish if a city is defined as smart or not?

Before knowing which performance indicators seemed relevant to stakeholders, it was necessary to know what their vision of the "smart city" was. Indeed, as already demonstrated in this work, there is a battery of definitions, visions, interpretations, etc… of the smart city concept; As a result, one indicator may seem more interesting for one than the other and vice versa. In addition, it allowed knowing if the vision used in this work stuck with that of the experts of the panel.

Unsurprisingly, Smart City Algiers partners in the panel share almost the same vision. As a reminder : «a smart city "is an ecosystem of stakeholders (local government, citizens, associations, multinational and local companies, universities, research centers, international institutions ...) engaged in a sustainable development strategy using new technologies (ICT, engineering, hybrid technologies) as a facilitator to achieve these sustainability objectives (economic development, social well-being and environmental respect) ". But, each of these added a few words of explanation.

For Dr Hartani; the definition of smart city is very specific to the context and the definitions are not unique, the definitions in Tokyo or Hong Kong or Algiers are not the same. So it is generally possible to define it according to their purposes. To the generic aspect it is that to

import the information systems and the models of the technologies of the information and communications in the city (the optimization of the city). He said that; for Algiers this is the tactical goal but the strategic goal is to develop the technological ecosystem and develop a mainly local value chain that includes that technology can participate in the implementation of solutions at the city level. And about the characteristics he says that the most important is how to optimize the management of the city in a more pleasant way for the citizens of the city. And find the insertion model of these new information technologies in all the main processes and the impact on improving the quality of life of citizens and also the reduction of city management costs.

While Ms Slimani sees that the smart city is a city which guarantees to its inhabitants the improvement of their quality and living environment despite the increasing development of the city. Moreover, it highlights the six dimensions of the smart city (smart people, smart environment, smart economy, smart governance, smart living and smart mobility) as essential features of the "smart city". And this is almost the same vision of her collaborator Ms. Bahia Zerouati and Mr Taouche who agrees that the "smart city" must follow the theory of sustainability and she sees it as “a new dimension” which is composed of three pillars, the social pillar, the economic pillar and the environmental pillar..

According to Mr. Chems Eddine Belkhir the overall goal of a smart city is to improve the quality of life of citizens through intelligent technology and he added that the fundamental axis is based on: an intelligent economy, intelligent roads, an intelligent population, an intelligent life and an intelligent government (The theory of city planning and development) ,But according to Mr Skander smart city is the city that facilitates the life of the users, especially the setting up of an ecosystem promoting innovation, and about the characteristics he says that the effective time, the management of waste and facilitation of the administrative actions are the most important. While Ms Benslama summarized the definition of smart city in three terms are inclusion, connectivity and eco-friendly. And about the most important characteristics she determined three ones (ICTs, inclusion and sustainability principles).

Ms Saad knows all the definitions that exist but does not have a personal one. that's why she did not give a complete definition of the "smart city" because she felt that his view was too restricted to digital component and that was too incomplete. For her, technology is at the

service of the "smart city». And (the ICTs, energy resources, natural resources) are the most important characteristics for a smart city.

About determining or judging whether the city is smart or not most of the answers almost came in the same context, the only point of view that diverges in the panel is that of Mr. Hartani. According to him, that there is no notion of smart or not smart it is not 0 or 1 it is more a progressive process of insertion of models and information process in the city plus there is an optimal use of information the technologies.
Anyway, all stakeholders agree that the "smart city" is an ecosystem of stakeholders that aims to improve living conditions, traffic, safety, work, environment, etc. based on citizen participation and having a coherent long-term strategic plan.

2.2 What are the success factors that can help Algeria transform its capital into a smart city

Some speakers spoke about the important factors to consider in a "smart city". The first success factor according to the majority of interviewees "Mr. Hartani, Mr. Belkhir Mr. Taouche and Mr. Skander, Ms.Bahia) is the human resource except Ms. Saadi and Ms. Benslama, who have seen that political decision is considered the most important to realize a smart city project, it allows to make a small recapitulation.

These factors include the following: the political rush, the long-term policy with a gradual transformation plan, the human resource, the participation and the citizen relation, the implication of the technology, the mobility, the connectivity and, energy and environmental management.

2.3 What characteristics do you see as priorities in a smart city initiative?
- In the Algiers Smart City project which indicators are difficult to measure?

In the terms of smart city's characteristics, most interviewers gathered the priority of smart government and smart people to achieve the initiative project of Smart City Algiers; that followed by smart economy and smart mobility; and then smart living and the smart

environment. But another team (Ms. Saadi and Mr. Belkhir) stressed the priority of the ICTs and its development for achieving this ambitious project.

Concerning the most difficult characteristics to measure Mr. Hartani and Ms. Bahia see that there are no difficult characteristics to measure while Mr. Belkhir and Ms. Benslama see that there is some indicators in smart living and smart economy there difficult to measure they quoted by those indicators (The satisfaction rate of citizens, Engagement rate in the smart city, The well-being of citizens, Citizen confidence in their city..) but according to Mr. Skander there is only one indicator that is difficult to measure : it is the rate of the development of start up's support , despite that he suppose that this may be possible through a long period of time. The rest of interviewees had no answers because they have no idea about the subject of KPIs.

2.4 What are the challenges that Algiers will face in the realization of the smart city project?

- What resources to mobilize to meet these challenges?

When we talk about identifying the challenges facing the Smart City or hindering its realization and its development, we are facing a very important step, or we can call it by "Smart Step" because of its role in guiding the strategy of this project.

So, After our discussions with the interviewees, it was clear to us that in general they are gathered that technological challenges, social challenges and the lack of collaboration among the governmental restraints and different stockholders are the biggest challenges facing the Smart City Algiers. Ms. Saadi mentioned the financial challenges and she said "the challenge of financing needs to be allocated, and for that we need to involve the private sector and why not foreign investors" while Mr. Skander added the challenge of traffic problems to the previous ones.

Finally, it is certainly important to be aware of the various challenges facing or hindering the achievement of Smart City Algiers, but the most important is the awareness of how to face these challenges and find solutions to solve them in the short and long term.

2.5 KPIs: 1-What are the different performance indicators "KPIs" that you used to measure the performance of a smart city?

Regarding the performance indicators, each speaker had to think a certain amount of time before finding his words. Asking them if they had any ideas about indicators seemed to put them in difficulty.
For her part, Ms. Saad judges that one must be part of the staff working on the project of smart city Algiers to be able to answer the questions of the performance and its indicators ,Ms. Silliman also believes that the performance indicators are technical issues and that is better to talk about them is Mr. Hartani ;Mr. Hartani insisted that, above all; it is necessary to analyze the project of smart city according to the objectives as it is supposed to reach, it is necessary to determine the objectives and it is necessary to define evaluation criteria (certain of its objectives certain of its subjectives certain of its directs and of its indirect) but he think the most important thing is to choose very specific activities in relation to the various business sectors such as lighting, optimization of transport regulation, improvement of quality of life and sustainable development. And for the evaluation, the ITU performance indicators are the most reliable for the smart city Algiers project.

Ms. Benslama seemed rather reluctant about the question. According to her, there should be a universal definition of the "smart city" before being able to choose indicators. But Mr Belkhir said that the smart city is not counted in number of inhabitants, it is measured in the yard of the services rendered, their efficiency, and of course the perception of the citizens.

According to Ms. Zerouati; Smart City KPIs developed by the FG-SSC from ITU provide reliable, relevant, objective and comparable indicators for assessing the progress of the smart city transition. While Mr. Taouche sees that for a better readability and to make room for future adjustments, a division into scoring lines was the most appropriate, it is necessary to evaluate these seven axes (transport, security, health, welfare, economic development, resources, and administration). Also Mr. Skander said that we should measure the performance of the smart city through selecting from the KPIs according the objectives of the city’s project. The number of "smart city" projects in relation to the population could also be an indicator according to Mr.Skander, but it should be seen as a general indicator that simply gives an idea. It does not confirm if the city is really "smart", it is complementary.

Finally, the interviewees Mr.Hartani, Mr. Taouche, Mr. Belkhir have at least once talked about the presence of sensors. The sensors give a "smart" impression and their use makes it possible to carry out projects of the same type. Be careful; do not just measure their density. Indeed, a city can have 10,000 sensors and not use them while another city has only a thousand but their efficiency is remarkable because they are used correctly. It is therefore essential to analyze their use before putting them forward as a pledge of urban intelligence.
Sustainability and environmental indicators are also present in the responses obtained. Indeed, the sustainable side of the "smart city" is not to be neglected.
In the end, no stakeholder knew how to give precise indicators. They each gave leads. Yet these indicators are indispensable.

2- In your opinion, which KPI indicators are the most difficult to implement in the Algiers smart city project?

3- How would you evaluate the performance of a Smart City?

We did not get answers from all the elements of the team selected “interviewees”, some of them who told us that he did not know anything about the KPIs of the smart city, and others said he did not understand the question.

Mr. Hartani stressed the importance of focusing on indicators in different areas of activities and also focused on human resources above all; For Mr. Belkheir, Ms. Mariam and Mr. Iskander had a little different opinions and had a clear view of what indicators are.
Mr. Belkhir presented a list of indicators and divided them into five main points (people, planet, prosperity, governance and propagation) and he putted in each one some indicators. But he did not give us an appropriate proposal to evaluate the project of Algiers Smart City.

While Ms. Benslama; although she did not answer the questions of KPIs but she gave us a proposal list that facilitates the evaluation of Algiers smart city; (Indicators related to the governance of the city, Speed of internet, Harvest and use of data, Economic competitiveness)

Mr. Skander thinks that the most difficult indicator to measure is the user well-being and he proposed the online survey and making a gap analysis between the satisfaction of users and the components of smart city Algiers .this can lead to solutions to evaluate this project.

Finally, we cannot measure what is not there, and we cannot manage what we cannot measure … because of that we say the focusing on the project evaluation and setting clear measurable goals is very urgent in smart city Algiers project.

1. 8 Search limits:

Concerning the limits we have encountered some difficulties we quote the time, the sample which remains minimal is requires even more respondent in order to further consolidate our research and also the response of interviwees

2. Presentation of the host organization "The Wilaya of Algiers"

2.1 Presentation of the wilaya:

The foundation of the city of Algiers in 1200 BC AD is attributed to the Phoenicians. By its opening on the Mediterranean sea, it was the crossroads of several civilizations whose traces are still here and there on its territory. The history of the region is very turbulent and rich in events that followed one another and contributed to its prosperity.

Currently, Algiers is the political and economic capital of the country, it is the seat of all central administrations, political and social institutions, economic and financial institutions, major decision-making centers and diplomatic representations. It is characterized by:

- Administrative organization:

Number of administrative districts: 13, led by Walis delegates

Number of communes: 57, Area (Km2): 1190

- Population:

Total population by 2016 (inhabitants): 3,174,792, Annual average growth rate (1998/2008): 1.60%

Population density (inhabitant/ km²): 3,900, Active population: 1,379,004 ,

Employed population: 1,311,993

- Political and economic situation:

An ideal geostrategic position allowing it to play a leading role in the economic integration of the country and pivot in the promotion of Euro-African exchanges.

Algiers capital of the country, Algiers is by its status, its size, its functions, the first city of Algeria. It includes the largest concentrations of population at the national level, service activities, equipment, infrastructure, research centers, industries and major urban projects. Algiers is the political, administrative and economic capital of the country. It is the seat of all central administrations, political and social institutions, large economic and financial institutions, major decision-making centers and diplomatic representations. Algiers has a good network of communication and telecommunications networks.

- Smart space:

A space of intelligence and recognized knowledge integrating some of the best services at the national level:

Large university centers supported by major schools and national institutes and centers, research centers, multi-sectoral research specialized agencies. The capital is a space, integrating some of the best services at the national level, two university centers, one in the East and the other in the West, eight high schools and more than fourteen institutes. For companies, Algiers is a real pool. In addition to this, more than 62,000 young trainees are trained in vocational training institutions across all sectors and modes of training. In terms of scientific research and technological development, Algiers is home to 3 national agencies, 34 research structures, 8 under direct supervision of the Ministry of Higher Education and Scientific Research and 101 research laboratories.

- Economic, administrative and social infrastructures:

-The wilaya has 4 industrial zones and 26 activity zones.

-Houari Boumediene airport: with two runways, one main and the other secondary.

- Port Infrastructures: Algiers has 4 ports: Algiers, Rais Hamidou, El Djamila and El Marsa.

- A road network composed of 113 km of express network, 307 km of national roads, 308 km of wilaya roads and 816 km of communal roads.

- The University of Algiers with more than 110,000 students, a set of schools including 818 primary schools, 257 middle school and 110 high schools.

