

Smart Cities: considerations and innovation challenges in a multidisciplinary vision

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IDI
Smart
Cities



IHC Virtual Day
CUDI Mexico
May 23th 2018

Agenda

- Smart Cities definition
- Stake holders & roles
- Roadmap + PMP experiences
- Models of Smartification
- Local Innovation Ecosystem
- Design Challenges & Processes
- Concluding remarks



Smart Cities: Concepts and Challenges

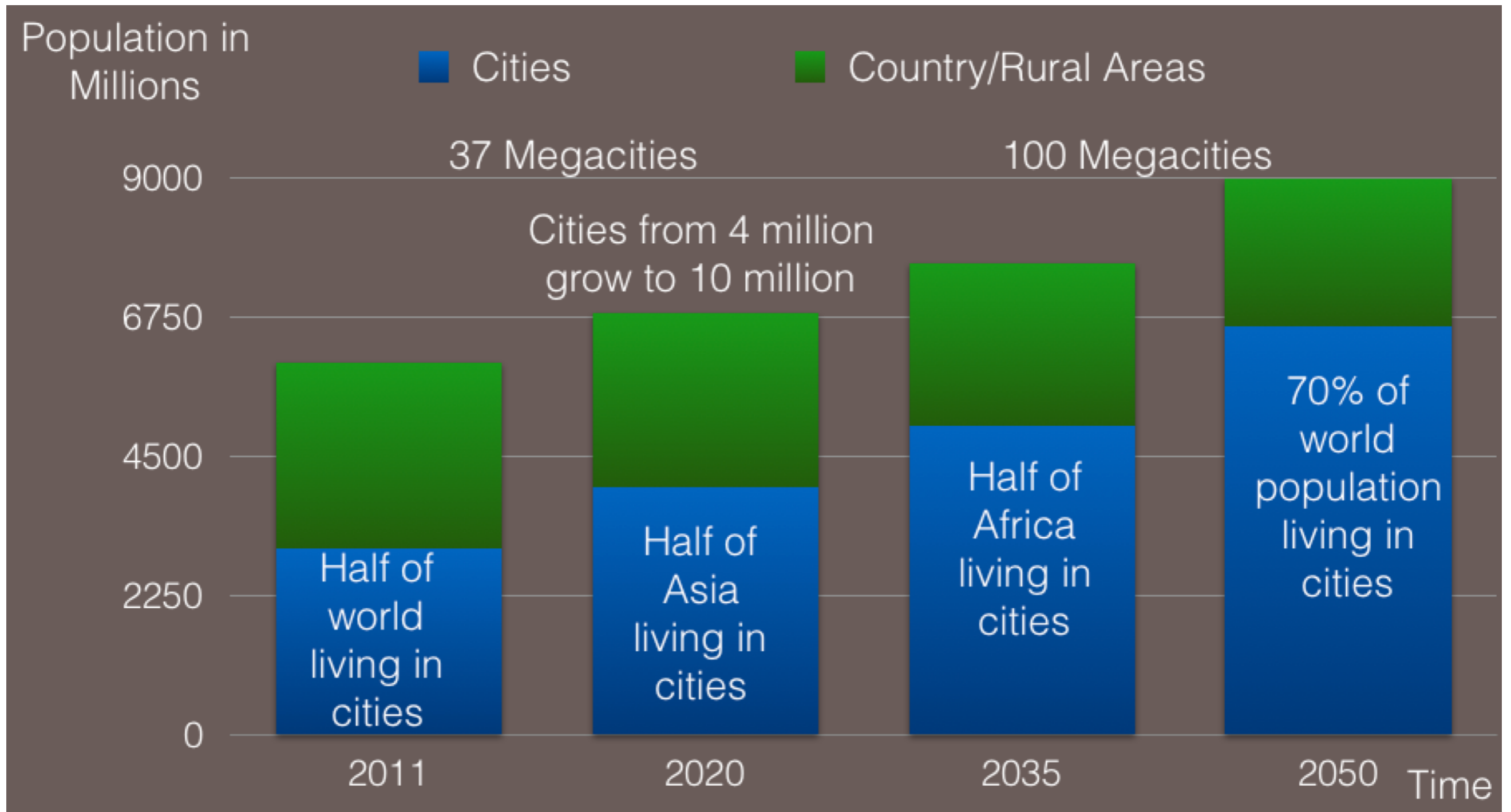
Smart Cities Definition



An aerial photograph of a city at dusk. The sky is a mix of blue and orange, indicating the sun has just set. The city is densely packed with buildings, many of which are illuminated with lights. A prominent tower with a spire is visible in the distance. The text "Urban Challenge" is overlaid in the center of the image in a white, sans-serif font.

Urban Challenge

Urbanization Trends



[UNWorldPopulation09]

Mexico challenges in sustainability

Mexican Cities Sustainability Challenges

Accelerated Urban Development

127.7 Millions of Mexicans in 2016

78% of Mexicans live in cities since 2012

Since 2013

Vertical development in cities growth

Energy

92% of energy is based in fossil technologies

Water

Most cities have an old sewage system

In some cities 50% of water is lost (GDL)

