



## SMART CITIES

L2 27.2.2017

Spring Semester 2017, ETH Zürich

Gerhard Schmitt





Sm

are

ies

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1 GS ET:  
Introduction

Objectives,  
Definition,  
MOOC

Exercise 1:  
QUA-KIT

Definitions  
Context

Smart  
Objects,  
Smart  
Buildings,  
Smart Cities

3 GS: Urban  
Big Data

Stocks and  
Flows in  
Urban  
Systems

4 GS ET:  
Urban  
Measuremen  
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Measuremen  
t and  
Simulation

Exercise 2:  
Urban  
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t

5 GS: Urban  
Science

Citizen  
Design  
Science

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Science

Complexity  
Science

Exercise 3:  
QUA-KIT

7 GS: Smart  
Governance

Participator  
y Design and  
Management

8 GS: Smart  
Livability

City  
Livability  
Rankings

10 GS: From  
smart cities  
to  
responsive

From smart  
cities to  
responsive  
cities

Final  
presentation  
on MOOC  
discussion  
topics

# The story so far:

- 27.2.2017 From smart houses to smart cities – emerging criteria for smart cities as urban systems
- 20.2.2017 Cities are complex systems. Ideally, they are sustainable, resilient, livable, smart, and finally responsive – from production machines to human habitat

# Content

- Information ARCHITECTURE, INFORMATION Architecture, INFORMATION ARCHITECTURE
- Smart Home → Smart City
- Definitions
- Examples
- Summary

## Information Architecture

- Information ARCHITECTURE: Making the invisible visible in architecture, urban design and territorial planning
- INFORMATION Architecture: Using the metaphor of architecture for the structuring of big data

# INFORMATION ARCHITECTURE

Chapter 2

## Information Architecture

In the realm of the built environment, Information **ARCHITECTURE** visualises the information inherent in a building and thus makes the invisible visible. In the realm of the virtual, **INFORMATION Architecture** serves as a metaphor to structure the vast amount of data produced in modern society. We define **INFORMATION ARCHITECTURE** as the necessary framework to understand architecture, urban systems and territories in the knowledge society.





# Smart House – Smart Home: Criteria

- Control
- Convenience
- Performance
- Security
- Architecture?

# Houses and Smart Houses

## Houses - analog

- Architecture
- Security
- Convenience
- Performance
- Control

## Smart Houses - digital

- Convenience
- Security
- Control
- Performance
- Architecture?

„In 2003 the UK Department of Trade and Industry (DTI) came up with the following definition for a smart home:

"A dwelling incorporating a communications network that connects the key electrical appliances and services, and allows them to be remotely controlled, monitored or accessed."

[http://](http://www.fardaintelligent.com/Smart-home-En.html)

[www.fardaintelligent.com/Smart-home-En.html](http://www.fardaintelligent.com/Smart-home-En.html)



„Machen Sie Ihr Haus zum Smart Home  
Somfy Smart Home macht Ihr Zuhause intelligent und Ihr Leben sicherer und komfortabler.  
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<https://www.somfy.ch/de-ch/smart-home/was-ist-tahoma/tahoma-connect>





**ETH**

Höhere technische Hochschule Zürich  
Swiss Federal Institute of Technology Zurich

## Systemdarstellung

Die Hauszentrale Vitocomfort 200 (1) ist das Herzstück zur drahtlosen Bedienung und Kontrolle der Haustechnik. Etwa zur Regelung der Raumtemperatur (6, 11), zur Steuerung von Licht (5) oder zur Überwachung offener Türen und Fenster (9, 10).