- The vocational training sector also has a number of establishments reaching 15 5 units and offering 10400 teaching places.

-The health sector has 4 university hospitals, 13 specialized hospitals, 10 health sectors and 61 polyclinics.

- The youth and sports sector has 82 football stadiums, 23 sports halls, 13 swimming pools and 219 sports fields.

- An economic hub with high potential:

Algiers is the most attractive economic and administrative center of the territory. It concentrates 4 industrial zones and 26 activity zones and a quarter of declared foreign investments in the country. It is a hub of national activity and a hub of exchanges

Thus, the Wilaya of Algiers has important assets and potentialities both natural and infrastructural.

- An important human potential characterized by its extreme youth as a reservoir of skilled labor and of supervision:

- 54% of the population under 35 years old.
- The active population is estimated at 53% of the total population.

- Diversified natural resources constituting productive based to value:

- An important agricultural potential characterized by a useful agricultural area of high agronomic value located mainly in Mitidja.
- A useful forest heritage dominated by Aleppo pine and eucalyptus.
- Significant fishing potential offering great opportunities the development of fishing activity.
- Considerable water resources ensuring a good endowment of drinking water supply.
- Tourism assets proven to promote Algiers as a preferred destination for both domestic tourists and foreigners.
- Beautiful landscapes and seascapes.
- Many historical sites and monuments ranging from prehistory to the contemporary era are of major interest both for the wilaya and for the country.

- Economic infrastructures and structuring equipment major and complementary structuring equipments factors favoring its spatial organization and its economic development:

- A large commercial port responding to new techniques of maritime transport encouraging promoting the promotion of Euro-African trade.
- The international airport Houari Boumediene extension offering all the amenities of a successful air transport.
- The railway line linking Algiers to the national network is an asset for economic development.
- A dense, meshed and well-structured road network: highway, national roads, dual-lane roads, expresses roads, wilaya roads, communal roads.
- A large energy network ensuring a reliable distribution of electrical energy and gas.

A structuring industrial base made up of SME / SMI units, mainly oriented towards agribusiness; chemical and plastic, pharmaceutical, leather and textile, steel, metal, mechanical and electrical industries (SMMEI), wood and paper industry, building materials. It can be used to boost the economic activity.

- A network of collective facilities ordered and organized into a hierarchy structure, ensuring a satisfactory coverage of the needs of all the populations of Algiers:

- Qualified schools and vocational training centers.
- Special health and social protection infrastructures.
- Diversified sports and cultural facilities.

- A perspective development program:

Significant development actions have been carried out, or are currently being carried out, particularly in terms of housing and service equipment, water supply and sanitation, research and leisure centers and the creation of new facilities. activities and wealth.

In fact, the territory of the wilaya of Algiers is changing: various changes, recent and evolving to manage in terms of the organization of space, preservation and enhancement of natural resources; economic development, creation of activities, jobs and improvement of people's living standards.

Thus, by virtue of its status as capital of the country, its strategic geographical position around the Mediterranean basin, the richness of its historical and cultural heritage, the diversity of its

physical and natural environments, the size of its infrastructure network and the importance of its program in progress, Algiers is the first city in Algeria. It represents a territory of excellence to live and work in, but above all to invest and succeed.

2.2 Representation of the Organizational structure of the Wilaya of Algiers:

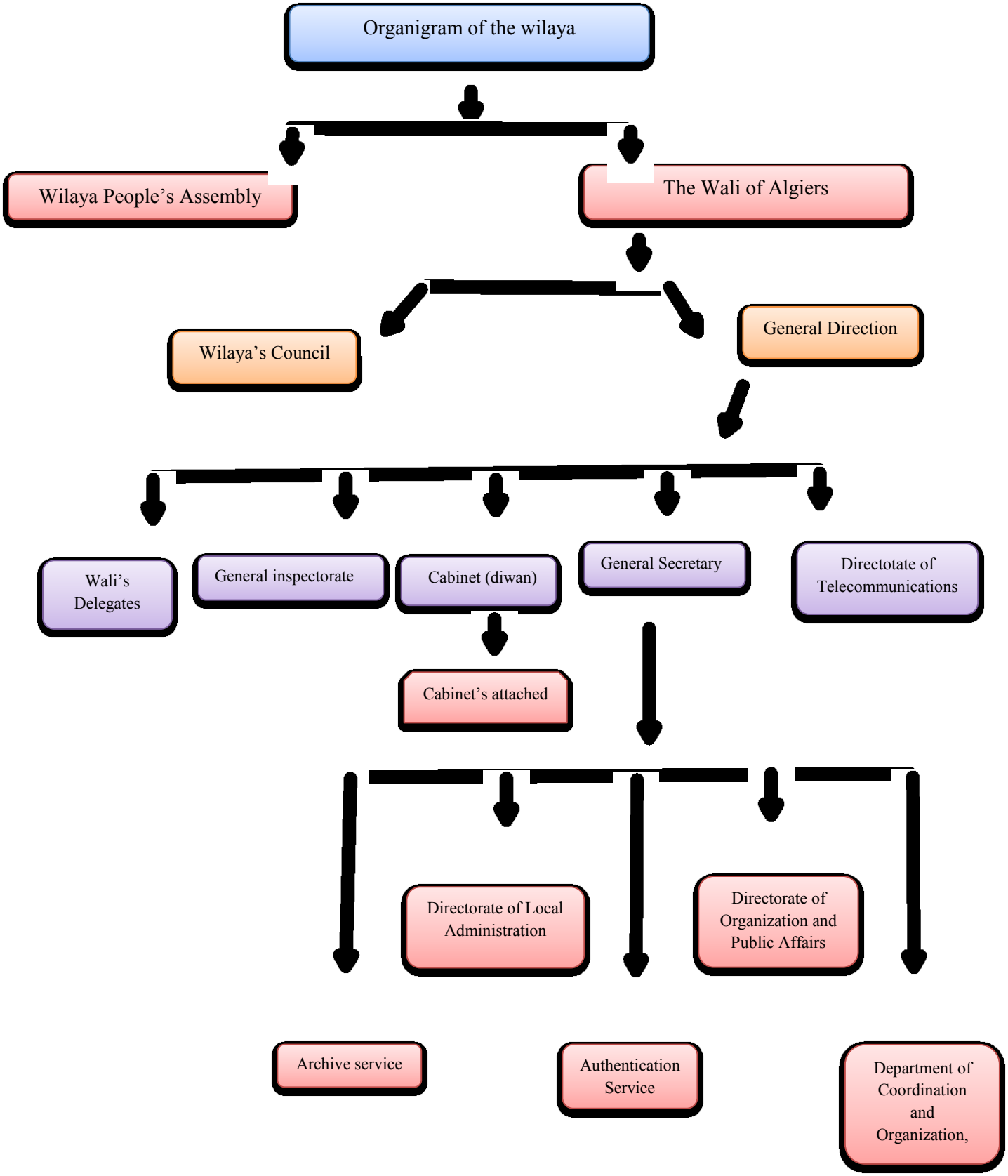
The Wilaya is a decentralized regional group and a non-centralized state administration. The state has two bodies: the People's National Assembly, a deliberative body elected by universal suffrage, the governor, the state executor, the state and state representative, and the government delegate.

“The executive decree No. 94-215 dated 14 February 1415, corresponding to 23 July 1994, defines the Wilaya's public administration organs and structures”. (Official gazette; February 1994)

The Algerian administrative organization has adopted the distribution of administrative functions between the central government in the capital and among local authorities. Thus, the centralized system is met by the decentralized system. The former depends on the concentration of administrative function and the second on distribution. The lack of administrative focus is one of the methods of administrative function as a picture of the central system imposed by the technical and logical factors that forced the state to reconsider the system, has introduced some modifications, including the establishment of the government of grand Algiers in the capital in 1997, which is the system that was withdrawn Year 2000 as unconstitutional. Then a “presidential decree No. 2000-45 of 25 Dhou el Kaada 1420 correspondent at 1st march 2000 amending the presidential decree n°97.292 OF 28 Rabie el awal 1418 correspondent at 02 August 1997 fixing the administrative organization of the Government of Grand-Algiers” was issued for the administrative organization of the state of Algeria, which was divided into administrative departments that are run by the Wali’s delegates.

The organizational shart of the wilaya of Algiers devided into two sections; the wilaya’s people assembly and the section of wali that devided into two parts: the wilaya’s council and the general directions.

Figure 09 A diagram that represents the organizational structure of the Wilaya of Algiers.



Source: developed by us

So, the wilaya of Algiers consists of structures and organs governed by the mayor “the wali”:

1st: Wilaya’s Council,

2nd: General directions;

1. Directorate of Telecommunications,

2. General Secretary;

- Directorate of Organization and Public Affairs.
- Directorate of Local Administration.
- Department of Coordination and Organization.
- Archive service,
- Authentication Service.

3. Cabinet,

- Cabinet’s attaches

4. General Inspectorate,

5. Wali’s Delegates,

Also;

- ✓ The Directorate of Organization and Public Affairs consists of:

- General Organization,
- Department of the Movement of Persons,
- Department of Legal Affairs and Disputes.

- ✓ The Directorate of Local Administration consists of:

- Users' interest,
- Interest Activation,
- Budget and Property Department.

3. Smart city Algiers's project:

3.1 Presentation of the "Algiers smart city project":

The Wilaya of Algiers, began a deep reflection with the aim of making the capital a smart city with the help and the Algerian local know-how (public incubators and accelerator, startups, students of the national polytechnic school, Higher School of Computer Science, Polytechnic School of Architecture, and Urban Planning, USTHB, R & D Center: Advanced Technology Development Center, Valorization of Research Results and Technological Development ANVREDET, development of renewable energy CDER, support associations and introduction to youth entrepreneurship, and that bringing together the economic operators of innovation, telecom operators: Algeria telecom - mobilis, Djezzy, oreedoo) and elements of our diaspora abroad, in Canada, in the United States, in Europe and elsewhere.

this file is co-piloted by the Wali advisers madam Slimani Fatiha and Riad Hartani, a representative of the diaspora, doctor of the university of Paris, postdoctoral fellow at the university of Berkeley in artificial intelligence and business studies at Stanford university California, which has a silicon valley incubator and has led renowned research teams in prestigious research & development labs in Canada, France, Korea, china and in Japan.

3.2. Engineering projects:

In addition to actions aimed at developing the ecosystem startups, the smarty city project has undergone an evolution.

Engineering projects are well advanced: several applications have been implemented with different actors of the city:

- With **MOBEAL**, for the regulation of road traffic;
- With **SEAAL** for the optimization of the water network;
- With the **Polytechnic Higher School**, the **Higher School of computer sciences** and the **research and development centers**;
- With the **ADC** (Algiers distribution company): for the optimization of energy consumption ect…

Projects being launched or realized:

- Experimental laboratory and technological hub: at the level of the Grands Vents Park in Ouled Fayet.
- Center and Innovation Show Room in Algiers center Larbi Ben M'hidi.

- The innovation cluster at Bab El Oued.
- Fab Lab at the level of Hussein Dey.

Innovative projects planned under the private investment:

- Incubator of startups;
- Center for the Development and acceleration of startups Specializing in Financial Technologies;
- Center for Innovation, Improvement and Transfer of skills.

3.3 Algiers Smart City Project goals:

The main objectives of the project "smart city Algiers" launched by the wilaya of Algiers by call to collaboration of 15/06/2017 are:

- The architecture, design and implementation of unified 'smart city' data model and applications to be exploited by the city, its citizens and the general public. this mainly includes the generation, transmission, communication, collection, aggregation and processing of data as well as applications leveraging this data in relation to challenges centered on smart city priorities.
- The selection of technology partners for the implementation, deployment and support of smart city solutions. the solutions will address the highest priorities and cross-cutting challenges of the city
- The integration of the solutions identified in the city of Algiers' current and future development plan, with the aim of optimizing the city's strategic public assets.