No separate systems for

Grey waters

Black waters

Air Quality

Guadalajara City had the 1st Record of air pollution in 2013

Industry and transport have a strong impact in most cities

Lack of regulations

Garbage

1Kg per day per citizen

CDMx 19,981 Tons/day

GDL 4,600 Tons/day

MTY 4,082 Tons/day

Main Solutions

Smart buildings

Multimodal mobility

Sensors

Programs

Source: INEGI 20

IT as innovation factor



Artificial Intelligence



Autonomous Vehicles



Big Data &
Cloud Computing



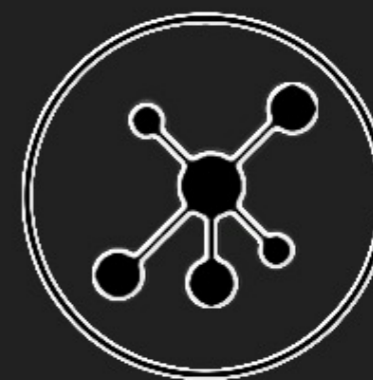
Advanced
manufacture
& 3D printing



Internet of Things &
Connected devices



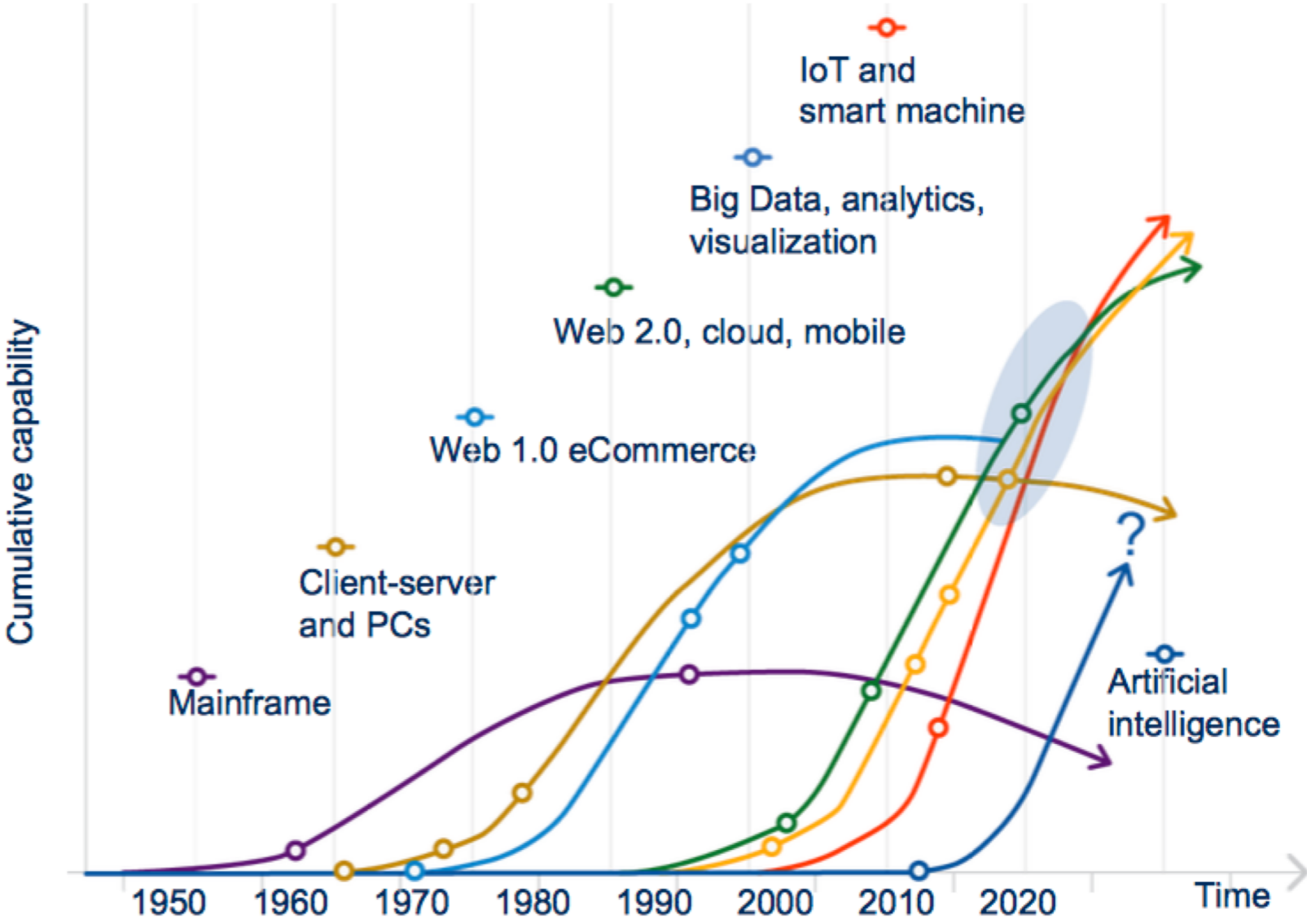
Robots & Drones



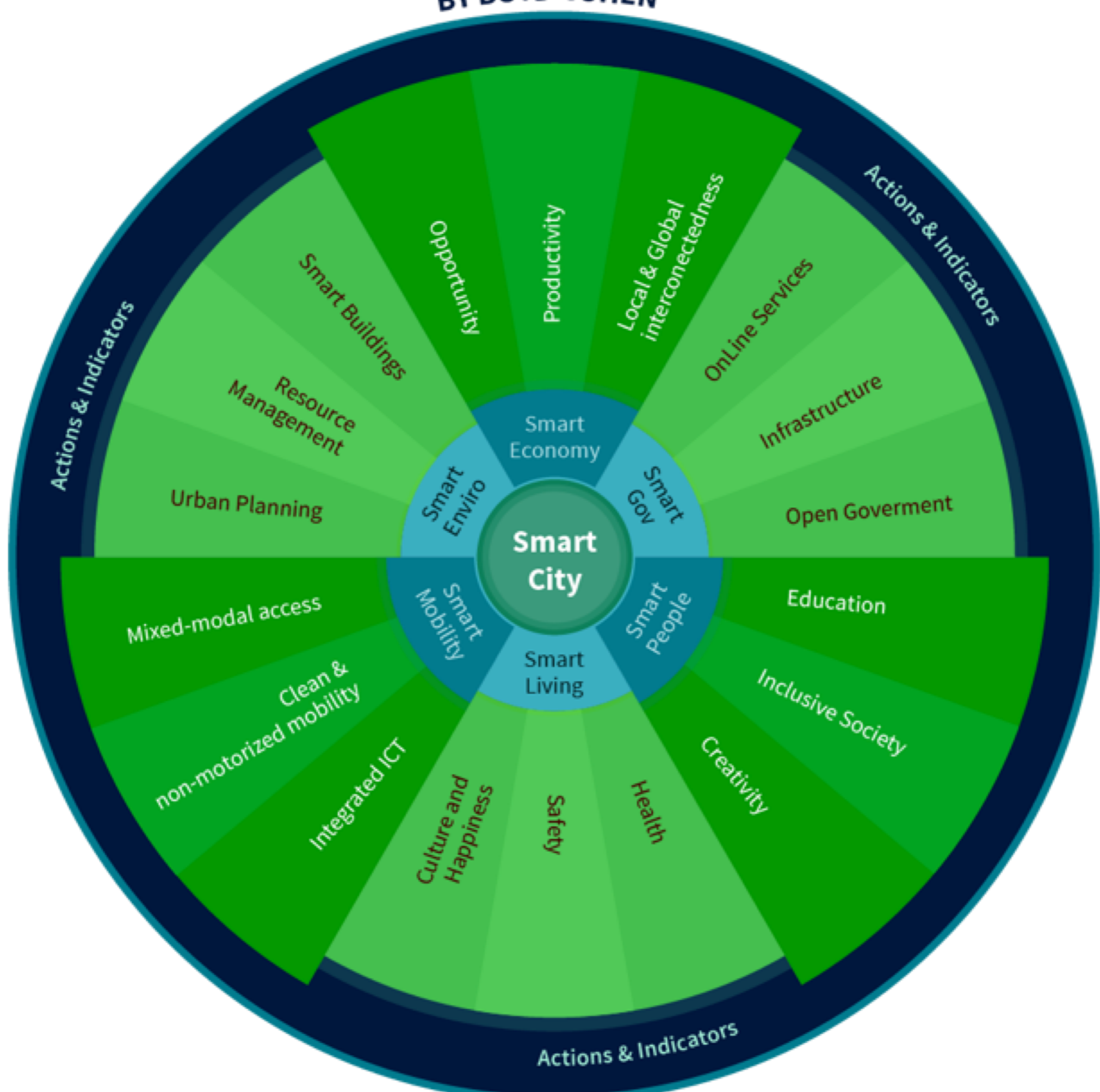
Social networks &
platforms

Technology evolution

Lower cost in advanced technologies is part of the digital revolution



Source: World Economic Forum/Accenture analysis




“A city may be called **Smart** when investments in human and social capital and traditional (transport) and modern (**ICT**) communication infrastructure fuel **sustainable** economic growth and a high **quality of life**, with a wise management of **natural resources**, through **participatory** government”

– [Caragliu:09], [Harrison:11], [Schaffers:2011kt]

A complex network diagram with various colored nodes (red, green, blue, orange, grey) and connecting lines, representing a network structure. The diagram is centered on a dark grey horizontal band.

Smart Cities: Concepts and Challenges

Stake Holders & Roles



Smart City is an integrated ecosystem

- Government
- Industry
- Academia
- Citizens

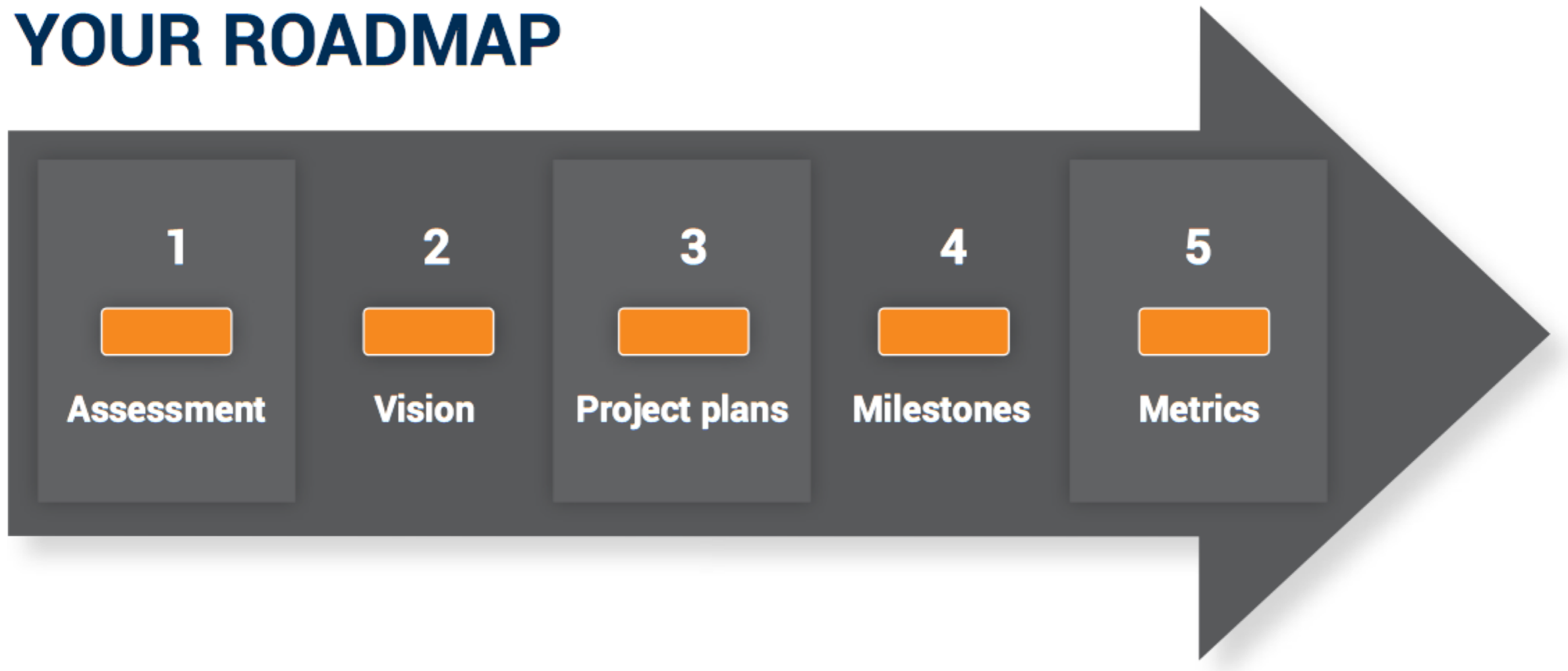
A complex network diagram with various colored nodes (red, green, blue, orange, grey) and connecting lines, representing a smart city network. The diagram is centered on a dark grey horizontal band.

Smart Cities: Concepts and Challenges

Roadmap

Smart City is a long term project

YOUR ROADMAP



[Council:2013wm]

PHASES OF A CITY IN THE ESCI

CORE OF THE METHODOLOGY
Development of the Action Plan | 1 year



PRE-INVESTMENT AND MONITORING
Action Plan Execution | 3 years

IADB

[Bouskela:2016db]

4

5



PRE-
INVESTMENT

MONITORING

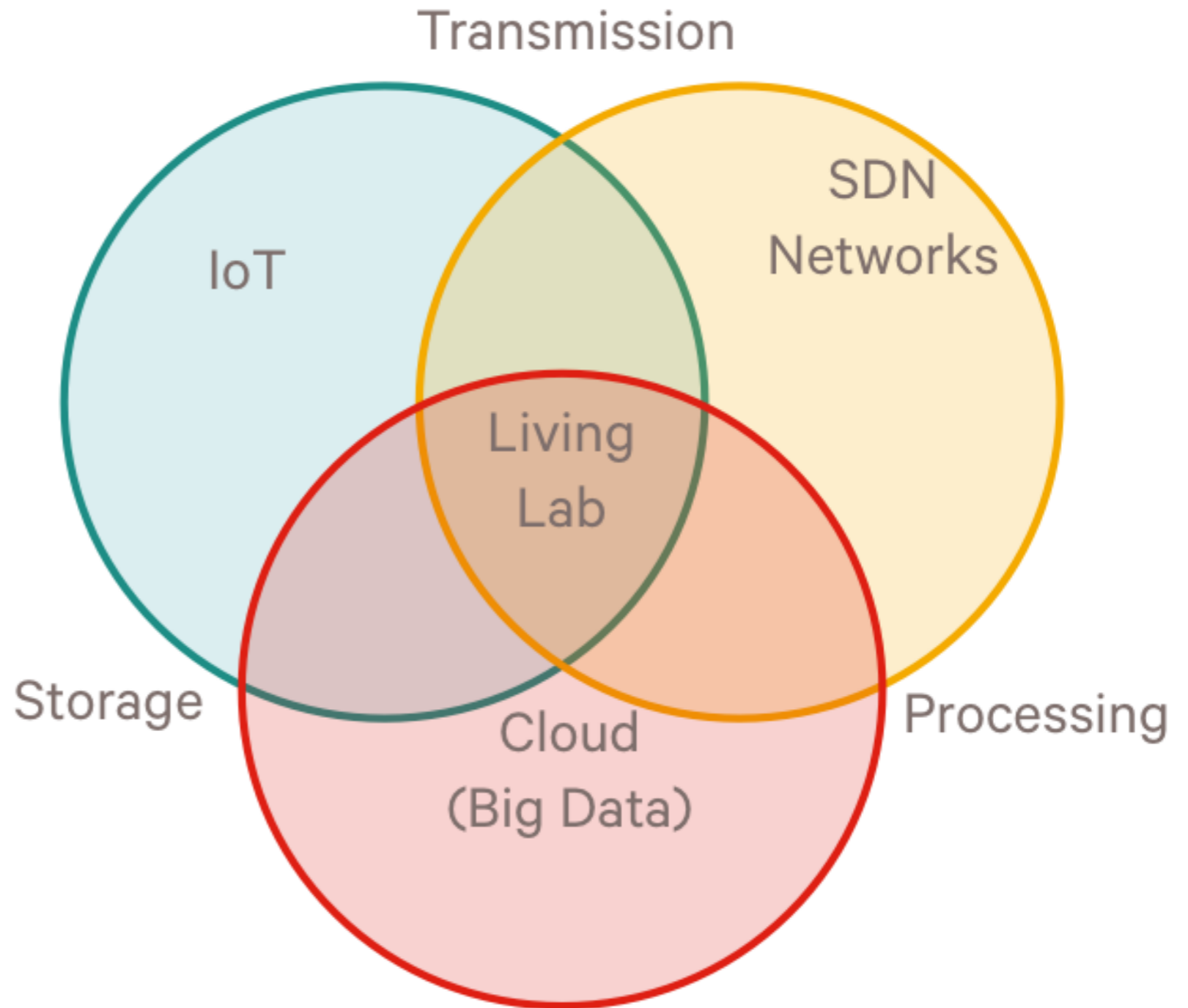
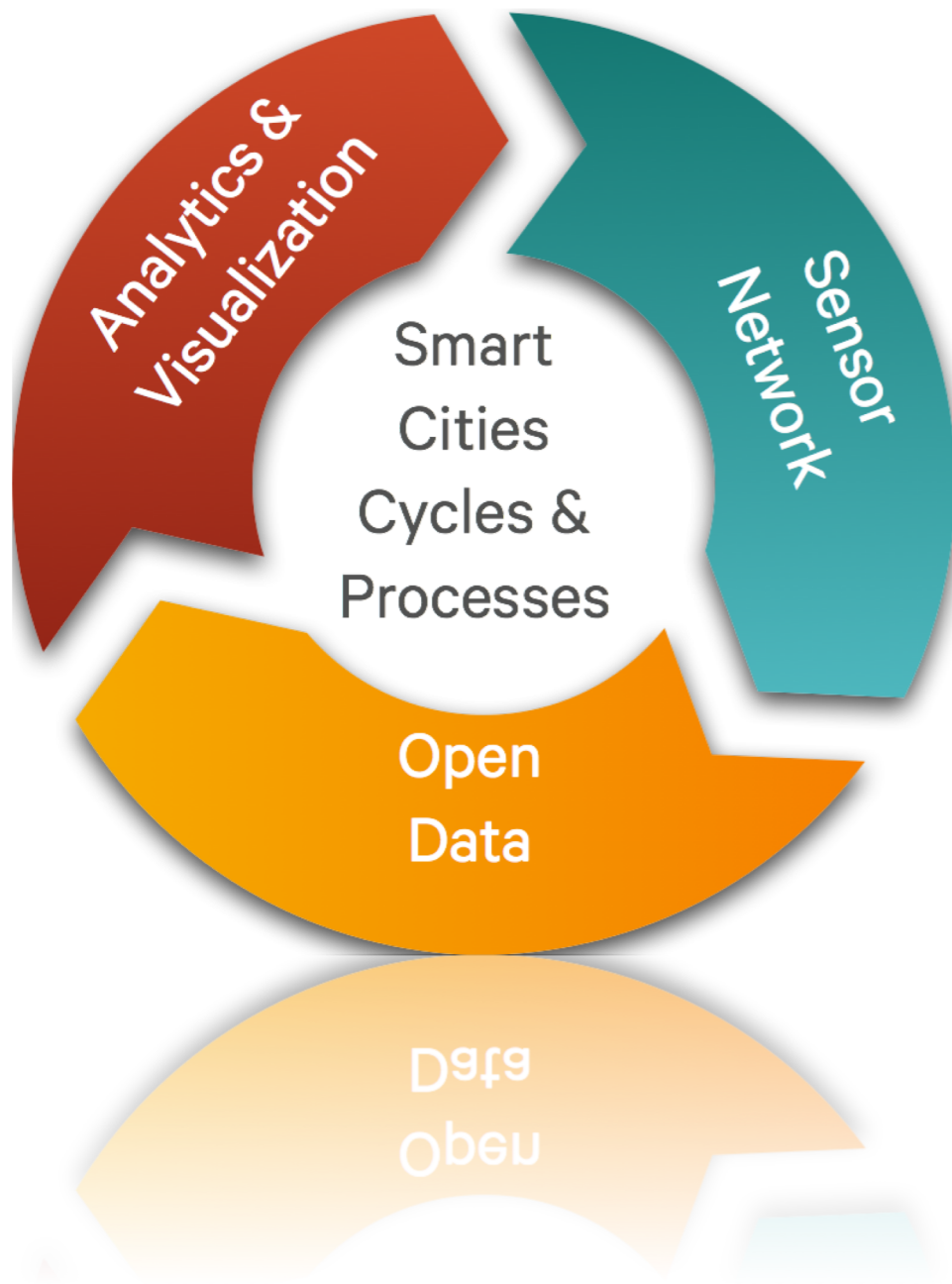
INVESTMENT