## Systemkomponenten

- [1] Vitocomfort 200 Zentrale
- Smart Energy
- [2] Zähleradapter
- [3] Bewegungssensor
- [4] Energiesteckdose
- [5] Doppeltaster
- Smart Heating
- [6] Fußbodenthermostat
- [7] Raumthermostat
- [8] Klimasensor
- [9] Fenstergriff
- [10] Öffnungssensor
- [11] Heizkörperthermostat
- [12] Funk-Außentempersensor

<http://www.viessmann.de/de/wohngebaeude/vitocomfort-200.html>





## Zeitprogramm Heizung

Dienstag



00:00 - 04:00 Reduziert

04:00 - 05:00 Normal

05:00 - 07:00 Festwert

07:00 - 13:00 Festwert

13:00 - 20:00 Festwert

20:00 - 24:00 Reduziert

--:-- --:-- Neue Zeitphase

VIESMANN

Heizkreis 2



Raumtemperatur Sollwert  
-5.0° 20°



Letzte Aktualisierung 10.01.17, 10:19

## Informationen Allgemein

Außentemperatur -5.0 °C

Puffertemperatur 31.4 °C

Gem. Vorlauftemperatur 31.0 °C







Klimaregelung aus

AN

Innentemperatur: -1.9 °C



24.0°



Home



Fahrzeug



Aufladen



Klima



Standort



ROUTE

Schnabelberg

Sehen Sie sich Informationen



Home



Fahrzeug



Aufladen



Klima



Standort



Sturmhoehe TestEMPFEHLUNGS

Geparkt



58%



9 Im Obersteig  
Einsiedeln, Schwyz



Home



Fahrzeug



Aufladen



Klima



Standort

# From Smart Houses to Smart Cities

## Smart Houses

- Convenience
- Security
- Control
- Performance
- Architecture?

## Smart Cities

- Control
- Convenience
- Performance
- Security
- Urban Design?

# Smart city

From Wikipedia, the free encyclopedia

See also: [Smart Cities in India](#)



This article may be **confusing or unclear** to readers. Please help us [clarify the article](#); suggestions may be found on the [talk page](#). (May 2015)

A **smart city** (also **smarter city**) uses digital technologies or [information and communication technologies](#) (ICT) to enhance quality and performance of urban services, to reduce costs and resource consumption, and to engage more effectively and actively with its citizens. Sectors that have been developing smart city technology include government services,<sup>[2]</sup> transport and traffic management, energy,<sup>[2]</sup> health care,<sup>[2]</sup> water and waste. Smart city applications are developed with the goal of improving the management of urban flows and allowing for real time responses to challenges.<sup>[3]</sup> A smart city may therefore be more prepared to respond to challenges than one with a simple 'transactional' relationship with its citizens.<sup>[6]</sup> Other terms that have been used for similar concepts include 'cyberville', 'digital city', 'electronic communities', 'flexible city', 'information city', 'intelligent city', 'knowledge-based city', 'MESH city', 'telecity', 'telepolis', 'Ubiquitous city', 'wired city'.

Major technological, economic and environmental changes have generated interest in smart cities, including [climate change](#), economic restructuring, the move to online retail and entertainment, ageing populations, and pressures on public finances.<sup>[7]</sup> The European Union (EU) has devoted constant efforts to devising a strategy for achieving 'smart' urban growth for its metropolitan city-regions.<sup>[8][9]</sup> The EU has developed a range of programmes under 'Europe's Digital Agenda'.<sup>[10]</sup> In 2010, it highlighted its focus on strengthening innovation and investment in ICT services for the purpose of improving public services and quality of life.<sup>[3]</sup> [Arup](#) estimates that the global market for smart urban services will be \$400 billion per annum by 2020.<sup>[11]</sup> Examples of Smart City technologies and programs have been implemented in Southampton,<sup>[2]</sup> Amsterdam,<sup>[2]</sup> Barcelona<sup>[2]</sup> and Stockholm.<sup>[12]</sup>



Some definitions of a Smart City place emphasis on citizen engagement, such as at this [hackathon](#) in New York in 2013.<sup>[1]</sup>

# Smart Cities in India

From Wikipedia, the free encyclopedia

The Prime Minister of India, Shri **Narendra Modi** has a vision of developing 100 smart cities as satellite towns of larger cities and by modernizing the existing mid-sized cities.

The government plans to identify 20 smart cities in 2015, 40 in 2016 and another 40 in 2017.