3.4 The three key elements of Algiers Smart City:

a) The Incubators in Algiers:

the Launchpad-FCE incubator based on the principle of concretisation born of a collaboration between the FCE (Forum of Business Leaders) with Dr. Riad Hartani to overcome two major problems which are the high mortality rate of startups as well as the difficulties encountered by large Algerian companies to find local partners to develop their innovation. The FCE Launchpad plans to concretize this concept by linking large companies willing to support innovative projects that meet their needs with startups and relies on the IDC theory developed

by Dr. Hartani to push Algeria to become a champion of innovation. However, there is no perfect incubator because any incubator has advantages and disadvantages as for all 12 incubators in Algiers and are summarized in the following table:

Name	Advantages	Disadvantages
ALINOV	Multidisciplinary-financing by a non-profit organization	Age limited to 45 years - business plan finalized
Sidi Abdellah	Discount accommodation - large space - smart building	Geographical isolation - disciplinary united (ICT)
INTILAQ	Multidisciplinary - research field	Lack of amenities - no domiciliation
Tstart	Free of all services without the requirement of a profit or a share of capital	Unidisciplinary (ICT) - no domiciliation
ACSE	A social / environmental character - financial assistance	Limited to disciplines with societal or environmental impact
Fikra-Tech	Technologically advanced materials - field of research - domiciliation	Lack of space - lack of a FabLab - geographical isolation
Sylabs	Strategic geographical location - open to the general public - domiciliation	No financing
DJEZZY	Strategic geographical location (ENP)	Limited to technical disciplines
Institut Habba	Multidisciplinary - strategic geographical situation - domiciliation Recognized	project (competition, event ...)
IncubMe	Multidisciplinary- domiciliation	Geographical isolation
CapCowork	Multidisciplinary - attractive development - domiciliation	No information
Launchpas – FCE	Multidisciplinary - finding the potential client upstream of the startup's creation	No information

The table above clearly shows that the choice of the appropriate incubator will depend on the project and even the project leader (ability to move far, financial capabilities).

Before selecting the structure that will host a project and help it to develop, it is imperative to define its needs because any incubator can not necessarily support them. The peculiarity of this type of structure lies in its specialization.

b) the startups:

Returning a few years back, the concept of startup was disregarded by the majority of Algerians but today it is a topic of trend and the number of startups to create is increasing year by year; according to data from the European directory Funderbeam, the country has 23 startups (less than eight years of existence) per 100,000 inhabitants, against 8 in France.

In Algiers the number of startups is 75 startups, number of projects accompanied by ANVREDET is 6 projects while the list of project carriers consists of 126 carriers; and 30 project carriers of the USTUB and finally 29 Ansej project.

Several sectors attract young Algerians such as transport, tourism, health environment ... and awakens their creativity and innovation in order to find solutions that facilitate the daily life of the citizen however to arrive to create a startup in Algeria

c) Financial institution:

Start-ups need considerable investment fundraising to finance all the steps from idea testing, technology validation, economic model identification and finally the commercialization of the project or service.

3.5. Evolution of the Algiers Smart City Project:

The Wilaya of Algiers started at the beginning of 2017, a thorough reflection with the aim of making the Capital a Smart City with the help and expertise of local Algerians and elements of our diaspora abroad, in the United States and everywhere in Europe

The Algiers Smart City project is evolving through four (04) aspects:

1) Support, assistance and promotion of existing innovative Startups for their inclusion in the local and international economic landscape.

2) The development of the technological ecosystem:

An ambitious plan has been launched with the aim of developing the ecosystem startup, in this context:

- The Wilaya organized, in partnership with the SYLABS incubator, two conferences that brought together different actors of the innovation ecosystem:
- The first on April 25, 2017 sponsored by the Prime Minister in the presence of eight (08) Ministers (about 1000 young participants).

- The 2nd Startups Conference was organized on 03 March 2018, (about 1600 young participants);
- The Algiers project is unifying: it is supported by different actors: Accelerators and Public and Private Incubators, Startups, Universities and Student Science Clubs, R & D Centers (Research and Development Center, Financing and Research Organizations). support, Support associations and initiation of youth entrepreneurship and Association of economic operators of innovation, Telecom Operator ....

3) Launch and implementation of the Smart City digital platform:

• Cloud: The Wilaya has launched, by Algerian experts, the realization of its own Cloud on which will be implemented all the technological solutions coming under the Algiers Smart City Project.

• Engineering projects: "we mentioned them earlier"

- With MOBEAL, SEAAL, Polytechnic High School, High School of Informatics, R & D Centers; and the SDA (Algiers Distribution Company)

4) Positioning of Algiers on the international scene:

a) Launch of an expression of interest on 15/06/2017 (Call for collaboration), the first analysis of which shows:

- More than 150 responses from more than 15 countries: Algeria, USA, Canada, France, Japan, South Korea, Holland, Spain, Luxembourg, China, United Arab Emirates, Finland, Belgium, Australia.

- The proposals have come from Startups, SMEs, Multinationals, Telecom Operators, Research Offices, Research Centers, Incubators Startups, and Lawyers Offices.

b) Alger took part in the Smart City Expo World Congress SCEWC event which took place in Barcelona from 14 to 16 November 2017

c) Organization of the International Summit of Smart Cities Technologies and Investments: Sponsored by His Excellency the President of the Republic at the ICC, 27 and 28 June 2018

• World Smart Cities Leadership Summit with 4000 participants, 55 Participating Countries - 16 International Institutions (World Bank, World Economic Forum, NASA, Islamic Bank, Smart Africa ...., + 150 internationally renowned Speakers and 50 sessions.

• 08 themes: IT - Infrastructure and Telecommunication - Data and Technology - Economy and Finance - Governance and Partnership - Safety and Security - Mobility - Society and Sustainable Development

2 side events of the Conference:

- Development of Start-up and Innovation Ecosystems: Start-ups competition with international jury

- Valorization of the diaspora: strategy of Inversion of the brain drain as a tool for rapid development in terms of technology and innovation.

3-6 The importance of evaluating the performance of a smart city project:

Because we have seen that the question of the importance of evaluating the Smart City project is an interesting question and its answer requires researches and investigations. The fact that our theoretical study and its interaction with the applied study led us to emphasize the importance of the smart city project's evaluation in the following points:

1- The evaluation will communicate about the project, and it can be seen from two angles;

a) - The evaluation is done in order to attract the investors, reason why a big project like the smart city requires great inverters; and win the trust of the project sponsors.

b) - sensitize the politicians to adopt the project and involve the policies in the project; through attract investors and facilitate their market research.

3- A better follow of evolution of the project actions.

4- Possibility of writing or correcting the objectives.

5- KPIs will manage an interdependent portfolio; and a better consideration of priorities (budget, resources, objectives, impact ... ect)

6- Urban sustainability indicators are tools that enable actors building urban strategies to gauge the environmental impact and socio-economic policies implemented

Critical Summary

The aim of this part was to carry out a critical synthesis by comparing the results obtained during the qualitative study with the theoretical framework in our work (literature review and conceptual framework).

Despite a fairly current literature in this area, it must be stressed that often, no definition of the "smart city" is given before the proposal of indicators. This leads to some confusion about what the authors measure and their vision of the concept. An author who does not have the same bases as another will measure different characteristics and the results will be different. On this point, the author may be at fault because he has not given his vision but it is also the concept of the "smart city" that can be targeted because there is no universal definition for it. this. From then on, each author has liberties. The proof is in this work, the definition used comes from a mixture of existing literature. The European Parliament (2014) has highlighted the six "smart" features of Giffinger (2007) in his official vision. No existing tool uses these tools to structure its indicators. They are only inspired by it when it could be a good base.

Too often, the "smart city" is only seen as a sustainable or ecological city. This can be seen in the indicators set up by ISO. These are turned towards the sustainability of the city often forgetting the technological side. The theme "technology and innovation" is far too light in relation to the importance given by the interviewees to this point. In the same vein, citizen participation is generally not taken into account in all the tools proposed by the literature, whereas this is, according to Mr. Hartani and the other speakers, the basis allowing the construction of 'a smart city'. Similarly, there is no indicator verifying that there is a real long-term "smart" policy broken down into a gradual strategic plan. One of the most comprehensive tools at this level is ITU framework (2014). Indeed, the "smart city" is divided into several themes covering most of the characteristics found in the literature. In addition, this tool highlights ICTs before other themes.

According to Mr. Taouche, some twenty indicators should be sufficient. The more indicators there are, the more difficult it would be to arrive at a constructive result. The tools explained in this work usually include too many indicators, especially the ISO standard 37120. In the end, the manager is lost in an ocean of indicators and cannot measure concretely his city.

The cities are different, they have different sizes, different cultures, they evolve at different speeds, the indicators are not always applicable to any type of city. One must be cautious about the interpretation of the results. The tools advanced highs are flexible and adaptable to

any city but is it really feasible? We must remain vigilant. The proof is, when "smart city" competitions are organized, it is not the same cities that win (Ms. Slimani).

Some tools will give rankings, say whether a city is "smart" or not, but can a city really be "smart" at 100%? According to Mr. Hartani, it's totally impossible. Even the most famous cities for their intelligence, like Amsterdam, Barcelona, etc. are not. It is impossible today to be totally "smart". As for him, Mr. Skander does not see the usefulness of this kind of classification.

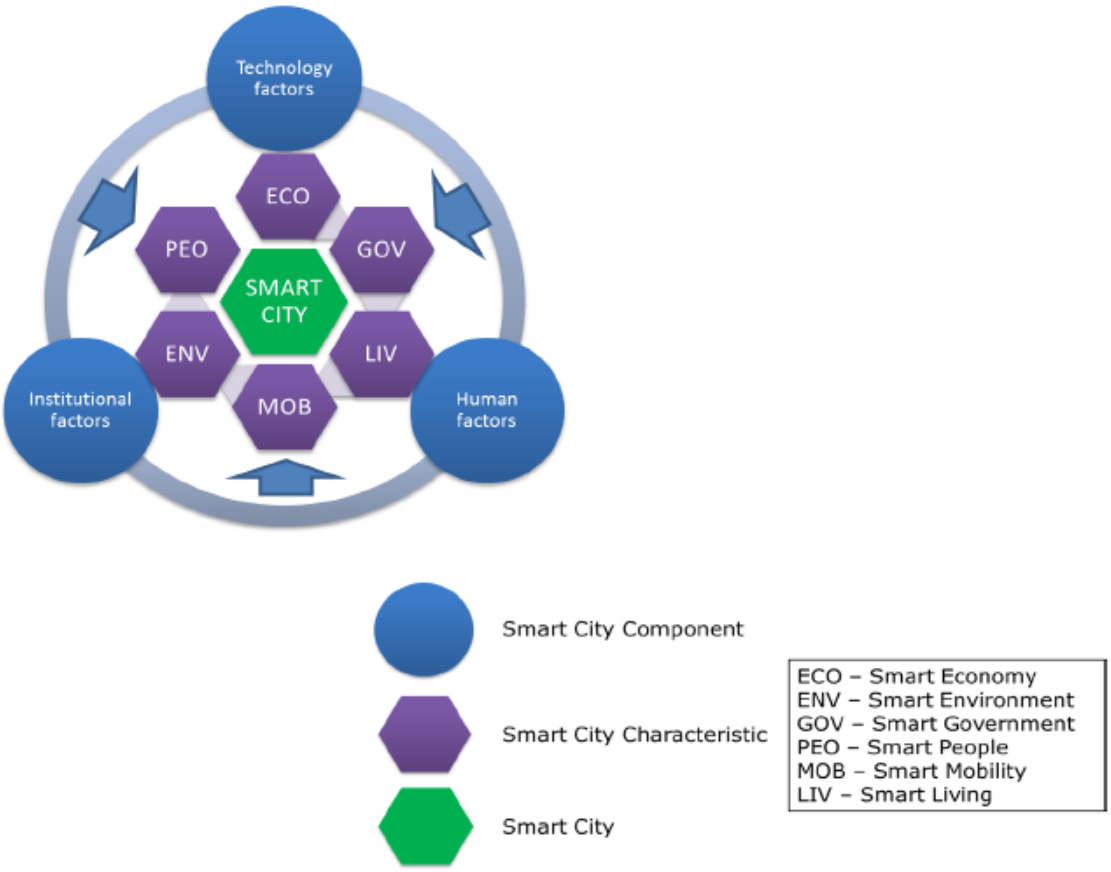
To conclude this critical synthesis, the majority of the measurement tools do not include the main characteristics of the "smart city" advanced by the panel of experts interviewed during the qualitative study. These are therefore not comprehensive enough and do not give a good view of the performance of the smart city. Leading indicators are often too focused on sustainability and wellbeing without paying enough attention to technology. Or, they have a binary character that is difficult to interpret. To divide the indicators by the six dimensions avoiding binary indicators while keeping their number around twenty would be a good solution.

Recommendations

The objective of this chapter was to propose a solution track for measuring the performance of a "smart city", that is to say, to develop a measurement tool and explain how it was built. The advanced tool took into consideration the different information gathered in this work as a starting point. It takes the form of a panel of indicators. These indicators were chosen according to the different recommendations made by the experts interviewed in the qualitative study and according to the literature review.