Smart City is about a
master plan and a roadmap

Smart Cities technological enablers



IADB Technology Model



4



Communication interfaces (services, web portal, mobile applications) to send and receive information from people and companies associated with Open Data platforms and e-government that favor participatory management and the transparency of the public structure;

3



Integrated operation and control centers equipped with computers and software applications that receive, process, and analyze the data sent by the sensors, provide monitoring and display panels, manage devices remotely, and distribute information to departments, institutions, and the population;

2



Sensors and connected devices that capture different signs from the environment and send them through the networks to computers in the control and management centers of the cities, covering different thematic areas such as traffic, safety/security, assistance to the population, emergency situations, and natural disaster alerts;

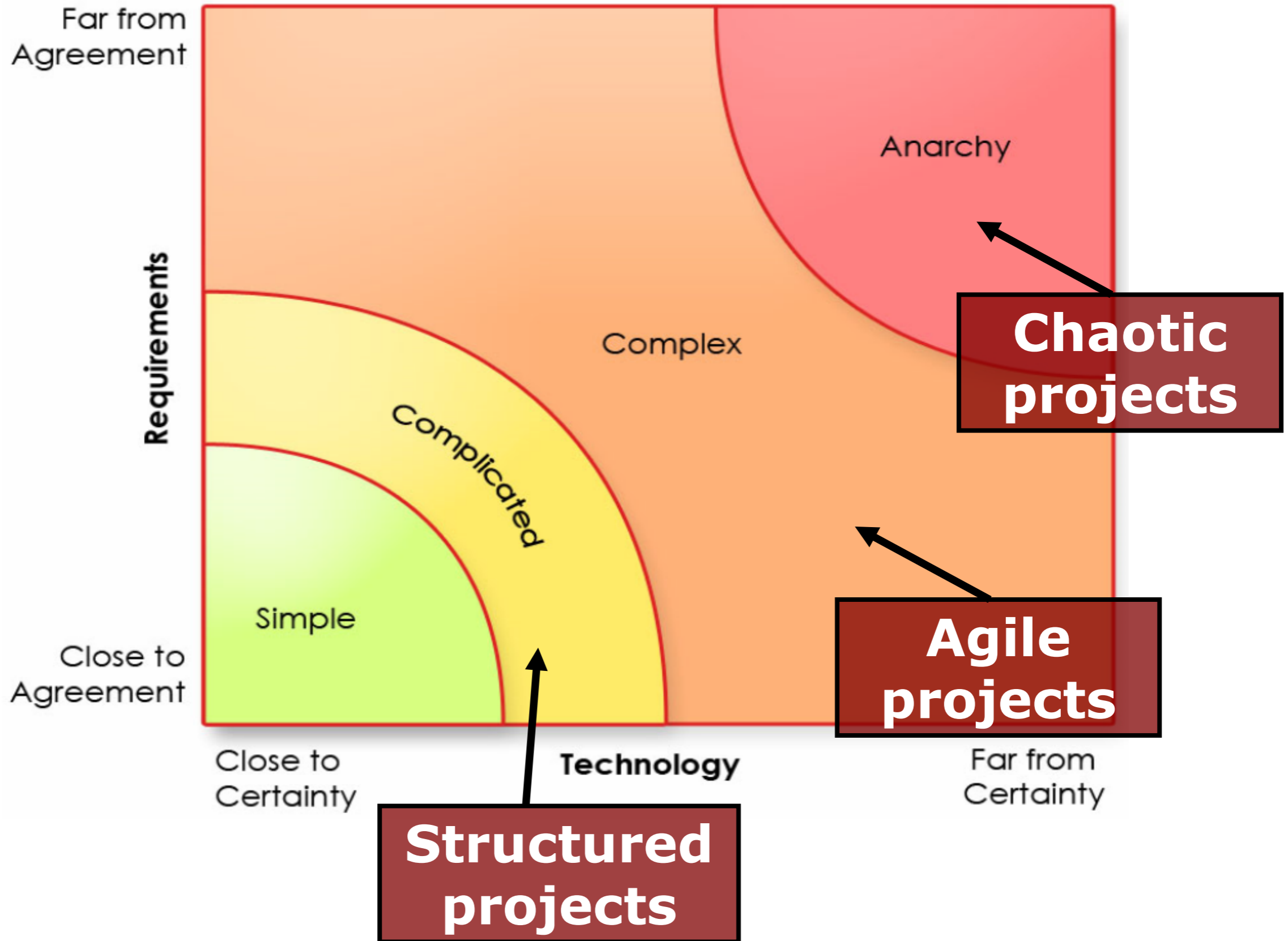
1



Connectivity infrastructure: broadband Internet networks (fixed and/or mobile) to send and receive data.

[Bouskela:2016db]

The Spectrum of Process Complexity



A complex network diagram with various colored nodes (red, blue, green, orange, grey) and connecting lines, representing a smart city network. The diagram is centered on a dark grey horizontal band.