**Contents** *[show]*

## Finance *[edit]*

In this regard an allocation of ₹ 7,060 crore was proposed in the Union Budget 2014. A total of ₹ 48,000 Crores/- will be spent on this project in a period of 5 Years by central govt and an equivalent amount will be spent by respective state governments.

First Year each Smart City will get ₹ 200 Crores following ₹ 100 Crores yearly for next 4 years.

## Core Infrastructure Elements *[edit]*

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1. Adequate water supply
2. Assured electricity supply
3. Sanitation, including solid waste management
4. Efficient urban mobility and public transport
5. Affordable housing, especially for the poor
6. Robust IT connectivity and digitization
7. Good governance, especially e-Governance and citizen participation
8. Sustainable environment
9. Safety and security of citizens, particularly women, children and the elderly
10. Health and education

# Smart City - Definitions

<http://www.smartcity-schweiz.ch/en/smart-city/>



## In summary:

- „A smart city offers its inhabitants maximal life quality with minimal consumption of resources, based on an intelligent interconnection of infrastructure (transport, energy, communication etc.) on different hierarchic levels (building, quarters, city).

# Smart City - Definitions

<http://www.smartcity-schweiz.ch/en/smart-city/>



## In summary:

- *„intelligent“ in this context does not necessarily equate information technology. Passive or self-regulating mechanisms are to be preferred to actively controlled approaches when having similar performance.“*



# Smart City - Definitions

<http://www.smartcity-schweiz.ch/en/smart-city/>

In summary:

- „Smart city“ is no new label, but describes a deepening engagement for the expansion of existing activities and projects of an innovative city possessing the „European Energy Award“. For those cities, the Smart City programme offers new possibilities for support of their innovative and „smart“ projects on the way to achieving the ambitious goals.



# Smart City - Definitions

<http://www.smartcity-schweiz.ch/en/smart-city/>

"Smart City" characterises a city that

- systematically applies information and communication technology as well as technology conserving resources on its way to post-fossil society
- intends to become independent of fossil energy carriers on the long run





# Smart City - Definitions

<http://www.smartcity-schweiz.ch/en/smart-city/>

"Smart City" characterises a city that

- connects new technologies for infrastructure, buildings, mobility etc. to uses resources such as energy or water as efficiently as possible
- anticipates and realises future sustainable forms of mobility and the necessary infrastructure



# Smart City - Definitions

<http://www.smartcity-schweiz.ch/en/smart-city/>

"Smart City" characterises a city that

- forces integrated (city) planning processes, e.g., for energy planning
- creates the spaces for innovation and the testing of new ideas (cleantech)



# Smart City - Definitions

<http://www.smartcity-schweiz.ch/en/smart-city/>

"Smart City" characterises a city that

- installs management systems ("Good Governance") to enable optimised leadership in the different areas and - through a holistic controlling - for developments to be reported in a measurable and verifiable manner
- provides the appropriate personal and financial resources
- The integration and interconnection of these areas is the characteristic of a smart city with the aim of realising the potential for ecologic and social improvements.



# Discover Our IoT Kits

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-  Smart Water
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Libelium-SensorInsight Air Quality  
Index Solution Kit



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Solution Kit

# Smart City - Definitions

For the giants of the technology industry, smart cities are fixes for the dumb designs of the last century to prepare them for the challenges of the next, a new industrial revolution to deal with the unintended consequences of the first one. Congestion, global warming, declining health—all can simply be computed away behind the scenes. Sensors, software, digital networks, and remote controls will automate the things we now operate manually. Where there is now waste, there will be efficiency. Where there is volatility and risk, there will be predictions and early warnings. Where there is crime and insecurity, there will be watchful eyes. Where you now stand in line, you will instead access government services online. The information technology revolution of the nineteenth century made it possible to govern industrial cities as their population swelled into the millions. This revolution hopes to wrest control over cities of previously unthinkable size—ten, twenty, fifty, or even one hundred million people.