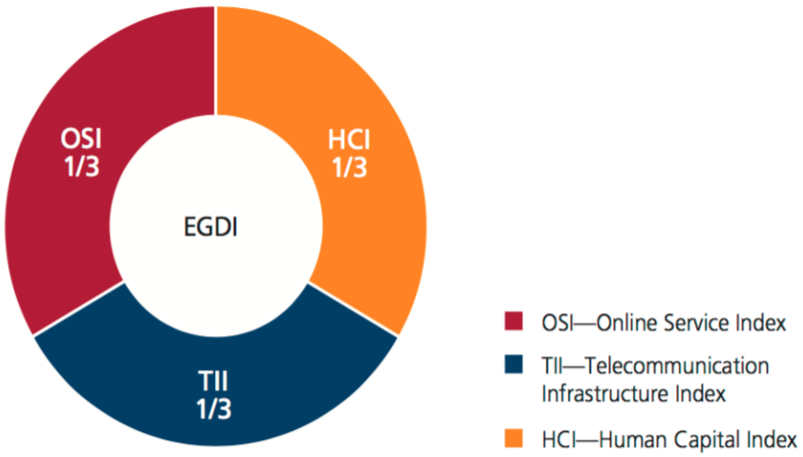
1)

To begin, it is necessary to recall the vision of the "smart city" that was chosen in this work. The "smart city" (see diagram below) would be at the center with in its closest environment, the six-dimensional smart (Giffinger and Co., 2007). In the second layer, we then find the three types of factors that are technology, the human and institutions. The formation of a "smart city" could result in a project comprising at least one of six dimensions while combining the elements of the second layer and more. The whole scheme represents in a way the ecosystem created by the "smart cities" in which all elements interact together (European Parliament, 30).



In the structure proposed by the solution, the indicators are divided into three main themes. The first is composed of general indicators that only provide information on the city studied to understand the environment of the city. The second theme includes a series of indicators related to the three components of Nam and Pardo (human factor, institutional factor and technological factor) These factors give way to three categories of dimensions bearing the same name (the technological dimension, the institutional dimension and the human dimension) We can measure them using the E-Government Development Index (EGDI) and its components on the three most important dimensions of e-government, namely:

- Scope and quality of online services (Online Service Index, OSI),
- Status of the development of telecommunication infrastructure (Telecommunication Infrastructure Index, TII) ,
- And inherent human capital (Human Capital Index , HCI).



Finally, the third category is split into six subcategories, the six smart features of Giffinger (2007). The indicators are grouped by theme.

In order to avoid redundancy between the second and the third theme, only the technological component has indicators focused on it. Indeed, the other two components can be translated through the characteristics of Giffinger (2007).

In summary, there are three types of indicators:

- General indicators;
- Technological indicators;

- Indicators of "smart" characteristics.

a) General indicators:

The purpose of these indicators is not directly related to the "smart city" problem, but it is to obtain a general vision of the city that is analyzed. As all cities are different, it is necessary first to understand and know the environment studied. The various indicators proposed are the following:

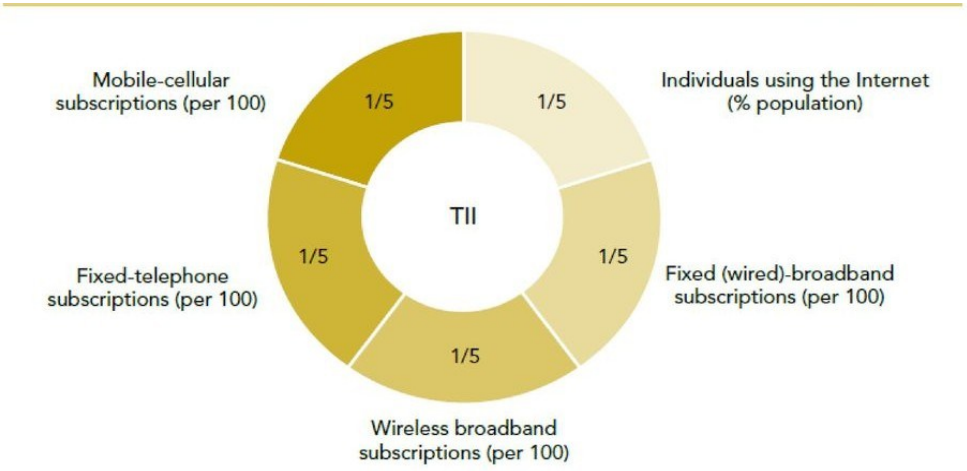
- Density of population in number of inhabitants per km², this will make it possible to measure the importance of the occupation of the territory by the citizens and to visualize the urbanization of the territory.

- Relative happiness index, knowing if people are happy in a city is an indicator of well-being. To calculate it, a survey of the citizens is necessary. This survey consists of asking them just how happy they are on a scale of 1 to 10 and then averaging the answers. The creation of a platform for citizens to easily give their score can be considered for this measure.

- Number of "smart city" projects in relation to the number of inhabitants. By "smart city" projects, it means all existing private or public initiatives that include at least one of Giffinger's (2007) six smart dimensions.

These three indicators are only indicative to give a vision of the city that is analyzed. They do not say whether a city is performing at the "smart" level or not.

b) Technological indicators: using the (TII).



Technology plays such an important role in the "smart city" that it has to have its own category. The integration of technology in the city is a major pawn in the evolution towards the smart city. Here is the list of the indicators selected according to the literature and the qualitative study:

- Density of the optical fiber. This is calculated by comparing the area of the territory having access to optical fiber (in km²) compared to the total area (in km²).

- Number of "Wi-Fi hotspot" in relation to the number of inhabitants.

- Number of technological enterprises in relation to the number of inhabitants.

- Number of patents of technological innovations of the territory in relation to the number of inhabitants.

- Number of sensors relative to the number of inhabitants. This indicator is to be taken with care because to be effective, these sensors must be used. It is therefore also necessary to study their use.

Indicators of "smart" characteristics:

Before presenting the various indicators selected, it is necessary to specify one thing to take into consideration when using them. For each characteristic, it is first necessary to check whether the city studied has a policy or strategy with a technological aspect concerning this characteristic. If this is not the case, it means that the results obtained are not due to a "smart city" vision. As a result, the indicator becomes less relevant. As a reminder, each feature was explained at the beginning of this work.

Smart mobility:

- Length of the public transport network (Km) in relation to the area of the territory (Km²).

- Number of public transport available (places) in relation to the number of inhabitants.

- The number of citizens use online transport services (Yassir, tem tem ...)

- Number of parking spaces in relation to the car park.

- Traffic monitoring (Percentage of major streets monitored by ICTs)

Smart environment:

- Reduction in water consumption

- Carbon dioxide emission reduction

- Area of urban green spaces in relation to the area of the territory (in Km²).

- Quantity of waste recycled (in tonnes) in relation to the total amount of waste (in tonnes).

- Quantity of energy (in KWh) from the renewable energy sector available per capita.

Smart economy:

- Unemployment rate.

- GDP per capita (in dollars).

- Annual number of business creations in relation to the number of inhabitants.

- Open information facilities/innovation hubs in the city.

- Amount of investments (in dollars) devoted to "smart" projects. By "smart" project, it implies all the existing private or public initiatives including at least one of the six "smart" characteristics of Giffinger (2007).

Smart living:

- Average life (in years).

- Number of available dwellings in relation to the number of inhabitants.

- Number of tourists per year in relation to the number of inhabitants.

- Number of people in the emergency services (firefighters, police and paramedics) in relation to thin creased (Smart City) tourism : The number of smart city tourists attracted by the project number of inhabitants.

- Improved access to public amenities

Smart governance:

- Existence of a long-term "smart" strategic plan (minimum 5 years).

- E-services ;Number of public services delivered through electronic means

- E-Participation; The rate of engaging people through e-participation “e-consultation and e-decision-making”.

- Number of private public partnership.

- Percentage of public services available online.

Smart people:

- Improved access to basic health care services (The extent to which the project has increased accessibility to basic health care)

- Waiting time (Percentage reduction in waiting time due to project)

- The number of creative hubs, incubators, and startups present on the territory.

- Capacity of co-working spaces located in the territory (in number of people) in relation to the number of inhabitants.

- Improved access to educational resources and digital literacy

The indicators are incomplete. Indeed, they have no target value to compare and define if they are positive or negative. Further study is needed to determine these values. In addition, some characteristics would be better represented by more qualitative indicators, but for that, more means are needed to define them. The problem is that there are also many binary indicators, but the usefulness of these is not great enough.

In order to strengthen the list of performance indicators that we proposed, we thought that before applying them on the ground needs assessment of the smart city’s performance to create the right atmosphere for work and from the experience of the city of smart Moscow, we drew “collection organization chart” suitable for smart city Algiers

Our share divided into three levels:

a) **The first level**: the wali of Algiers and wali’s office.

b) **The second level** : Algiers authorities.

- Department of information technology WITH SMART CITY ALGIERS **FAB LAB**

- Department for the development of new territories.

- Department of construction.

- Department of economic policies.

- Development of transport and development of road infrastructure.

- Department for environmental management and protection

- State inspection on the quality of agricultural products, raw, materials of foods

- Department of healthcare.

- Department of housing and communal services.

- Department of labor and social protection of population

- Department of sport and tourism

- Department of trade and services.

- Department of urban planning policy .

- Department of education.

- Department of finance.

c) The third level: subordinate organizations.

- SEAAL , SONALGAS, Cadastre and conservation indeed, Algerie Telecom ,ONS, LONDA, ANSEJ, National Agencies of parc teck , the incubato, SNCS…..ect

Conclusion:

As a reminder, the contribution sought from this work was to establish whether a city was smart or not and to establish its performance according to a number of relevant indicators. The hypothesis that had been raised behind this approach implied that it was possible to assess whether a city could be considered smart while evaluating its performance at the smart or sustainable or smart and sustainable level.
To do this, the concepts of "smart city", performance and indicators have been revised in order to have a clear basis. This starting point was essential because the literature related to these subjects was rather vague, especially that which concerned the "smart city".

Once these different concepts have been clarified, a review of the literature has been undertaken. The purpose of this was to review all the existing literature regarding the measurement of the performance of a "smart city". It has proved quite interesting. But, the quality of these left to be desired. Indeed, most of the indicators put forward were focused solely on the concept of sustainability and took too little of technology or citizen participation into account, whereas these are basic characteristics of the "smart city".
Then, a qualitative study was undertaken. Its purpose was to interview experts in the "smart city" field. These experts have been chosen in such a way that several horizons are represented. The financial, technological, consultancy, academic, public and research sectors were present in this panel. The results of this study were analyzed, highlighted and yielded another vision. They were then compared with the literature review within a critical synthesis.
It turned out that within this panel itself, the definition of "smart city" could vary.
The results obtained highlighted some shortcomings in the literature and contributed to the development of a solution proposal.

The solution consists of a series of 38 indicators divided into different themes. These were developed based on the qualitative study and the literature review. This series is only a proposal and is not complete. The threshold values of these are not given. A further study would be needed to assess from what value the indicator would show that the observed

situation is positive for the performance of a "smart city". What is important to remember in the solution is the structure hosting the indicators and the elements of it.
In the end, the answer to the research question is divided into two parts. The first concerns indicators. It is almost impossible to establish universal indicators. Indeed, each city is different. Therefore, it is not consistent to have a list of the same indicators for any type of city. What is important is to have the same structure according to which the indicators are distributed to have an evaluation of the general characteristics of the "smart city". The indicators allow to have a vision, to build an appreciation of the performance of the city. The number of indicators to use also poses a problem. The field of the "smart city" is so vast that it is very difficult to keep a reasonable number of indicators. A larger scale study would be needed to define the ideal indicators.

The second part is about whether a city is smart or not. By definition, no city is 100% smart. There are many smart cities at the "smart city" level, but these are only developing towards total intelligence.

Therefore, it would be more appropriate to say that a city is on the right track at the smart and sustainable level rather than stamping it "smart city". It might be possible to give it a percentage that evaluates its intelligence and its durability but for that, it would be necessary to establish the standards of the perfect "smart sustainable city". To say that a city is a "smart city" is therefore an assertion to consider with caution.

The solution proposed in this work is therefore a track for the future. More in-depth and larger work at the outset would yield more concrete results. The observed problem must continue to be studied.