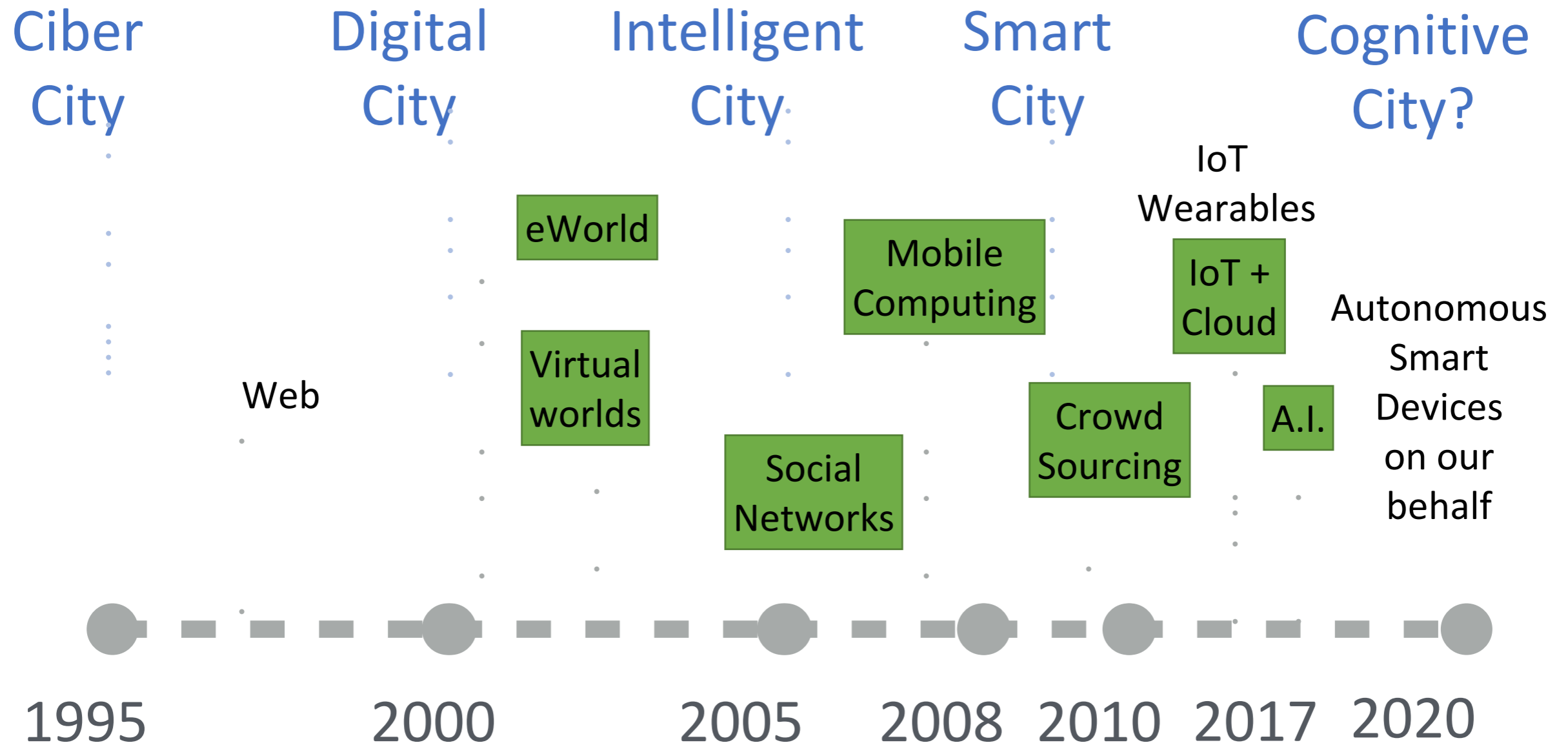
Smart Cities: Concepts and Challenges

Models to develop Smart Cities



Real world Vs Digital

Cities Evolutionary time line



Emergent models

Panopticon

Control is centralized
Ex. Rio De Janeiro



Civic Hackers

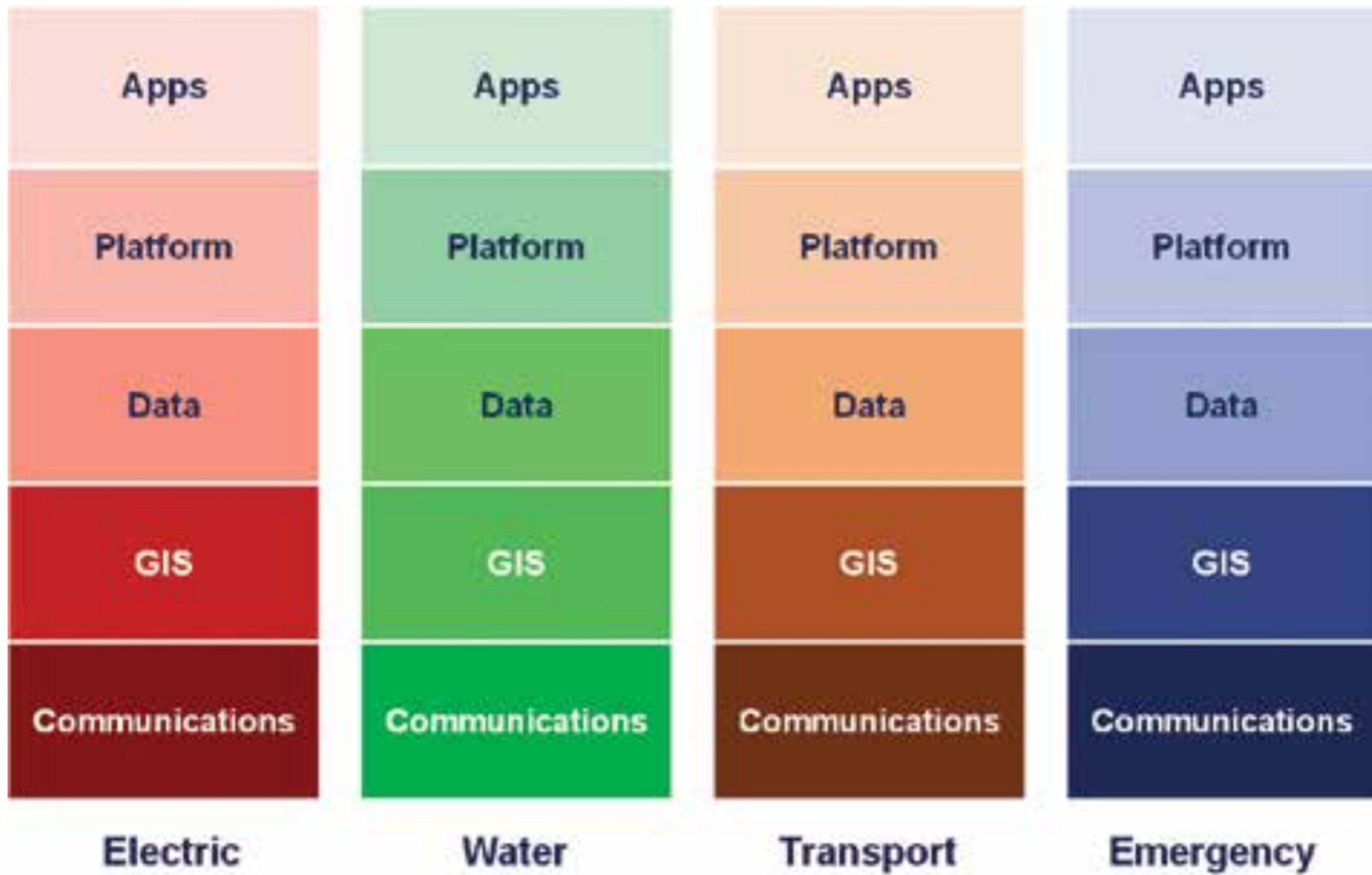
Citizens participate in solutions, produce open data and improve services
Ex. Madrid



Collaborative

Government & citizens as stakeholders
Ex. Amsterdam

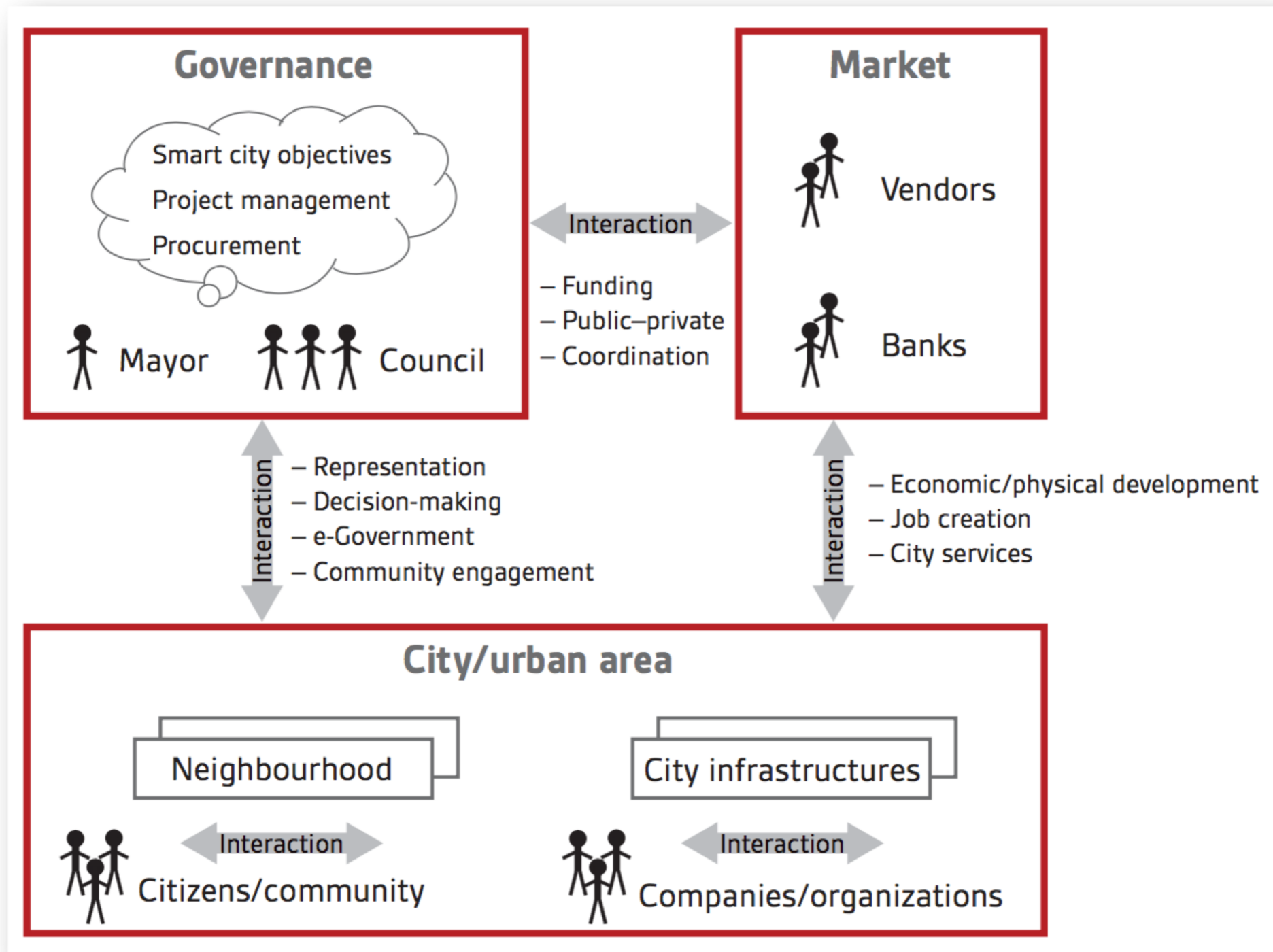






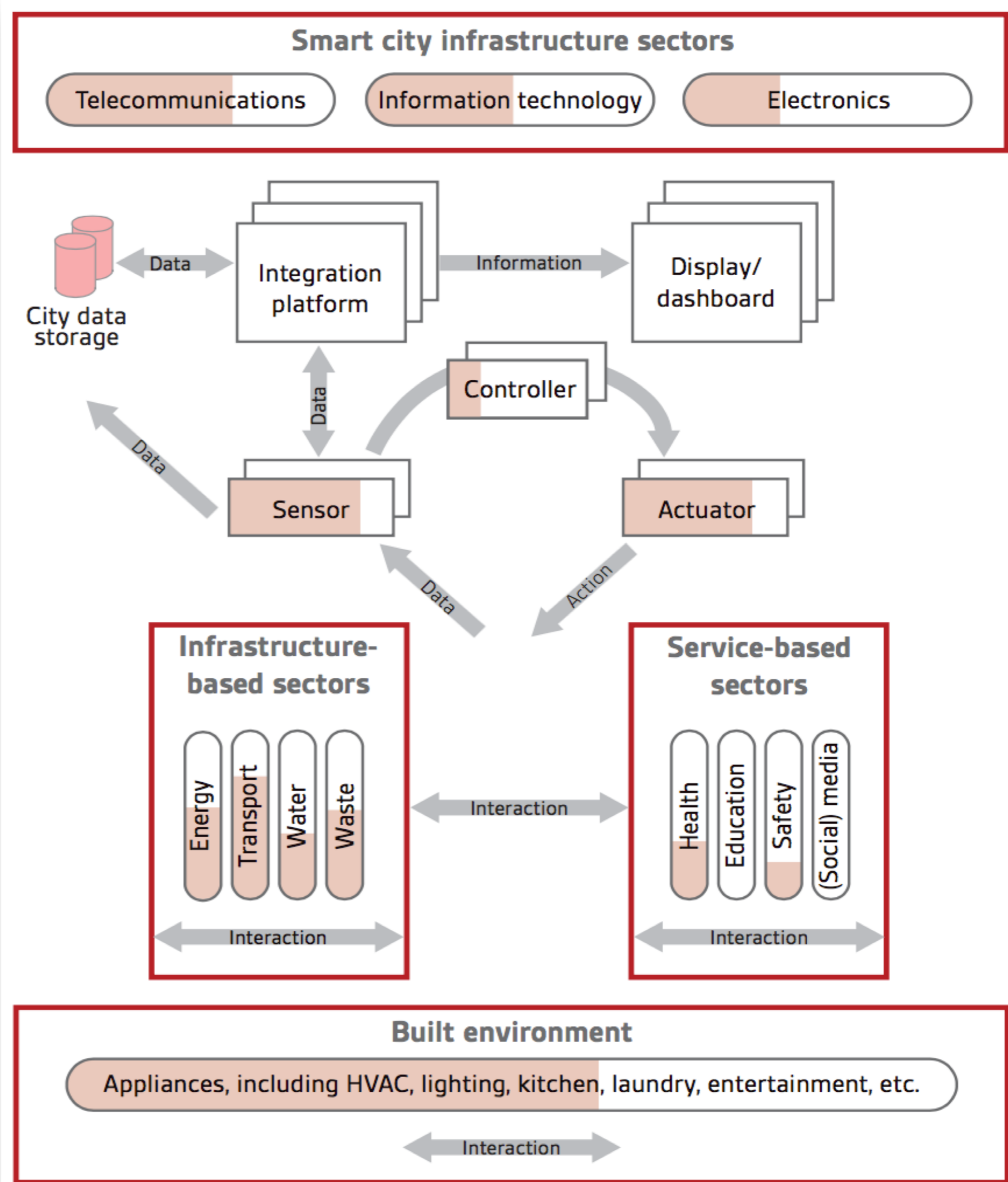
Smart City Metrics = Holistic vision

BSI Smart City I



[BSI:2015]