From: **Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia** (Englisch) Gebundene Ausgabe - 5. November 2013 von [Anthony M. Townsend \(Autor\)](#)

## DIGITALISIERUNG

# Wie intelligent darf die Stadt der Zukunft sein?

Deutsche Stadtverantwortliche haben häufig ganz andere Ideen, was gut für ihre Stadt ist, als die großen Tech-Kongressen mit ihren glitschen Smart-City-Konzepten. Forscher suchen Lösungen für Europa. Ihre erste Erkenntnis: Projekte sollen von unten wachsen.

von Eva Wolfangel



©: iStockphoto

Was für eine Utopie: Sensoren registrieren jede Aktivität der Bürger. Kanäle haben alle im Blick, die sich in einer Stadt bewegen, die gesamte öffentliche Infrastruktur ist mit dem Internet verbunden. Stadtbürgerlektüren beschreiben aus all diesen Daten den effizientesten Ablauf des Lebens: welchen Verkehrsmittelnehmer auf welcher Route am schnellsten zum Ziel kommt, welche Mülleimer geleert werden müssen, auf welchen öffentlichen Toiletten das Klopapier aufgefüllt werden und in welchen Gebäuden die Klimaanlage wie viel kühlen muss und welche Janitoren wann heruntergefahren werden. Die Stadtbürger treffen keine irrationalen Entscheidungen mehr, Computer bestimmen schließlich, was das Beste für die Gesellschaft ist – und setzen es auch gleich um. Pragmatismus statt Volkswirtschaft. Und der Stadtbürger muss sich um nichts mehr selbst kümmern, er hat wieder Zeit für das Wesentliche im Leben.





It's rush hour in the city. People make their way home after a hard day's work. Driverless cars pass by as cyclists steam along purpose-built lanes, safe from motorised traffic and unpredictable pedestrians.

Of course architecture, infrastructure and planning are important. But at the heart of all cities are communities and people. If the urban future needs to be sustainable, it needs to work much more closely with its inhabitants.

One of the proponents of this personalised approach to planning is Neil Leach, professor of architecture at the University of Southern California (USC). He believes there is a greater need to understand how our brains are affected by spaces, light and noise, for example, and apply this to architecture so that buildings can understand what inhabitants are thinking.

As the city awakens in the evening, indoor sensors adjust the ambient temperature and turn lights on; televisions, radios and even lifts are operated with a gesture from an armchair.

Outside, sensors monitor atmospheric irritants, ready to alert those at risk should dangerous levels be reached. A computer planning the city's waste collection receives data about foul-smelling and full bins. Traffic systems constantly check and adjust, ensuring jams and accidents are a thing of the past. Unbeknown to its citizens, every function of the city is silently optimised to make life simple and efficient.

## Employees Safety - PSI Reading



Noor Faizah - Bintie Othman  
Donnerstag, 24. September 2015 16:46  
An: SEC Global

Dear All

HR had been monitoring the PSI level and at this moment it is in the hazardous level at 314 (psi 3 hrs reading).

It comes to our attention on the safety of our employees and if it continues to worsen please take extra measure to limit your outdoor activities.

For those who are feeling unwell tomorrow you may work from home but please do update HR of your absence from the office.

There are still masks available and you may collect from HR if you need it.

Take care everyone and thank you.