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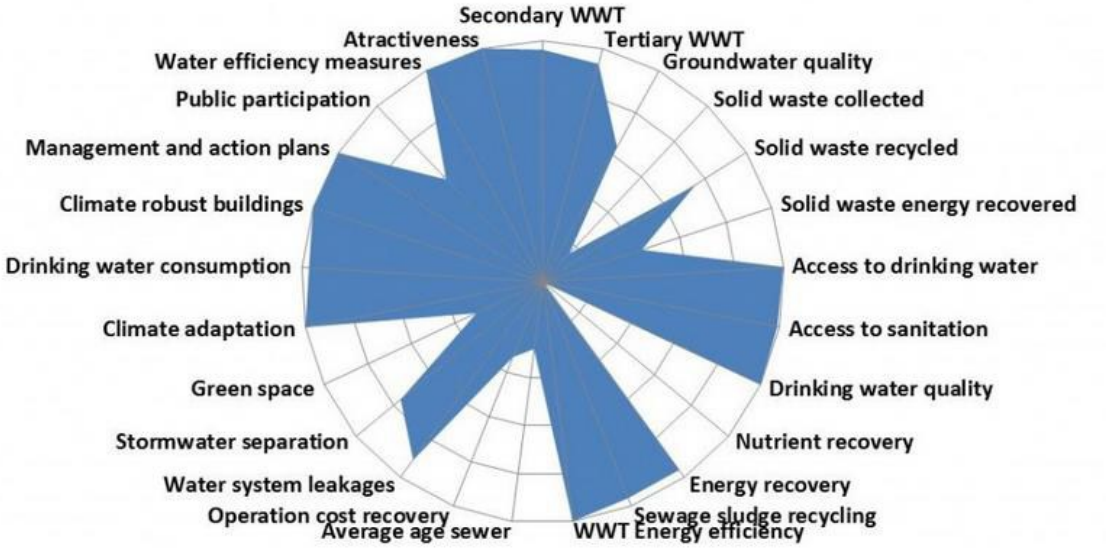
Annexes

Annex 1: City blueprint

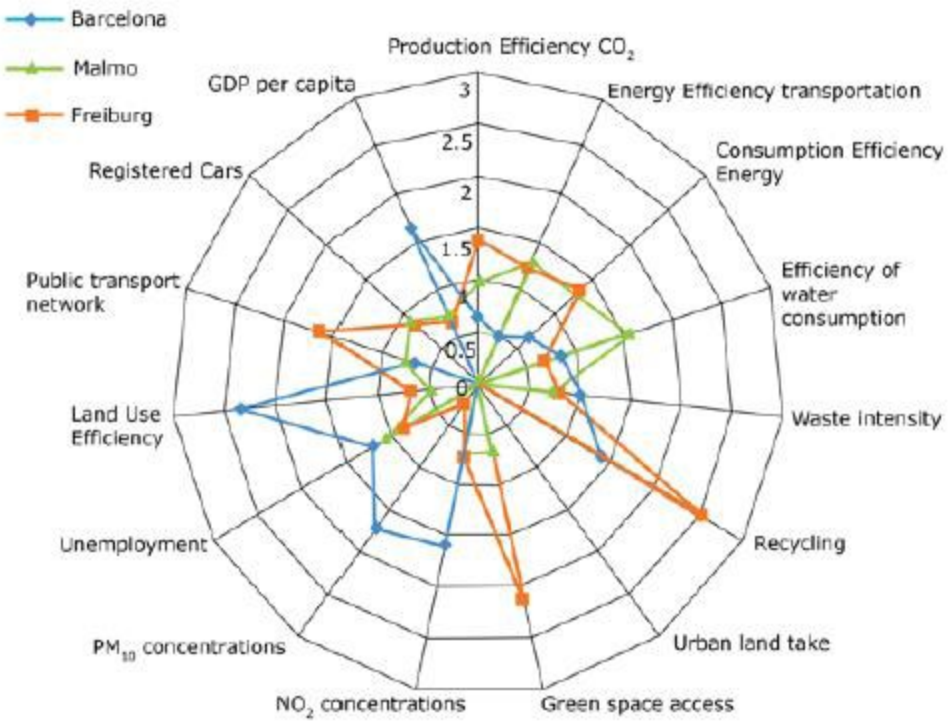


Source :European commission, 2015, p. 12

No.	Description	Dimension
H1	Per capita CO_2 emissions from energy consumption	Urban Flows
H2	Energy efficiency of transport	Urban Flows
H3	Efficiency of residential energy use	Urban Flows
H4	Efficiency of urban water use	Urban Flows
H5	Waste intensity	Urban Flows
H6	Recycling	Urban Flows
H7	Urban land take	Urban Flows
H8	Green space access	Urban Quality
H9	NO_2 concentrations	Urban Quality
H10	PM_{10} concentrations	Urban Quality
H11	Unemployment rate	Urban Quality
H12	Land use efficiency	Urban Patterns
H13	Public transport network length	Urban Patterns
H14	Registered cars	Urban Drivers
H15	GDP per capita	Urban Drivers

Annex 2 : EEA Urban Metabolism Framework

Source :European commission, 2015, p. 13



Source :European commission, 2015, p. 13

Annex 3 : European Green Capital Award.

1. Climate Change: Mitigation & Adaptation
2. Local Transport
3. Green Urban Areas Incorporating Sustainable Land Use
4. Nature and Biodiversity
5. Ambient Air Quality
6. Quality of the Acoustic Environment
7. Waste Production and Management
8. Water Management
9. Waste Water Management
10. Eco-innovation and Sustainable Employment
11. Energy Performance
12. Integrated Environmental Management

Source :European commission, 2015, p. 14

Annex 4 : Global City Indicators Facility

The Global City Indicators Facility is structured around "themes' organized into two broad categories, city services and quality of life.

Governance

Gross Operating Budget [$]
Gross Operating Budget per capita [$]
Gross Capital Budget [$]
Gross Capital Budget per capita [$]
Debt service ratio [%]
Tax collected as a % of tax billed
Capital spending as % of total expenditures
Own-source revenue as % of total revenues
% of women employed in the city government
Voter participation in last municipal election [%]
No. of local officials elected to office per 100,000
Type of government (e.g. Local, Regional, County)

Economy

Country's GDP [$]
City Product per capita [$]
GDP per capita [$]
% of country's GDP
% of country's population
Average household income [$]
Annual inflation rate (avg. of last 5 years) [%]
Cost of living [$]
Income distribution [GINI Coefficient]
Total employment
Annual avg. unemployment rate [%]
Employment % change based on the last 5 years
% of persons in full time employment
Commercial/Ind. assessment as % of total assess't
Number of businesses per 1000 population
% of city population living in poverty

People

Total population
% of population that are children
% of population that are youth
% of population that are adults
% of population that are senior citizens
Male -Female ratio (# of males per 100 females)
Annual population change
Population Dependency Ratio
[%] of population that are new immigrants
% of pop. migrating from elsewhere in country

Urban Planning, Shelter and Environment

Land Area
Population Density [per km2]
Jobs/housing ratio
Total number of households
Total # occupied dwelling units (owned & rented)
Dwelling density [per km2]
Persons per unit
Informal settlements as % of city area
% of city population living in slums
No. of households without registered legal titles
No. of homeless people per 100,000 population
Green area per 100,000 population [ha]
% of non-residential area
Public indoor recreation space per capita [m2]
Public outdoor recreation space per capita [m2]
Global region
Climate type
Average annual temperature [Celsius]
Average annual rainfall [mm]
Average annual snowfall [cm]
PM10 concentration [µ/m3]
GHG Emissions [tonnes per capita]

Global City Indicators Facility
www.cityindicators.org

City Management and Infrastructure

Energy

% of pop. with authorized electrical service
Total residential electrical use per capita [kW]
Total electrical use per capita [kW]
Electrical interruptions per customer [avg. #/yr]
Avg. length of electrical interruptions [hours]

Waste Management

% of pop. with regular solid waste collection
% of solid waste that is recycled
% of solid waste disposed of in an incinerator
% of solid waste burned openly
% of solid waste disposed of in an open dump
% of solid waste disposed of in a sanitary landfill
% of solid waste disposed of by other means

Wastewater

% of population served by wastewater collection
% of wastewater that has received no treatment
% of wastewater receiving primary treatment
% of wastewater receiving secondary treatment
% of wastewater receiving tertiary treatment

Water

% of population with potable water supply service
Domestic water consumption per capita [litres/day]
% of pop. with sust. access to improved water source
Total water consumption per capita [litres/day]
% of water loss
Water service interruption per household [avg. hrs/yr]

Transportation

Km of high capacity public transit per 100,000 pop.
Km of light passenger transit per 100,000 pop.
Number of personal automobiles per capita
Annual number of public transit trips per capita
Number of two-wheel motorized vehicles per capita
Number of non-stop commercial air destinations
Transportation fatalities per 100,000 population

Education, Technology and Innovation

Education

Student/teacher ratio
% of children completing primary & secondary ed.
% of students completing primary education
% of students completing secondary education
% of school-aged children enrolled in schools
% of male children enrolled in schools
% of female children enrolled in schools

Technology & Innovation

No. of internet connections per 100,000 pop.
No. of new patents per 100,000 per year
% of jobs in the cultural sector
No. of higher education degrees per 100,000 pop.
No. of telephones (landlines & cell) per 100,000 pop.
No. of landline phone connections per 100,000 pop.
No. of cell phone connections per 100,000 pop.

Health, Safety, and Emergency Response

Health

No. of in-patient hospital beds per 100,000 pop.
No. of physicians per 100,000 pop.
No. of nursing/midwifery personnel per 100,000 pop.
Average life expectancy
Under age five mortality per 1,000 live births

Safety

No. of police officers per 100,000 population
No. of homicides per 100,000 population
Violent crime rate per 100,000 population

Fire & Emergency

No. of firefighters per 100,000 population
No. of fire related deaths per 100,000 population
Response time for fire department [minutes]

Source : http://www.cityindicaors.org

Annex 5 : Indicators for Sustainability*

Sector	Indicator	Measures
Economy	Unemployment rates/ Jobs	Underemployment/employment/ unemployment rates: Percentage of green jobs in the local economy: Average professional education years of labour force
	Economic growth	Annual GDP growth rate: Annual GNP growth rate: Net Export Growth rates (% increase of country's total exports minus the value of its total imports per annum: Foreign Direct Investments (Capital/ Earnings accrued from listed FDI's per annum)
Environment	Green spaces	Percentage of preserved areas/ reservoirs/ waterways/parks in relation to total land area: Percentage of trees in the city in relation to city area and/or population size
	Reduce greenhouse gases/ Energy efficiency	Total amount of GHG emissions per city and per capita: Percentage of total energy consumed in the city that comes from renewable sources
	Mobility	Transportation mode split (Percentage of each mode of transportation, i.e. private, public, bicycles, pedestrians): Average commute time and cost
	Water quality/ Availability	Total amount of water availability: Water quality index/scores: Proportion of population with access to adequate and safe drinking water
	Air quality	Levels of Particulate Matter (PM_{10} – mg/ m^3): Levels of Particulate Matter ($PM_{2.5}$ – mg/m^3)
	Waste/ Reuse/ Recycle	Recycling rate (Percentage diverted from waste stream): Volume of solid waste generated
Social	Complete neighbourhood/ Compact city	Access to local/ neighbourhood services within a short distances: Crime rates: Measures of income distribution and inequality
	Housing	Percentage of social/ affordable/ priority housing: Breakdown of housing sector by property type (owner occupied/ rental, single occupant/couples/family/multifamily etc.)
	Quality public space	Percentage of roadways in good condition: Percentage of green space (public parks) coverage in relation to city area and/or population size
	Education	Number of schools with environmental education programs: Adult literacy rate
	Sanitation	Percentage of population with access to water-borne or alternative (and effective) sanitary sewage infrastructure
	Health	Mortality rate/ Life expectancy: Percentage of population with access to health care services

Source :European commission, 2015, p. 16

Annex 6: Reference Framework for Sustainable Cities

ECONOMY	
Questions	**Indicators (K)**
1. Enhance the economic attractiveness of the city/ region/territory	K1 - net migration (immigration minus emigration) – growing / declining city
2. Develop the local economy by providing the knowledge and skills needed	K2 – Intensité R&D
3. Guarantee the connectivity of cities and develop efficient facilities	K3 – Percentage of households with access to high-speed Internet (above 30 Mbps)
4. Develop/promote/support the sustainable production and consumption of goods and services locally	K4 – Number of shops selling local products
5. Meet the needs of the population as regards types of employment and access to employment	K5 – Activity rate for women and men aged 20 to 64 (benchmark: 75%)
6. Maintain or develop a more diversified local economy	K6 – Level of employment per sector (economic diversity indicator)