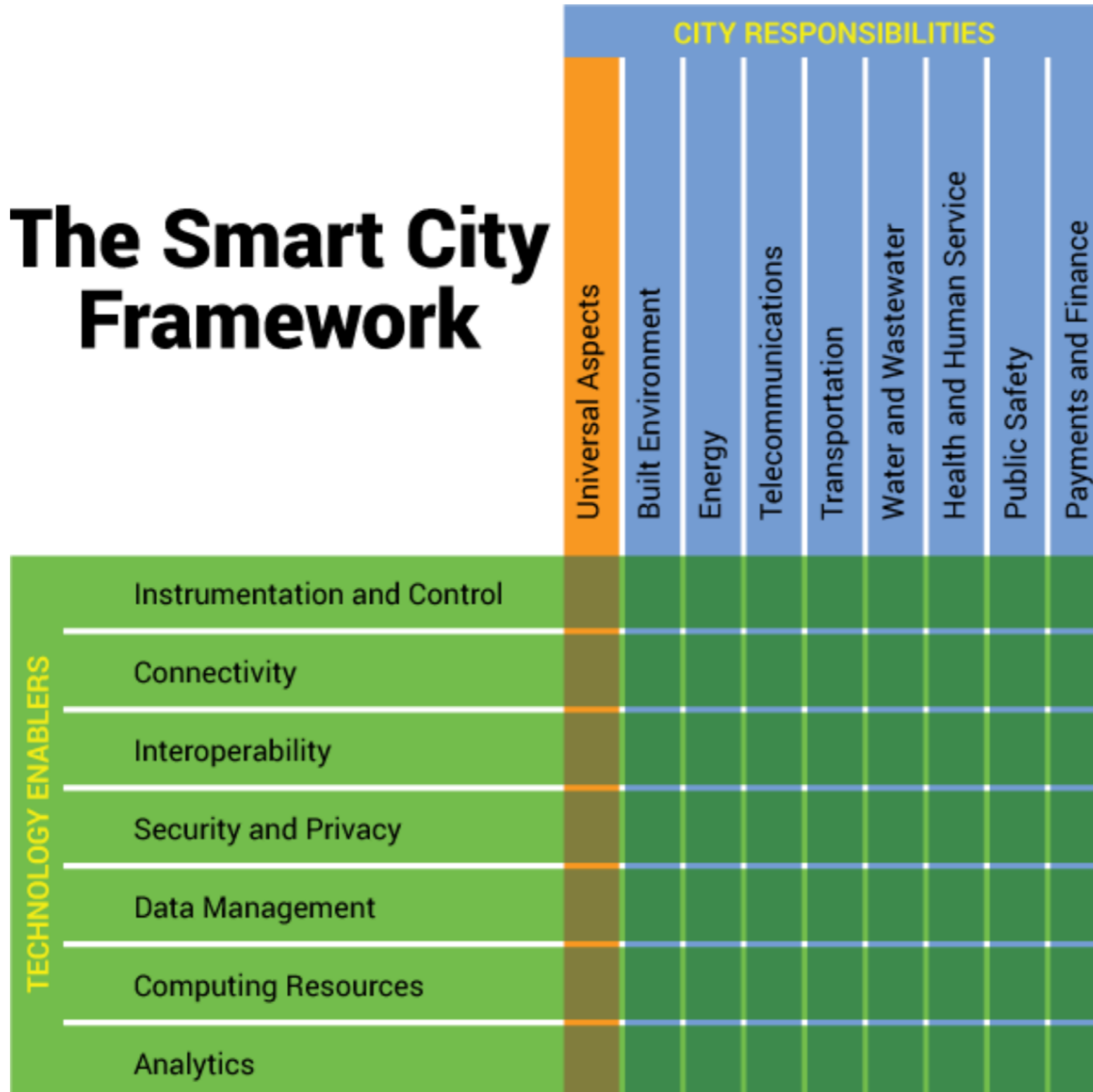
BSI Smart City III



BSI:2015

Smart Cities Council

The Smart City Framework



[Council:2013wm]

A complex network diagram with various colored nodes (red, blue, green, orange, grey) and connecting lines, representing a network or system. The diagram is centered on a dark grey horizontal band that contains the text.

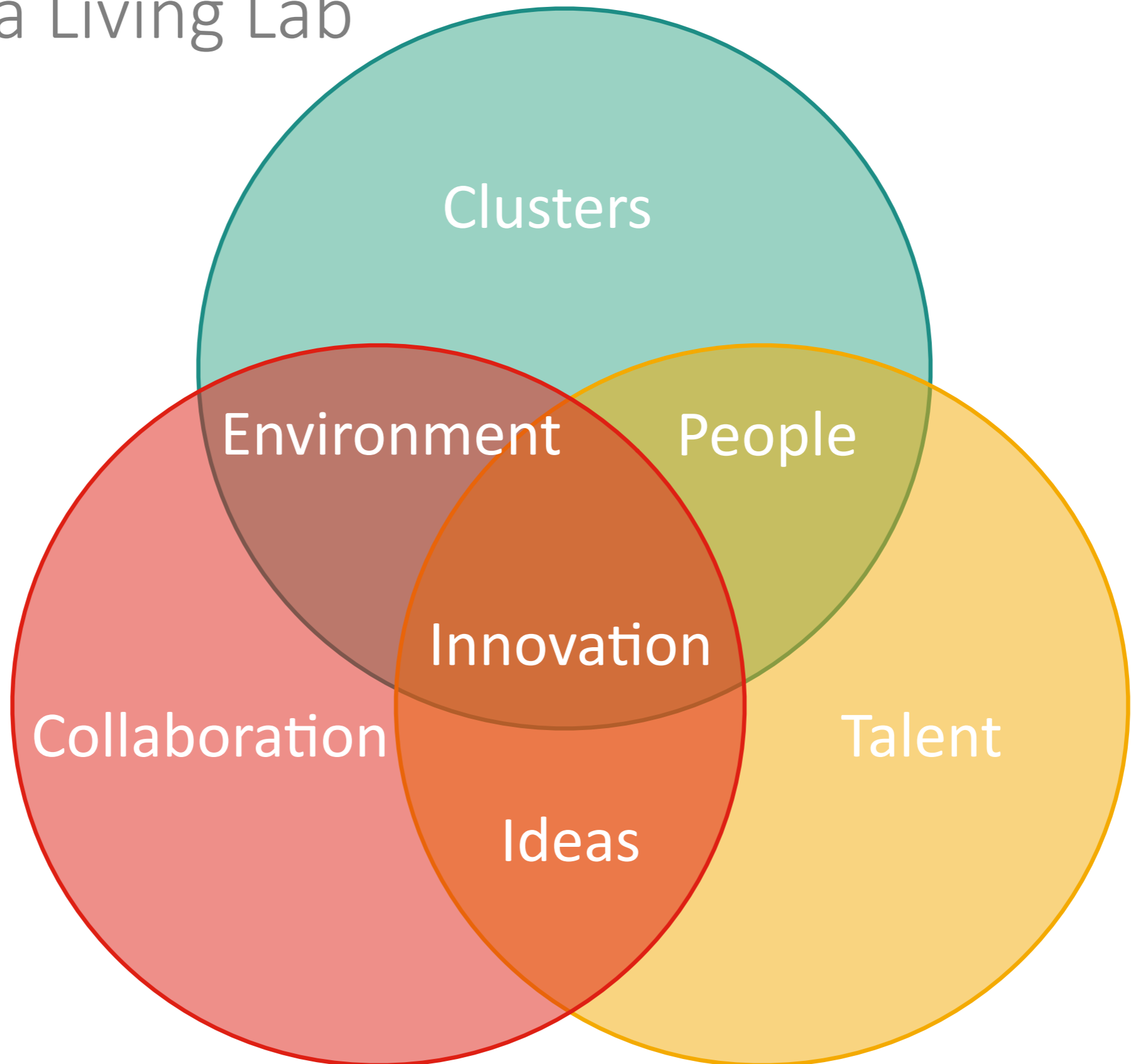
Smart Cities: Concepts and Challenges

Local Innovation on Living Labs

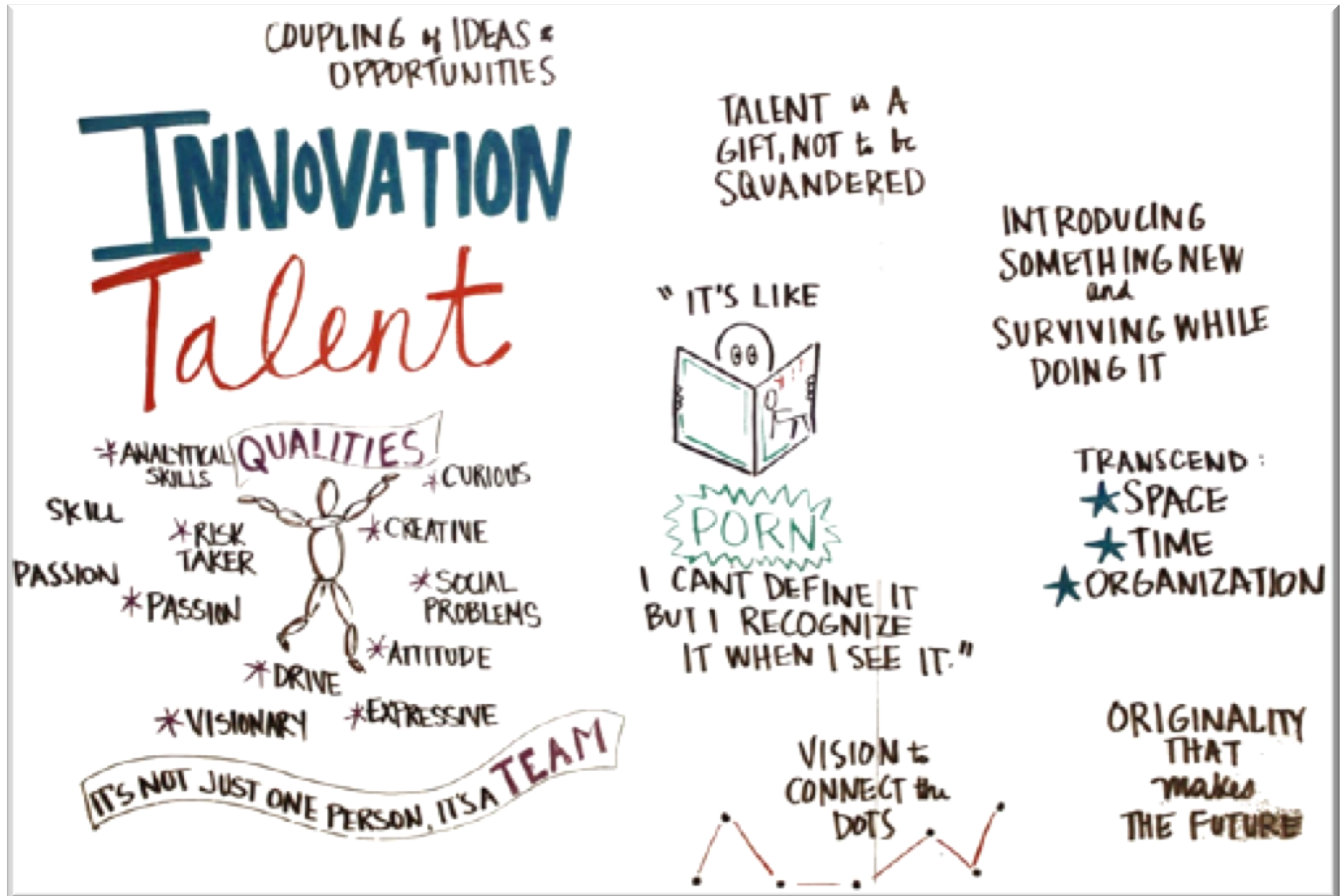
A black and white photograph of a hand holding a glowing lightbulb. The lightbulb is the central focus, with its filament clearly visible and emitting a bright light. The hand is positioned in the foreground, with fingers spread, holding the bulb. The background is dark, making the lightbulb stand out. The overall mood is one of inspiration and innovation.