Best regards

Faizah

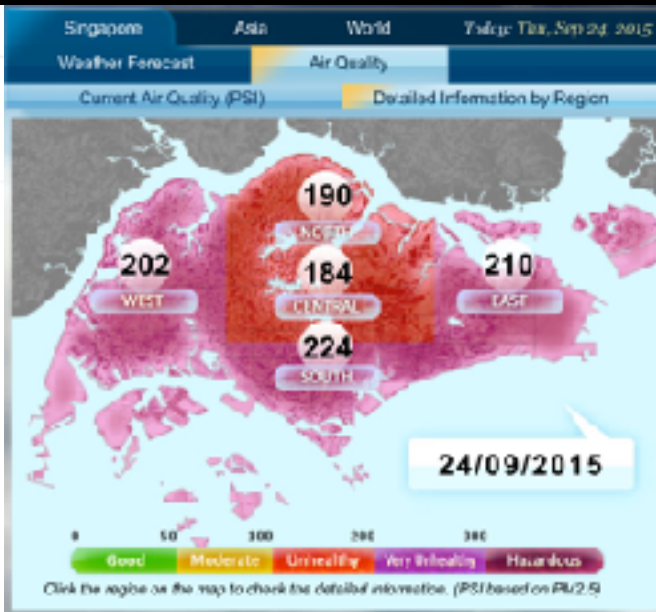


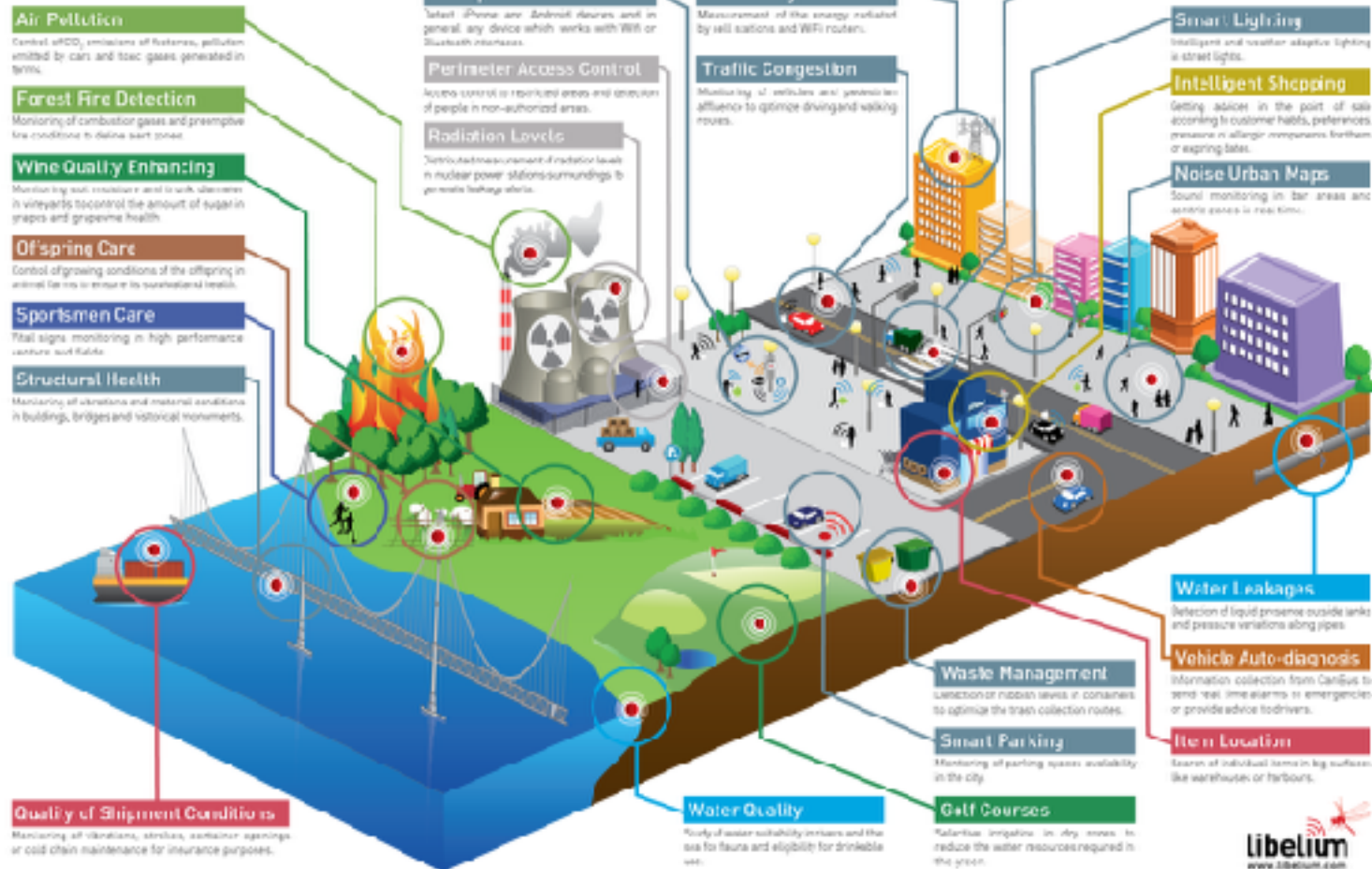




Photo: S1



# Libelium Smart World



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COMPULSORY EXERCISE 1	

## Is the mayor of your city ready to turn your city into a smart city?

Discussion started 7 days ago by [Isabelle](#)

I believe and hope that cities will be able to receive incentives from the government for the technological development added to the growth of a city. I have observed the expectation that cities will be intelligent, but I believe that it is necessary to understand these purposes and leaders. Besides the commitment to the development not only of the city but also of the population, there have to be other considerations. Will they consider the development work? Will the population be prepared to choose a ruler who assumes the responsibility of this commitment? This is why I insist on the preparation of the users of the city, so that they defend their common purposes to obtain an evolved city. I understand the resources that we have to develop a project of intervening actions in favor of the city, but before these resources are there, updated and adequate governmental laws for the context of the evolution of the city to the intelligent city? Because I believe that all the governmental organs need to work together, with a necessary organization that prepares the government for such changes, which makes everything much more complex, but with possibilities of evolution as already we have physical examples during the history of a city intelligent.

Related to: [Week 2 / Week 2 Review/Question](#)  
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3 responses

[Mike\\_Vicks\\_Mike](#)

7 days ago

very good question the mayor and Congress talk the talk but I really want to walk the walk

I'm a very good question. I think it depends on the reality of each country. In some countries political leaders are more concerned with environmental issues, although when the subject is of political interest, there have been interest for the governments. Or it might be that when our society puts a lot of resources in environmental issues, it is taken into account that a change is necessary in the way we live.

provided by [govint.org](#)

[Add a Comment](#)

[InêsWWW](#)

2 days 11 hours ago