SOCIAL	
Questions	**Indicators**
7. Improve quality of and accessibility to public utilities for all	K7 – Percentage of journey covered by motorised transport (European Common Indicators (ECI), Urban Sustainability Indicators –USI), by automobile and motorcycle – Urban Audit (UA)
	K8 – Number of community utilities and basic utilities
8. Enable each person to have access to a proper	K9 – Percentage of early school dropouts
	K10 – Proportion des 30-34 ans ayant suivi une formation supérieure ou équivalente (valeur de référence: au moins 40%)
9. Promote proper public healthcare with no preconceptions	K11 – Espérance de vie
10. Provide good quality housing and surroundings to all	K12 - Indicateur de qualité des logements
11. Promote social inclusion and equal opportunities	K13 – Part de la population pauvre ou exclue
12. Promote cultural and leisure activities and make them accessible to all	K14 – Pourcentage du budget municipal alloué aux infrastructures culturelles et sportives

ENVIRONMENT	
13. Mitigate the effects of climate change and build the cities' adaptation capacity to the change	K15 – Greenhouse gas emission – in tonnes per capita
	K16 – Proportion of renewable energies in total energy consumption
14. Protect and promote biodiversity	K17 – Percentage of protected areas as protection of nature and biodiversity by municipal, council, national or local schemes
15. Reduce pollution	K18 – Number of times where the PM10 threshold authorised by the European directives on air quality is exceeded
16. Preserve the quality and availability of natural resources	K19 – Waterproofing of soil (in m^2 per capita)
17. Preserve and promote the good quality and proper operation of the buildings, shared spaces and urban landscape	K20 - Rate of satisfaction with shared spaces

GOVERNANCE	
18. Develop an integrated sustainable development vision for our city	K21 – Last date of approval of a master plan containing an integrated vision of the city as a whole
19. Pay special attention to disadvantaged neighbouring areas	K22 - Percentage of local budget allocated to disadvantaged neighbourhoods on overall local budget
20. Organise the management structures of your city to achieve a sustainable urban development	K23 - Percentage of key urban projects managed by a cross-cutting team
21. Manage to provide an integrated sustainable development financing for your city	K24 – Debt service ratio: proportion of debt service spending on income of municipality
22. Monitor and assess progress	K25 – Does your local authority assess project or programme progress and make adjustments accordingly?
23. Work with other authorities at different levels	K26 – To what extent does your local authority promote cooperation and/or coordination with other municipalities and/or other levels of government?
24. Promote the active participation of partners and citizens	K27 – Level of satisfaction of local stakeholders with their involvement in local planning and decision-making
25. Promote networking and knowledge sharing	K28 –Do the employees of your administration attend training sessions and share views on integrated and sustainable urban development?

Source : http://rfsc.eu/

Annex 7 : STAR community Rating System

Table of STAR Goals and Objectives

Built Environment	Climate & Energy	Economy & Jobs	Education, Arts & Community	Equity & Empowerment	Health & Safety	Natural Systems
Ambient Noise & Light	Climate Adaptation	Business Retention & Development	Arts & Culture	Civic Engagement	Active Living	Green Infrastructure
Community Water Systems	Greenhouse Gas Mitigation	Green Market Development	Community Cohesion	Civil & Human Rights	Community Health & Health System	Invasive Species
Compact & Complete Communities	Greening the Energy Supply	Local Economy	Educational Opportunity & Attainment	Environmental Justice	Emergency Prevention & Response	Natural Resource Protection
Housing Affordability	Industrial Sector Resource Efficiency	Quality Jobs & Living Wages	Historic Preservation	Equitable Services & Access	Food Access & Nutrition	Outdoor Air Quality
Infill & Redevelopment	Resource Efficient Buildings	Targeted Industry Development	Social & Cultural Diversity	Human Services	Indoor Air Quality	Water in the Environment
Public Spaces	Resource Efficient Public Infrastructure	Workforce Readiness		Poverty Prevention & Alleviation	Natural & Human Hazards	Working Lands
Transportation Choices	Waste Minimization				Safe Communities	

Source : http://www.starcommunities.org/rating-system/framework/

Annex 13: Urban Ecosystem Europe

The 25 indicators

1. Air quality: **PM_{10}** concentrations
2. Air quality: **NO_2** concentrations
3. **Noise** map and noise reduction plan
4. Domestic **water consumption**
5. Inhabitants served by **water treatment** plants
6. **Electric consumption** variation
7. Amount of **municipal waste** produced
8. Municipal waste, **differentiated collection**
9. **Green public procurement,** procedures and purchasing
10. **Passengers** travelling on **public transport**
11. **Underground and tram** lines in the urban area
12. Number of registered **cars**

13. **Cycle** paths and lanes availability
14. Public **green areas** availability
15. Energy Balance and **CO_2 reduction target**
16. **Solar power** generation in public buildings
17. Inhabitants connected to **district heating** system
18. Climate and **Energy saving policies**
19. Demographic and **old age dependency**
20. **Female employment**
21. Population qualified at **highest level of education**
22. **Env. Certification of** public authorities
23. Level of mplementation of **Agenda 21** processes
24. **Electorate voting** in city elections
25. City **representatives** who are **women**

Source : Berrini et Bono, 2008, p. 5

Annex 9: Urban Sustainability Indicators.

Indicator	Data components/measure
Global climate	Emitted total CO_2, CH_4, N_2O and CFCs and halons
Air quality	Number of days per year on which alarm levels are exceeded and traffic circulation is stopped
Acidification	Deposition of SO_2, NO_2 and NH_3 per hectare
Ecosystem toxification	Sum of emitted quantities of cadmium, polyaromatic hydrocarbons, mercury, dioxin, epoxyethane, fluorides and copper, and radioactive substances, weighted according to their toxicity and their residence time in the environment
Urban mobility/clean transport	Total number of trips (and their length) by private car and number of trips, (and their length) for commuting and basic needs/inhabitant/year
Waste management	Tonnes of waste disposed of per inhabitant and per year (building and demolition waste, industrial waste, domestic waste, retail and service waste)
Energy consumption	Tonnes of oil equivalent per inhabitant per year for domestic use, industrial use, the tertiary sector and public spaces
Water consumption	Metres^3 per inhabitant per year (total water extracted minus water from recycling and water used for maintenance of public and green spaces)
Nuisance	Percentage of the population affected by noise, odour or visual pollution
Social justice	Percentage of the population affected by poverty, unemployment, lack of access to education, information, training and leisure
Housing quality	Percentage of the population affected by lack of housing or poor housing environments
Urban safety	Total percentage of the population affected seriously by crime or traffic accidents
Economic urban sustainability	Total individual incomes in city minus: city fiscal deficit, environmental expenditure and pollution damage per inhabitant per year
Green, public space and heritage	Percentage of green or public spaces and local heritage in need of improvement
Citizen participation	Total percentage of the population participating in local elections or as active members in associations for urban improvement and quality of life
Unique sustainability	To be defined by cities — this indicator should represent the degree to which unique factors or events lead to urban sustainability with its environmental, social and economic dimensions

Source: European Commission, 2015, p. 20

Annex 10:

THEME	CORE INDICATORS	SUPPORTING INDICATORS
Economy	City's unemployment rate	Percentage of persons in full-time employment
	Assessed value of commercial and industrial properties as a percentage of total assessed value of all properties	Youth unemployment rate
	Percentage of city population living in poverty	Number of businesses per 100,000 population
		Number of new patents per 100,000 population per year

Annex 11

THEME	CORE INDICATORS	SUPPORTING INDICATORS
Education	Percentage of female school-aged population enrolled in school	Percentage of male school-aged population enrolled in school
	Percentage of students completing primary education	Percentage of school-aged population enrolled in school
	Percentage of students completing secondary education	Number of higher education degrees per 100,000 population
	Primary education student/teacher ratio	

Annex 12

THEME	CORE INDICATORS	SUPPORTING INDICATORS
Energy	Total residential electrical use per capita (kWh/year)	Total electrical energy use per capita (kWh/year)
	Percentage of city population with authorized electrical service	Average number of electrical interruptions per customer per year
	Energy consumption of public buildings per year (kWh/m2)	Average length of electrical interruptions (in hours)
	Percentage of total energy derived from renewable sources, as a share of the city's total energy consumption	

Annex 13

THEME	CORE INDICATORS	SUPPORTING INDICATORS
Environment	Fine particulate matter (PM2.5) concentration	NO2 (nitrogen dioxide) concentration
	Particulate matter (PM10) concentration	SO2 (sulphur dioxide) concentration
	Greenhouse gas emissions measured in tonnes per capita	O3 (ozone) concentration
		Noise pollution
		Percentage change in number of native species

Annex 14

THEME	CORE INDICATORS	SUPPORTING INDICATORS
Finance	Debt service ratio (debt service expenditure as a percent of a municipality's own-source revenue)	Capital spending as a percentage of total expenditures
		Own-source revenue as a percentage of total revenues
		Tax collected as percentage of tax billed

Annex 15

THEME	CORE INDICATORS	SUPPORTING INDICATORS
Fire and Emergency Response	Number of firefighters per 100,000 population	Number of volunteer and part-time firefighters per 100,000 population
	Number of fire related deaths per 100,000 population	Response time for emergency response services from initial call
	Number of natural disaster-related deaths per 100,000 population	Response time for fire department from initial call

Annex 16

THEME	CORE INDICATORS	SUPPORTING INDICATORS
Governance	Voter participation in last municipal election (as a percentage of eligible voters)	Percentage of women employed in city government workforce
	Women as a percentage of total elected to city-level office	Number of convictions for corruption and/or bribery by city officials per 100,000 population
		Citizens' representation: number of local officials elected to office per 100,000 population

Annex 17

THEME	CORE INDICATORS	SUPPORTING INDICATORS
Health	Average life expectancy	Number of nursing and midwifery personnel per 100,000 population
	Number of in-patient hospital beds per 100,000 population	Number of mental health practitioners per 100,000 population
	Number of physicians per 100,000 population	Suicide rate per 100,000 population
	Under age five mortality per 1,000 live births	

Annex 18

THEME	CORE INDICATORS	SUPPORTING INDICATORS
Recreation	None	Square meters of public indoor recreation space per capita
		Square meters of public outdoor recreation space per capita

Annex 19

THEME	CORE INDICATORS	SUPPORTING INDICATORS
Safety	Number of police officers per 100,000 population	Crimes against property per 100,000 population
	Number of homicides per 100,000 population	Response time for police department from initial call
		Violent crime rate per 100,000 population

Annex 20

THEME	CORE INDICATORS	SUPPORTING INDICATORS
Shelter	Percentage of city population living in slums	Number of homeless per 100,000
		Percentage of households that exist without registered legal titles

Annex 21

THEME	CORE INDICATORS	SUPPORTING INDICATORS
Solid waste	Percentage of city population with regular solid waste collection (residential)	Percentage of the city's solid waste that is disposed of in a sanitary landfill
	Total collected municipal waste per capita	Percentage of the city's solid waste that is disposed of in an incinerator
	Percentage of a city's solid waste that is recycled	Percentage of the city's solid waste that is burned openly
		Percentage of the city's solid waste that is disposed of in an open dump
		Percentage of the city's solid waste that is disposed of by other means
		Hazardous waste generation per capita
		Percentage of the city's hazardous waste that is recycled

Annex 22

THEME	CORE INDICATORS	SUPPORTING INDICATORS
Telecommunication and Innovation	Number of internet connections per 100,000 population	Number of landline phone connections per 100,000 population
	Number of cell phone connections per 100,000 population	

Annex 23

THEME	CORE INDICATORS	SUPPORTING INDICATORS
Transportation	Kilometers of high capacity public transportation per 100,000 population	Percentage of commuters using travel mode to work other than a personal vehicle
	Kilometers of light passenger public transportation system per 100,000 population	Number of two-wheel motorized vehicles per capita
	Annual number of public transport trips per capita	Kilometers of bicycle paths and lanes per 100,000 population
	Number of personal automobiles per capita	Transportation fatalities per 1000,000 population
		Commercial air connectivity (number of non-stop commercial air destinations)

Annex 23

THEME	CORE INDICATORS	SUPPORTING INDICATORS
Urban planning	Green area (hectares) per 100,000 population	Annual number of trees planted per 100,000 population
		Areal size of informal settlements as a percent of city area
		Job / housing ratio

Annex 25

THEME	CORE INDICATORS	SUPPORTING INDICATORS
Wastewater	Percentage of city population served by wastewater collection	
	Percentage of the city's wastewater that has received no treatment	
	Percentage of the city's wastewater receiving primary treatment	
	Percentage of the city's wastewater receiving secondary treatment	
	Percentage of the city's wastewater receiving tertiary treatment	

Annex 26:

THEME	CORE INDICATORS	SUPPORTING INDICATORS
Water and sanitation	Percentage of city population with potable water supply service	Total water consumption per capita (litres per day)
	Percentage of city population with sustainable access to an improved water source	Average annual hours of water service interruption per household
	Percentage population with access to improved sanitation	Percentage of water loss
	Total domestic water consumption per capita (litres per day)	

Source : http://www.smartcitiescouncil.com

Annex 27 : The interview guide

1. Could you introduce yourself?
- What is your pedagogical / professional experience?
- Are you directly or indirectly involved in a smart city initiative?