Living Labs Embrace innovation

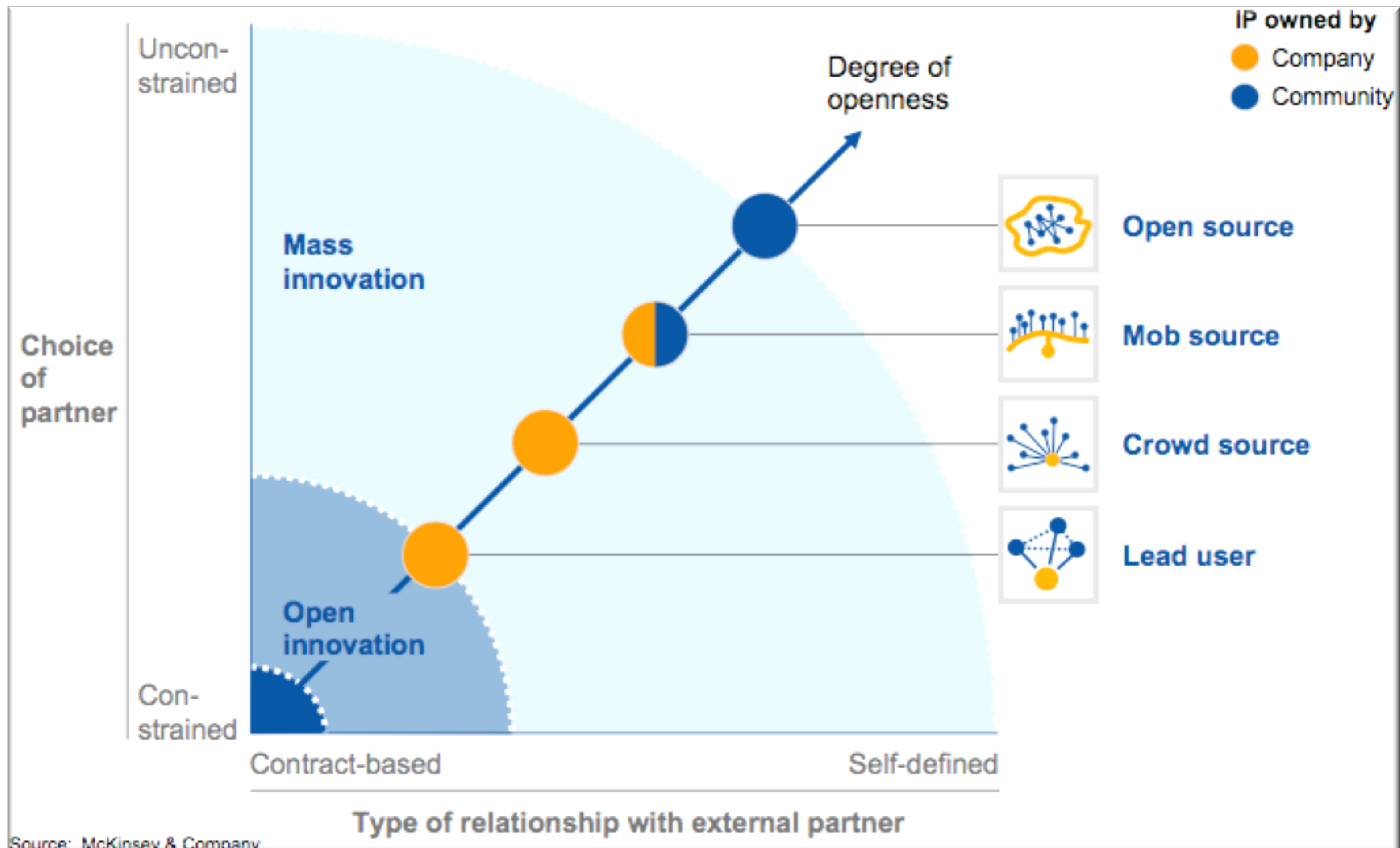
Elements of Innovation requiring a Living Lab