In my opinion the Mayor of my city can't understand this process. It's need a good mind and the decision after that will take dependent on a government approach not on personal one and that is doesn't happened in my city government.

[Add a Comment](#)

Show 1 posts	by most votes
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 design to favor the social encounter I put all the residents around the bl...	40
 Houses around the roads. My idea is to bring the houses close...	10

## Week 2 Exercise

discussion posted about 21 hours ago by [EM\\_5](#)

I don't know if this was the intention of the exercise, but I quickly realised that without meaningful information - demographics of the residents, traffic conditions of the adjacent roads, the residents' daily activities and schedules based on cultural norms, climatic patterns etc. - any geometrical urban move on the part of the designer (me) was mostly based on my own imagination and preconceived ideas of what life in Cape Town is like. I felt like a preschooler playing lego and moving blocks at my own whim. The best I could do was consider shadows based on cardinal directions, configuring houses into clusters with shared open spaces for recreation and communal activities, while providing pedestrian access way between these open spaces to connect one community cluster to the other.

Related to: [Week 2 / Week 2 - Compulsory Exercise](#)

This post is visible to everyone

[Add a Response](#)

0 responses

[GerhardSchmitt](#)

less than 1 month ago

Thank you for the comment. Without any further information, this is indeed how one would feel like. Therefore, in the description of the exercise, we have included a link to a video by Urban Think Tank UTT <http://utt.com/project/empower-shack/> that explains the background. It should point to some of the "other meaningful information - demographics of the residents, traffic conditions of the adjacent roads, the residents' daily activities and schedules based on cultural norms, climatic patterns" you rightfully request as design brief.

# Summary

- Smart rooms, smart homes and smart buildings are building blocks of smart cities
- Scaling up from smart rooms to smart territories is not an additive or linear process, as the complexity of interaction between parts increases exponentially
- To understand the functioning, the opportunities and threats of the smart city, we must focus on the goals, the interactions and the components of Smart Cities