2. How do you think a smart city can be defined?
    - What are the important features?
    - How would you establish if a city is defined as smart or not?

3. What dimensions do you see as priorities in a smart city initiative?
Or what are the priority projects to launch in relation to the different dimensions?

4. How can the performance of a smart city project be measured in these different dimensions?

5. What are the success factors that can help Algeria transform its capital into a smart city?

6. What are the challenges and challenges that Algiers will face in carrying out the smart city project?
- What resources to mobilize to meet these challenges?

7. In the Algiers Smart City project which characteristics are difficult to measure?

8. What are the different KPI performance metrics you used to measure the performance of a smart city?

9. In your opinion, which KPI indicators are the most difficult to implement in the Algiers smart city project?

10. How would you evaluate the performance of a Smart City? What factors would you consider?

Annex 28

Slimani .Fatiha – The Wilaya of Algiers

1. Could you introduce yourself in some way?

- What is your pedagogical / professional experience?

- Are you directly or indirectly involved in a smart city initiative?

Ms. Slimani Fatiha (biography)

- Advisor to Wali of Algiers, in charge of investment, Startups and Algiers Smart City.
- Licentiate in Administrative and Legal Sciences with 4th semester Magister, she participated from 1993 to 1996, in her quality of HRDC and then Head of Division of Finance, Heritage and Regulation, to erect in 1994, the technical services of the City of Algiers in 14 EPIC and EPA.
- Since 1997, in the Cabinet of the Minister Gouverneur then with 03 Walis, was in charge of the Administration, Management Control and IT Department (supervision of 25 EPIC and EPA from 2000 to 2014), President of Commissions (Millennium, Markets, Reflection, Industrial Land Remediation ...)
- Initiated and organized under the auspices of the Walis several events including "The Urban Furniture Fair" (Safex 2005), The Equipment of the City of Algiers in Kiosks, Abribus, Public Benches, Sanisettes, Planters .. by l Advertising Advertising Domain Organization (2004-2012), "The Showroom of Cleaning and Cleaning Equipment of the City" (BEZ 2013), "The First Salon of the City of Algiers" (gathered More than 150 Economic Operators, Architects, Town Planners, Local and Territorial Communities, etc.Safex 2014), "Algiers Startups Conferences" (El Aurassi 2017 and 2018 in partnership with SYLABS), the International Smart Cities Conference "Smart Cities Global Technology & Investment Summit algiers June 2018.

- Are you directly or indirectly involved in a smart city initiative?

I am responsible for Project Algiers Smart City. I am accompanied in terms of ICT knowledge by Mr Riad Hartani, Dr in Artificial Intelligence.

2.

2. How do you think a smart city can be defined?

- What are the important features?

- How would you establish if a city is defined as smart or not?

The terms for the smart city are numerous: smart city, digital city, green city, connected city, eco-city, sustainable city etc ... In general, the Smart City is the City that favors information technologies and ICT communication to foster better interaction with its citizens and guarantee its inhabitants the improvement of their quality and living environment despite the increasing development of the City.

Three aspects are important in the notion of Smart City: Economy, Environment and Social. The Local Authority uses digital as a tool for its sustainable and inclusive urban development strategy.

In general, smart cities can be classified according to six main criteria:

1. A smart economy.
2. Intelligent mobility. Integrate different modes of transportation into one system that is efficient, easily accessible, affordable, secure and environmentally friendly.
3. A smart environment. two main areas: waste and energy.
4. Smart inhabitants.
5. A smart lifestyle.

The smart city is rebuilding around the needs of its inhabitants who are no longer seen as consumers of services but as partners and stakeholders in its development.

6. Intelligent administration. Technologies will need to be associated with sound choices in governance. This governance will be based on the correct use of the information collected.

- How would you establish if a city is defined as smart or not?

- Dr. Hartani's answers..

the rest of questions to Dr hartani.

Dr Hartani Riad- Wilaya of Algiers

1. Could you introduce yourself?

- What is your pedagogical / professional experience

adviser of the wali, a representative of the diaspora, doctor of the university of Paris, postdoctoral fellow at the university of Berkeley in artificial intelligence and business studies at Stanford University California, who has a silicon valley incubator research & development labs in Canada, France, Korea, China and Japan.

- Are you directly or indirectly involved in a smart city initiative

I participated in different smart cities around the world like America and in Europe and it is about two and a half years ago to start having Algiers aspects for the Algiers smart city project.

2. How do you think a smart city can be defined?

The definition of smart city is very specific to the context so the definitions are not unique, the definitions in Tokyo or Hong Kong or Algiers are not the same. It is generally possible to define it according to their purpose. To the generic aspect it is that to import the information systems and the models of the technologies of the information and communications in the city (the optimization of the city).

I think for Algiers this is the tactical goal but the strategic goal is to develop the technological ecosystem and develop a primarily local value chain that includes this technology can participate in the implementation of solutions at the city level.

- What are the important characteristics?

The most important thing is how to optimize the management of the city in a more pleasant way for the citizens of the city. and find the insertion model of its new information technologies in all the main processes and the impact on improving the quality of life of citizens and also the pooling of city management costs

- How would you establish whether a city is defined as smart or not?

There is no notion smart or not smart it is not 0 or 1 it is more a progressive process of insertion of models and information process in the city plus there is an optimal use of the technologies of the information but it's not 0 or 1.

3. What dimensions do you see as priorities in a smart city initiative?

The most important thing is to have a critical mass of mainly local expertise that includes these information technologies and solutions to propose and implement them so human resources are the most important

What are the priority projects to launch in relation to the different dimensions?

Generally develop a technological ecosystem that means develop a model of local connectivity and global local means it works on Algiers Algeria and global level of the world in all the initiatives that you will see on Algiers on state as goals

. How do you think the different factors (technological, institutional, human) can be involved in a smart city?

We must work in conjunction, we must work synergistically in very multilinear subject in: (the technology aspect, the finance aspect, the regulation aspect, the training aspect, the partnership aspect, the resource development aspect human, the legal development aspect) all this must be the parallel notion.

4.How can the performance of a smart city project be measured in these different dimensions?

It is necessary to analyze it according to the objectives as it is supposed to reach it is necessary to determine the objectives and it is necessary to define evaluation criteria certain its objective certain its subjective certain certain direct sound its indirect) but I think the most important thing is to choose very specific activities in relation to the various business sectors such as lighting, optimization of transport regulation, improvement of quality of life and sustainable development.

5. What are the success factors that can help Algeria transform its capital into a smart city?

We must focus on the human resource (we must develop it for a very long time and we must put models of expertise and knowledge on the city.

6. What are the challenges and challenges that Algiers will face in carrying out the smart city project?

The challenges are very clear it is not for Algiers smart city but for all Algeria in a general way: the mastery of the new technology that the information and the communication and the possibility to understand the needs and the proposed solutions on the short and the long term and it is necessary to improve it also and that it is the main problem and after the problems which are around the processes the regulation ... ect. But deep down is the expertise and the human resource.

- What resources to mobilize to meet these challenges?

Quite, it's the human resource.

7. In the Algiers Smart City project which indicators are difficult to measure?

I do not think there is something very difficult to measure in general we say there are subjective difficult to measure for example ... the added value creation impact very specific but it is not obvious but however something else there is no indicator very or less difficult to measure it must be said that things are subjective.

- Does this have an impact on the performance measure?

8. What are the different KPI performance metrics you used to measure the performance of a smart city?

we are not yet starting in the evaluation of the project

9. In your opinion, which KPI indicators are the most difficult to implement in the Algiers smart city project?

The pooling aspect of resources common to all sectors of activity because the optimization can come from pooling for example we place all the applications of the cloud the citizen must have access optimally there are several in the pooling.

12. How would you evaluate the performance of a Smart City (not just a single project)? What factors would you consider?

The performance ; first you have to have ... for example for Algiers there are three points we have seen; transport, energy management, water management must be linked with industry players who are on the ground (the inclusion aspects of information technology)....

Taouche Hamidallah- The wilaya of Algiers:

1. Could you introduce yourself ?

Mohammed Hamid Allah TAOUCHE; Counselor Wali of the Wilaya of Algiers

- What is your pedagogical / professional experience

Communication Officer; Startups and Project Algiers Smart City.
Graduate of the National School of Administration 2008; Hydra; Alger.
Master in Public Management option e-Government & e-Policy 2018, Seoul; South Korea.

- Are you directly or indirectly involved in a smart city initiative

Yes, I am a member of the Algiers Smart City team

2. How do you think a smart city can be defined?

Smart city, sustainable city, connected city, smart city ... It is not always easy to know what precisely these terms mean. Smart City is a city that seeks to solve public challenges through ICT-based solutions through multi-party, multi-partner partnerships. It is also a concept that appeared ten years ago, which is an extension of that of the sustainable city. It brings to the latter a new dimension by integrating the impact of the digital transition on the fabric of the city and territories.

- What are the important characteristicss?

According to Rudolf Giffinger, an expert in analytical research on urban and regional development at the Vienna University of Technology, smart cities can be classified according to six main criteria, related to regional and neoclassical theories of growth and urban development respectively. based on theories of regional competitiveness, the economics of transport and information and communication technologies, natural resources, human and social capital, quality of life and citizens' participation in the democratic life of the city.

1. A smart economy.
2. Intelligent mobility.

3. A smart environment.
4. Smart inhabitants.
5. A smart lifestyle.
6. Intelligent administration.

- How would you establish whether a city is defined as smart or not?

Smart City is a smart city that is characterized mainly by increased production and the use of data to enable the management of new urban environments in a connected and digital way.

3. What dimensions do you see as priorities in a smart city initiative? What are the priority projects to launch in relation to the different dimensions?

1. Smart administration.
2. A smart economy.
3. A smart lifestyle.
4. A smart environment.

4. How can the performance of a smart city be defined? How can we measure the performance of a smart city project in these different dimensions?

For a better readability and to leave room for future developments, a division into scoring axes was what was most appropriate. There are seven so far:

• Transportation
• Security
• The health
• The well-being
• Economic development
• The resources
• Administration

5. What are the success factors that can help Algeria transform its capital into a smart city?

The Wilaya of Algiers started at the beginning of 2017, a thorough reflection with the aim of making the Capital an Intelligent City with the help and expertise of local Algerian and elements of our diaspora abroad, in the United States and everywhere in Europe.

6- What are the challenges and challenges that Algiers will face in carrying out the smart city project? What resources to mobilize to meet these challenges?

• Architecture, design and implementation of 'Smart City' unified data and application models for use by the city, its citizens and the general public.

• This mainly includes: (1) data generation; (2) transmission and communication of data; (3) the collection, aggregation and processing of data; (4) applications leveraging data with challenges focused on Smart City priorities.

• Selection of technology partners for the implementation, deployment and support of Smart City solutions. The solutions will address the highest priorities and cross-cutting challenges of the city.

• Integration of the solutions identified in the current and future Algiers city plan, with the aim of optimizing the strategic public assets of the city.

7. In the Algiers Smart City project which features are difficult to measure?

The organizational, technological and societal changes of today's cities are driven by their desire to be part of the response to climate change. The smart city seeks to reconcile social, cultural and environmental pillars through a systemic approach that combines participative governance and enlightened management of natural resources to meet the needs of institutions, businesses and citizens.

To become smart, today's cities will have to develop new and powerful services in all areas:

• Transport and smart mobility: One of the challenges is to integrate different modes of transport - rail, car, cycle and walk - into one system that is efficient, easily accessible, affordable, safe and environmentally friendly. This integration allows for a reduced environmental footprint, optimizes the use of urban space and offers city dwellers a wide range of mobility solutions to meet all their needs. In addition, the city of tomorrow will have to put in place the latest technologies of public transport and electric mobility;

• Sustainable environment: cities will have to act in two main areas: waste and energy. With regard to waste, cities will have the mission to reduce or even avoid their waste production and to set up efficient waste recovery and recovery systems (process by which a waste material or a useless product is transformed into a new material or product of superior quality or utility). In the field of energy, cities will have to step up their energy efficiency measures (development of low-energy public lighting) and will

have to set up local energy production systems (rooftop solar panels). buildings, electricity generation from waste, etc.);

• Responsible urbanization and smart housing: The high value of real estate in the city centers combined with the limited availability of land make the current urbanization complex. Indeed, the model of urban sprawl - expensive space, public facilities, energy - which prevailed so far is no longer possible. It is necessary to reinvent urban forms which, at the same time, respect an indispensable intimacy, ensure sufficient sunshine, allow evolutions and favor the "living-together". Buildings will also need to be smarter in order to facilitate and improve energy management and even reduce consumption.