Local talent is an asset to boost with Living Labs



Collaboration models for Living Labs



Source: McKinsey & Company
 Source: McKinsey & Company

Type of relationship with external partner

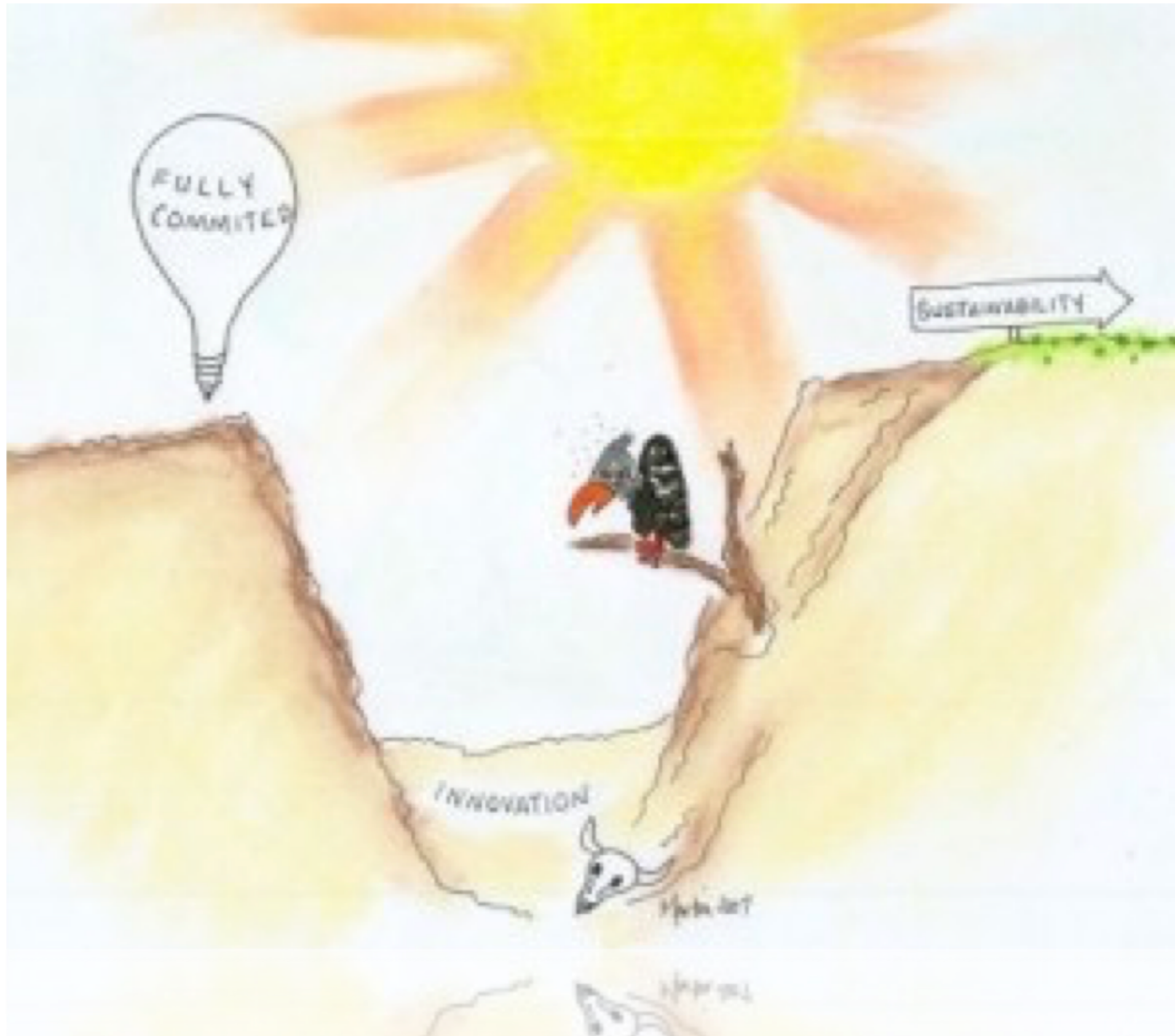
Contract-based

Self-defined

Unconstrained

Constrained

The Valley of Death in Smart City developments and Living Labs projects

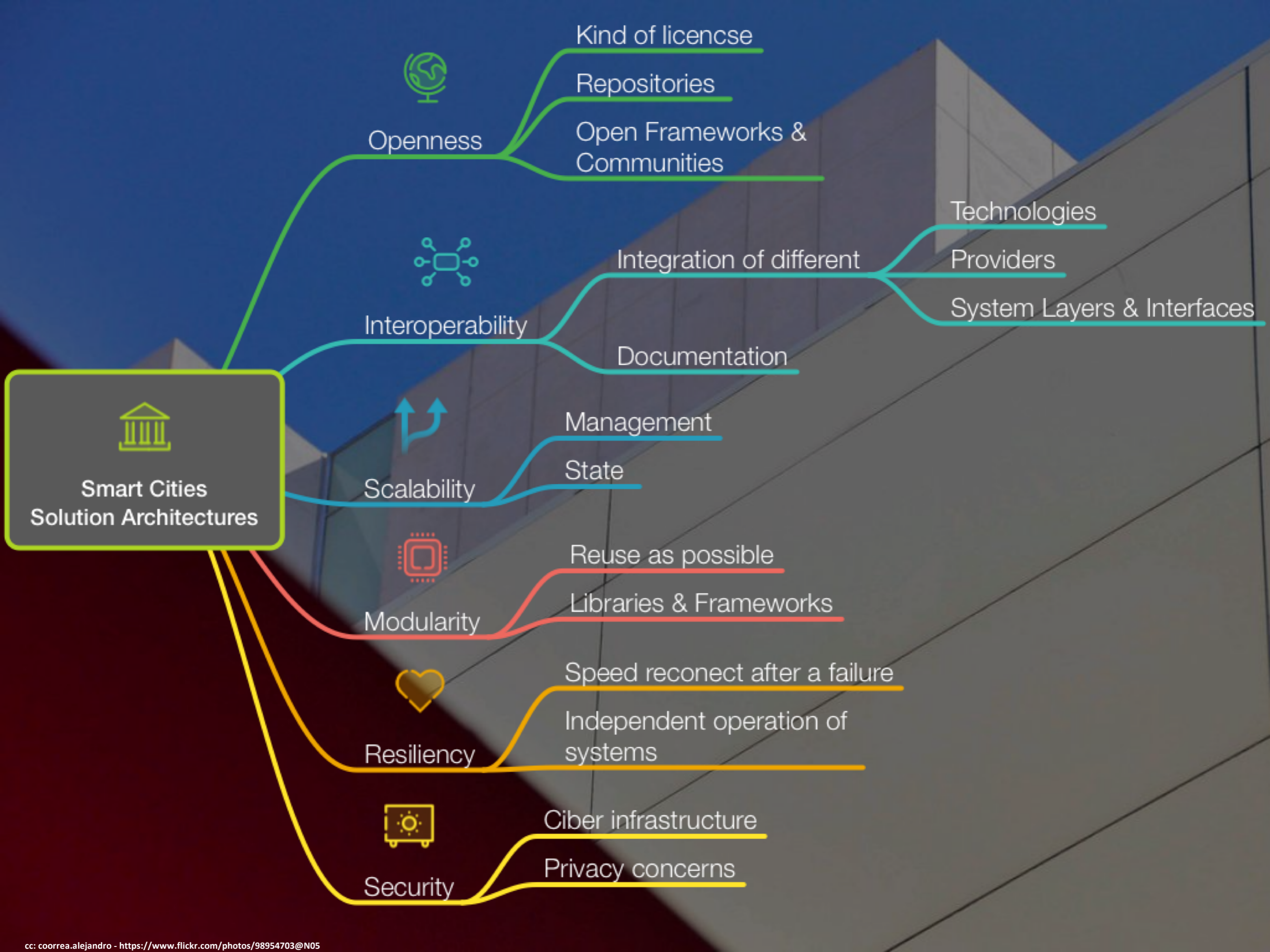




Smart Cities: Concepts and Challenges

Design Considerations in Living Labs





**Smart Cities
Solution Architectures**

Openness
Kind of licence
Repositories
Open Frameworks & Communities

Interoperability
Integration of different
Documentation
Technologies
Providers
System Layers & Interfaces

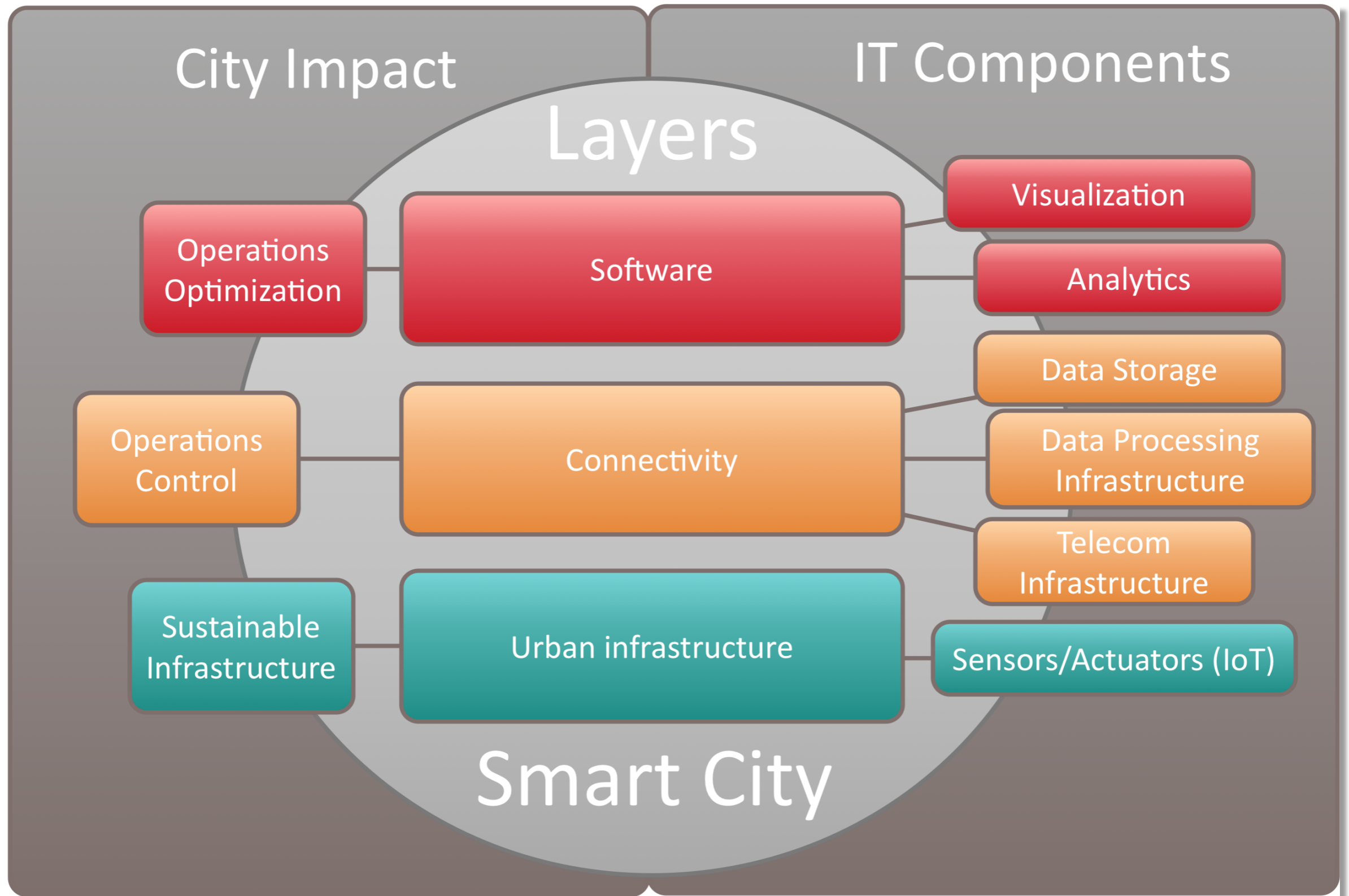
Scalability
Management
State

Modularity
Reuse as possible
Libraries & Frameworks

Resiliency
Speed reconect after a failure
Independent operation of systems

Security
Ciber infrastructure
Privacy concerns

Interoperability example for projects in Living Labs



Working layers





Looking to share knowledge by real experience building a Smart City

A world map with a hatched texture, showing the outlines of continents. Four orange location pins are placed on the map, each with a label: Guadalajara (North America), Kansas (North America), Casablanca (Africa), Trento (Europe), and Wuxi (Asia).

Guadalajara

Kansas

Casablanca

Trento

Wuxi

Guadalajara 1st IEEE Smart City Initiative Pilot in 2013

Twitter: @IEEESmartCities
<http://smartcities.ieee.org>

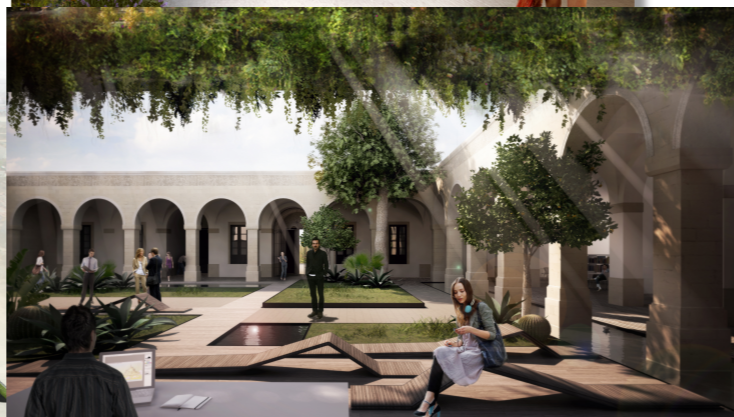
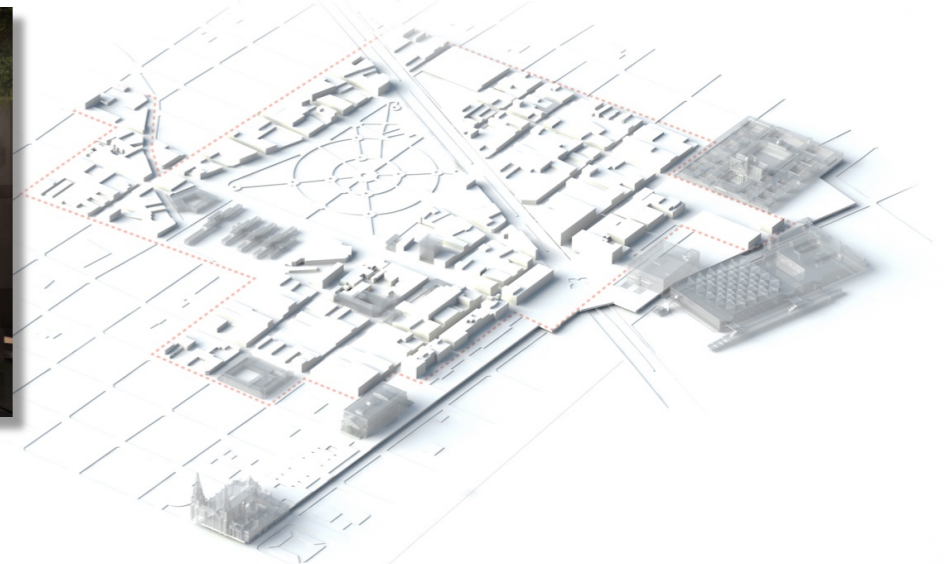
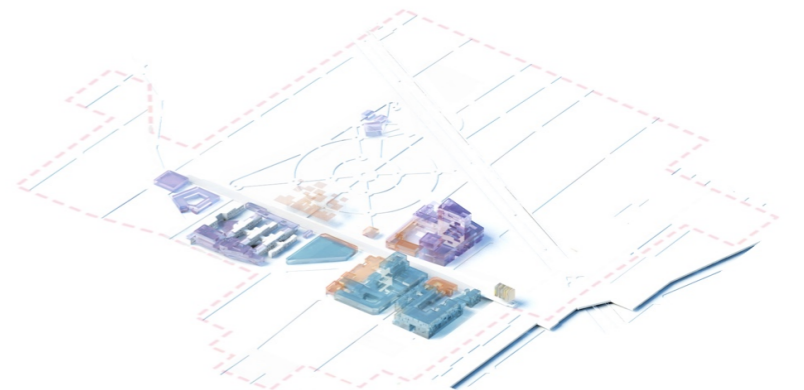
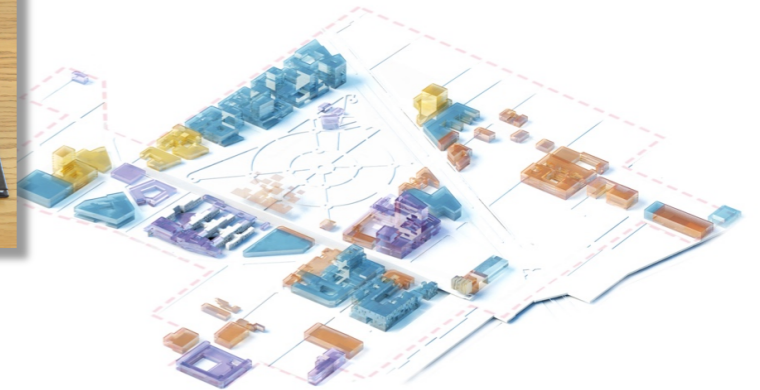
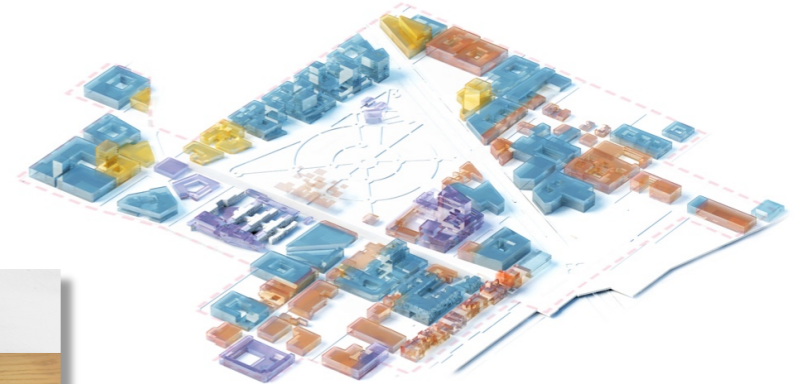