- Does this have an impact on the performance measure?

8. What are the different KPI performance metrics you used to measure the performance of a smart city?

First, it will be necessary to visualize but also to understand the functioning of the consumptions of the city but also to identify the weak points and the dysfunctions in order to palliate to these difficulties and to transform its weak points in strength for the city.

The second factor to take into account would be to bring out the needs related to this information, because if we collect the data the objective remains to identify the needs and to answer them in the most efficient way possible. In addition, it would provide new services and useful uses for the city, but also the best allocation of resources.

Finally, it remains to show that if the Smart City is to be useful and effective, it requires data interoperability, in other words, to be able to access the data in a simple way, but also to be shareable. This is why the establishment of a common standard seems indispensable. The challenge lies in the fact that it must be absolutely

Belkhir Chems Eddin – high school of informatics.

1. Could you introduce yourself?

Mohamed Chemss eddine BELKHEIR 5th-year student at the National School of Computer Science Algiers option information system and technology, co founder of trillio tech / economic startup and Ro'aa startup based in saudi arabia,

- What is your pedagogical / professional experience

• President of the ESI Science Club in 2017/2018

• Co-founder of two startups

• Intern at Cevital SPA (sentiment analysis on social networks) PFE

- Are you involved directly or indirectly in a smart city initiative

Co founder of the largest hackathon in Africa as part of the smart city Algiers which focused on leapfrog technologies (Ai, Finetech, blockcahine) with the participation of more than 50 international personalities,

I joined the project smartcitye May 2018, assistant of Dr. Riad haratni and Mrs. Slimani in organization of the smart city summit which is held in June 2018, responsible for youth engagement in the smart vision Algiers, encourage the Algerian talents through organization of major technical events, digital, negotiate financing with sponsors

2. How do you think a smart city can be defined?

A smart city is a designation that combines information and communication technologies (ICT) with improving the quality and performance of urban services such as energy, transport and utilities, in order to reduce resource consumption, waste and overall costs. The overall goal of a smart city is to improve the quality of life of its citizens through intelligent technology.

- What are the important features?

The fundamental axis of a smart city is a smart economy, smart roads, smart people, intelligent lives and smart government.

These axes are related to the theories of urban planning and development, which manage to provide a high quality of life, with a good use of natural resources and the establishment of a participative government.

- How would you establish if a city is defined as smart or not?

If it meets the majority of the features of the previous question saying the basics with a good information system at the heart

3. What dimensions do you see as priorities in a smart city initiative? What are the priority projects to launch in relation to the different dimensions?

• Sociological
• Economic
technical •
the saying goes "there are no smart cities without smart inhabitants",
• mainly it is necessary to launch awareness campaigns on the reality of the smart city the advantages and the inconvenient and to emphasize the
• Launch events, bring people together to talk about the smart city, talk about the smart city vision and integrate the population into the dynamic
• economic it's easy to keep the budget and strategic economic study
• Technique must bet on training, launch It projects and integrate the best projects into the real plan of the smart city, in particular we can launch competitions to study Tech said hackathon as we did with Algiers smart city

4. How can you define the performance of a smart city? How can we measure the performance of a smart city project in these different dimensions?

The smart city is not counted in number of inhabitants, it is measured in terms of services rendered, their effectiveness, and of course the perception that they have.

5. What are the success factors that can help Algeria transform its capital into a smart city?

The talents we have (specialist and expert)
Young people and their motivation
Government involvement (legally and financially)
Invest in private companies
In this context, the emergence of a new economic model is a necessity because it is necessary to finance the reflections and experiments that result from it. This necessarily involves cooperation between the main actors, which are public authorities and authorities, businesses, universities and citizens. Learning to work together, to combine ideas and expertise, to co-

create, in a context of economic crisis, scarcity of natural resources and ecological awareness can create a new chain of value where each of the actors is able to find his place.

6. What are the challenges and challenges that Algiers will face in carrying out the smart city project? What resources to mobilize to meet these challenges?

The main challenge is the society we imply the mentality of the citizens especially and the regulation.
The word infrastructure often comes back and we can not create a smart

The main challenge is the society we imply the mentality of the citizens especially and the regulation.
The word infrastructure often comes back and we can not create a smart city without broadband connection we talk about the 4 G even there are countries that go to 5 G since it is the basis of sensor networks and connected objects.
Data or data and the importance of having a data center that can store data TBs

7. In the Algiers Smart City project which characteristics are difficult to measure?
- the interconnectivity of public and private services
-The satisfaction rate of citizens
-Engagement rate in the smart city
(more precisely as long as we do not have an information system it will always be difficult to have all the measures and once this system is established functional we will have all the characteristics on the city

- Does this have an impact on the performance measure?
Of course, this is an advanced logical consequence without evaluation will lead to bad decisions and it will be a risk for a smart city.
8. What are the different KPI performance indicators you used to measure the performance of a smart city?
People
1. Encourage a healthy lifestyle
2. waiting time
3. Quality of public transportation
4. Increased flexibility in delivery services
5. Increased awareness of the environment

6. Improving digital culture
7. Sufferers
8. Increased participation of vulnerable groups
9. Increased use of ground floors

Planet

1. Extension for life
2. Reduction of water consumption
3. Self-Sufficiency - Water
4. Sufficiency - Food

prosperity
1. Certified companies involved in the project
2. Green Public Procurement
3. Stimulate an environment of innovation
4. Quality of open data

The governance
1. Involvement of the city administration
2. Ascending or descending initiative
3. Participatory governance

Spread

1. Visitor of the Smart City project

More others
1. Number of smart meters installed
2. Proportion of homes using smart monitoring Percentage of smart buildings
3. Percentage of smart buildings
4. Number of electric vehicles Number of charging stations for electric vehicles
5. Coverage of road detection terminals Proportion of traffic lights connected to the traffic management system

6. Use of ICT in public transport Availability of a multimodal transport application with at least 3 integrated services

7. Existence of an official citywide privacy policy to protect confidential citizens

9. In your opinion, which KPI indicators are the most difficult to implement in the Algiers smart city project?

In our framework practically all the KPIs are not really applicable, since Algeria is still in the benign phase and it is early to talk about KPI smart city, it is necessary to start first by creating a solid ecosystem , so measure the growth of the ecosystem [infrastructure, mentality,] then we can talk about the measures of preference of a potential smart city

For Algiers there really is a dynamic will and desire that started moving several devices are set up (cloud of the wilaya of Algiers, start-ups around them that are created and the desire to create an information system for the project, the economic actors who want to integrate the project what is missing is more motivation in the coming period more expert commitments, to study and operators in for me we are in the way of going towards a smart city but we do not have it yet and we cannot measure the performance of something that does not exist.

10. How would you evaluate the performance of a Smart City (not just a single project)? What factors would you consider?

I did not understand the question, I think it's the same thing a smart city project will lead to a smart city where we must evaluate its performance, predict the hazards, improved gaps.

For the key to performance, it is the same, citizenship, the rate of integration of ICTs in everyday life, the environment, energy, water, transportation, tourism, etc.

But never forget the fact that a smart city is made to ease the life of the citizen so The first factor is citizen satisfactio

Saad Nabila – Ministry of TIC

1. Could you introduce yourself?

Ms SAAD Nabila, Director of Development of the Information Society at the Ministry of Post, Telecommunications, Technology and Digital.

- What is your pedagogical / professional experience

I am a computer engineer, graduated from the former National Institute of Informatics (INI), with more than 20 years of experience in the design, development and deployment of information solutions, in addition to a experience in ICT project management at the ministry level.

- Are you directly or indirectly involved in a smart city initiative

No, not particularly.

2. How do you think a smart city can be defined?

I know the definitions of the smart city but I have not a particular definition for me but I cat tell you It is an expression in English that means a smart city, from my point of view, it is the use of digital technologies to improve the management of the city and consequently the improvement of the life of the citizen .

- What are the important characteristics?

Its characteristics are:

To use new technologies in the management of the city (services: transport, health, ... etc.);

Saving energy resources (eg less displacement: less consumption of carbons);

Streamline the use of natural resources (water and electricity management).

- How would you establish if a city is defined as smart or not?

A city is smart if it is composed of intelligent systems that manage to interact with each other.

3. What dimensions do you see as priorities in a smart city initiative? What are the priority projects to launch in relation to the different dimensions?

From my point of view, we must consider the following dimensions:

The involvement of all stakeholders;

The building of an information society (generalization of the use of new technologies);
The introduction of ICTs in public services;
The use of renewable resources;
The introduction of new technologies in educational programs and vocational training.

4. How can we define the performance of a smart city? How can we measure the performance of a smart city project in these different dimensions?

5. What are the success factors that can help Algeria transform its capital into a smart city?
The factors from my point of view are:
- A national policy for the development of the capital in smart city;
- The encouragement of innovation through startups;
- The exploitation and use of ICT skills (digital);
- The creation of a local digital ecosystem favorable to the development of a smart city;
- And the search for the financial funds necessary for this development.

6. What are the challenges and challenges that Algiers will face in carrying out the smart city project? What resources to mobilize to meet these challenges?
From my point of view there is not a generic solution that can be used in any city for it to be a smart city but the approach has to be an inclusive approach ie it is necessary to involve all stakeholders involved in the project, including citizens. Also, there is the point about the choice of technological solutions which is very important because the chosen solutions must communicate with each other in a first place in the same city but after they must also exchange information in a national context, on this point I propose the installation of a national committee to help all cities. On the other hand, there is the challenge of financing that needs to be addressed, and for that we need to involve the private sector and why not foreign investors.

7. In the Algiers Smart City project which features are difficult to measure?
- Does this have an impact on the performance measure?

8. What are the different KPI performance indicators you used to measure the performance of a smart city?

9. In your opinion, which KPI indicators are the most difficult to implement in the Algiers smart city project?

10. How would you evaluate the performance of a Smart City (not just a single project)? What factors would you consider?

Meriem Benslama –ACSE

Interview guide :

1. Could you introduce yourself?

Meriem Benslama, head of the Algerian center of social entrepreneurship, an organization that promotes social entrepreneurship in Algeria, and which acts on three aspects:

• support for project leaders in the creation of social enterprises (incubator)

• Coworking space dedicated to social innovation

• creating a community around social entrepreneurship

- What is your pedagogical / professional experience

I hold a degree in languages from the University of Algiers, a business engineering and a master's degree in engineering of cultural projects. I have professional experiences in communication and journalism in France and Algeria. In addition, I have professional experience in the field of social entrepreneurship in France.

- Are you directly or indirectly involved in a smart city initiative

We incubate social enterprise projects (recycling) that contribute to the smart city.

2. How do you think a smart city can be defined?

A smart, inclusive, connected, and eco-friendly city.

- What are the important features?

The digital aspect, the inclusion, and respectful of the principles of sustainable development (economy, social and environmental)

- How would you establish whether a city is defined as smart or not?

The power of internet speeds, Internet penetration rate, a high-performance transport network, and respectful of the environment;

3. What dimensions do you see as priorities in a smart city initiative? What are the priority projects to launch in relation to the different dimensions?

In Algiers, priority projects are public transport to unclog the city, waste management, and all aspects related to participatory democracy

4. How can we define the performance of a smart city? How can we measure the performance of a smart city project in these different dimensions?

I do not know

5. What are the success factors that can help Algeria transform its capital into a smart city?

• An increasingly qualified youth
• Involve the diaspora with talent, network and know-how
• An increasingly connected population (high Internet penetration rate)
• The financial and material means available to the wilaya of Algiers
• Above all a political will, otherwise it can not materialize

6. What are the challenges and challenges that Algiers will face in carrying out the smart city project? What resources to mobilize to meet these challenges?

• Overpopulation in Algiers
• The resistance of still archaic mentalities
• The breach of trust between citizens and public authorities
• Lack of monitoring and evaluation of past and ongoing urban projects
• Corruption and therefore the challenge would be more transparency

7. In the Algiers Smart City project which features are difficult to measure?

• The well-being of citizens
• Citizens' confidence in their city
• The indirect impact: job creation, the number of tourists, the improvement of health and education etc ...

- Does this have an impact on the performance measure?

Yes,

8. What are the different KPI performance metrics you used to measure the performance of a smart city?

I do not know not being a specialist in the field

9. In your opinion, which KPI indicators are the most difficult to implement in the Algiers smart city project?

Refer to answer 9

10. How would you evaluate the performance of a Smart City (not just a single project)? What factors would you consider?

- Indicators related to the governance of the city
- Speed of internet
- Harvest and use of data
- Economic competitiveness
- Sustainability (social and environmental)