Smart Cities: Concepts and Challenges

UDG Smart Cities Innovation Center



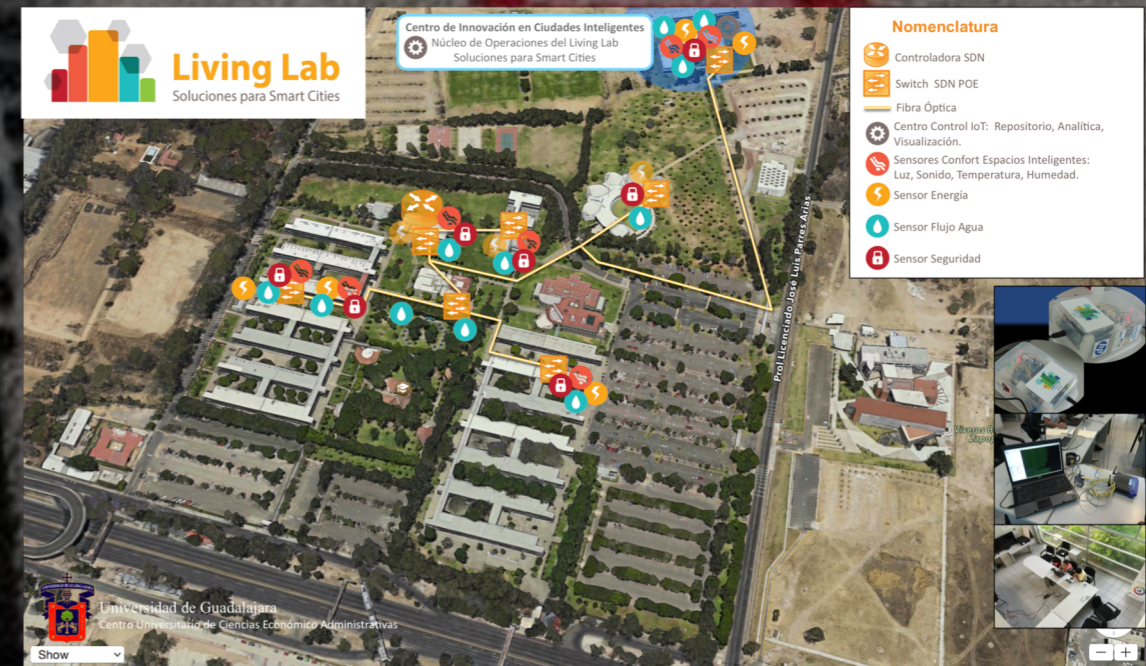
GDL Digital Hub @ CCD + UDG Smart Cities Living Lab



It's not about ideas

UDG Actions

- UDG Smart Cities Innovation Center
- Infrastructure for Smart Cities (Living Lab)



its about making them happen!

"Hmmm Idea" cc licensed (BY NC SA) flickr photo by Xurxo Martínez/



Smart Cities
Innovation Center

Working topics in
a multidisciplinary
approach



Metrics for Smart Cities



Data Visualization

Video Wall

Mobile Apps

Augmented Reality

Serious Games



Analytics & Big Data



Open Data management



IoT

Sensors

Actuators

Architectures

Interoperability

Scalability

Resiliency

Protocols



Infrastructure

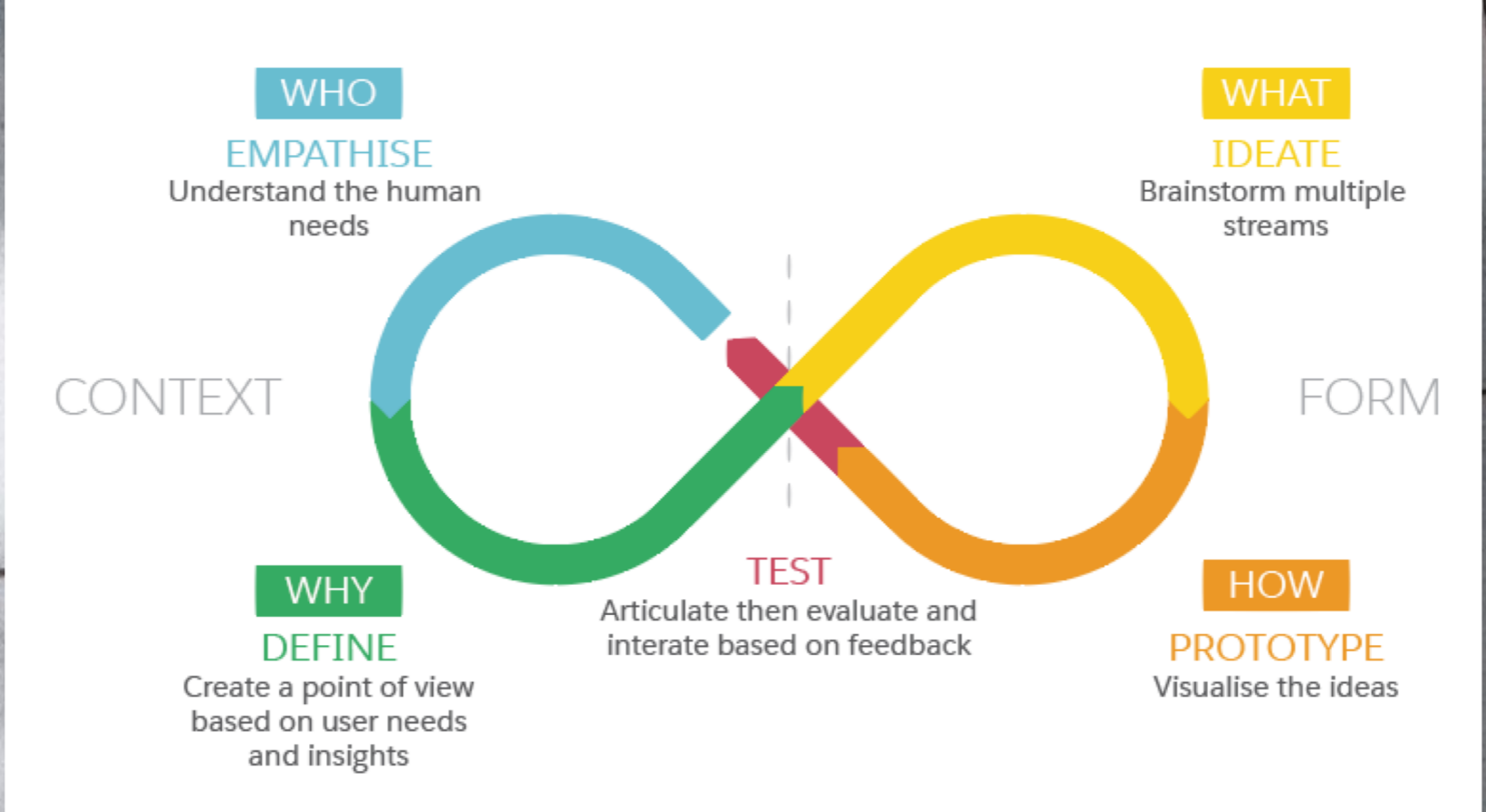
Cloud Technologies

SDN Networks

A photograph showing a group of people's hands, palms up, holding a large, glowing red heart shape. The hands are arranged in a circle, and the heart is formed by the fingers and palms of the hands in the center. The background is dark, making the red heart stand out prominently.

GDL Quadruple Helix Model

Government + Academia + Industry + Citizens



PASSION LED US HERE

Design Thinking + Scrum Agile
Methodology



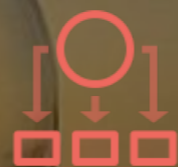
Better management for Decision Making



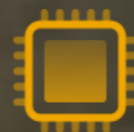
Push Open Data models for Government and City



Education in Smart Cities



Empower multidisciplinary approach



Prepare infrastructure with open architectures for

Interoperability

Scalability

Resiliency

Security

Open questions for Sustainability in Mexico

A complex network diagram with various colored nodes (red, blue, green, orange, grey) and connecting lines, representing a smart city network. The diagram is centered on a dark grey horizontal band.

Smart Cities: Concepts and Challenges

Concluding remarks



Smart City =
Quality of life



IT is the vehicle of innovation

Concluding Remarks & Wrap-Up

- Smart City definition focused in people
- Stakeholders and roles related to Living Labs
- Roadmap & PM to feed Living Lab
- Local innovation is boosted in Living Labs
- Think about solution architectures
- Design Thinking for quick wins
- Living Lab is a continuous process to evolve

Thank you!

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References

- [BSI:2015] BSI British Standards *Smart city Framework. Guide to establishing strategies for smart cities and communities.* (n.d.). *Smart city Framework. Guide to establishing strategies for smart cities and communities.* London: BSI British Standards.
- [Council:2013wm] Council, S. C. (2013). *Smart Cities Readiness Guide.* (J. Berst & L. Enbysk, Eds.). Retrieved from <http://smartcitiescouncil.com/resources/smart-cities-readiness-guide>
- [ISO:2013us] Lazarte, M. (Ed.). (2013, January). *ISO Focus+*, 4(1), 1–53. Retrieved from www.iso.org/isofocus+
- [ISO/IEC JTC1:2014] ISO/IEC JTC 1. (2015, September 2). *ISO/IEC JTC 1.* Retrieved September 2, 2015, from
- [Bouskela:2016db] Bouskela, M., Casseb, M., Bassi, S., De Luca, C., & Facchina, M. (2016). *The Road toward Smart Cities: Migrating from Traditional City Management to the Smart City* (pp. 1–148). Inter-American Development Bank. Retrieved from <https://publications.iadb.org/handle/11319/7743>