

SOCIETAL automation

Systems of Systems Perspective for Smart Cities

Panel Discussion

Smart Cities

The Smart City paradigm remains largely **technology pushed**

Different efforts at city level do not create **adequate market development**

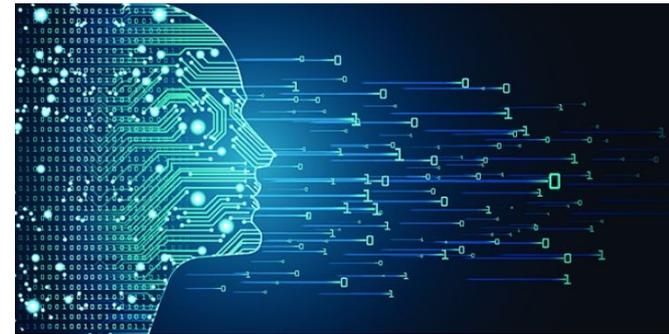
Question: Which solutions can **accelerate economic growth through disruptive innovation** while increasing **quality of lives of the citizens?**



Smart Cities

Digitalization

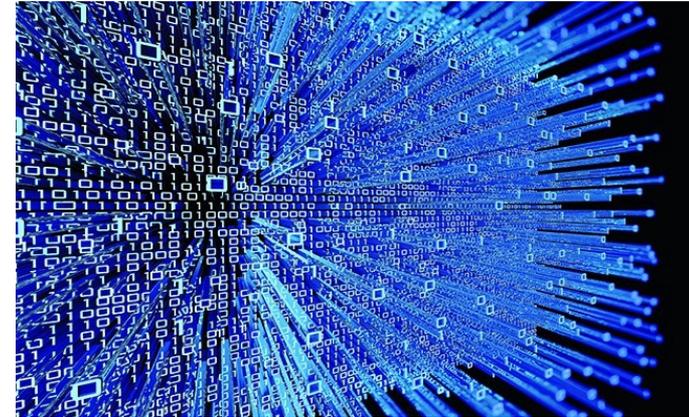
- Digitalization is an **influential driver**
- Digitalization is driven by **urban density**
- It enables managing **complexity** in cities: millions of vehicles, hundreds of thousands street lights, hundreds of public buildings, hundreds thousands of fees invoices
- Digitalization results in **inventing things** so as to improve every day life
- Digital cities could enable **technological and industrial transformation**
- Digitalization can turn cities into **innovation ecosystems**



Smart Cities

Data

- Represent the **raw material** for new solutions / applications / services
- **Reinvent processes** in cities
- Can be **business creators**
- Data fuels **digital solutions**
- Data Services actually **means** Smart Cities
- Data is collected from the real world through **IoT** architectures and from citizens / smart devices through **social networks** to be analyzed and feed **AI**



Smart Cities

- An “Industrial” Domain

- Different critical infrastructures
- Smart Devices + Control Automation Applications
- Examples
 - Building structural health
 - Waste management
 - Traffic management
 - City Energy consumption
 - Building automation
 - Smart Parking
 - Smart Lighting
 - Environmental Monitoring



ICS / CPS in Cities

Challenge to integrate IT with OT (PLCS, SCADA)

- Ever increasing capabilities of smart devices (sensors/actuators, embedded devices) than OT, enabling advanced applications & business models
- Different evolutionary paths: IT more open and interconnected that OT being in many cases managed independently by their owners, IT also more complex and vulnerable to failures and security threats
- The challenge is to **maintain OT stringent requirements** with adopting **IT higher capabilities**.



Smart Cities

- Frontier Technologies

◦ Sensing Technologies and IoT

- Global number of IoT devices in 2018 reached 7 billion, while global number of connected devices is estimated to 17 billion
- IoT application potential economic impact between 3.9 and 11.1 trillion USD per year in 2025 (McKinsley Global Institute)

◦ Artificial Intelligence and Cognitive Computing

- AI market is expected to reach USD 190.61 billion by 2025 up from USD 16.06 billion in 2017 (source www.marketsandmarkets.com)
- Global Cognitive Computing market is expected to grow from USD 9.85 billion in 2019 to USD 71 billion in 2025 (source www.marketwatch.com)

◦ Data Processing and Computation

- Global Big Data market is forecasted to grow to USD 103 billion by 2027 up from USD 42 billion in 2018
- Edge computing market is set to capture a compound annual growth rate of 27,3% between 2017 and 2023 reaching a valuation of USD 9.2 billion

Smart Cities

- Market Creators

- Governance : how to enhance the city innovation ecosystem
- Planning : how to integrate in a holistic way
- Skills : how to attract and retain talent
- Digitalization : data management, open business standards, right size of IT solutions
- Business model: involvement of public and private stakeholders
- Local engagement : citizen participation
- Urban resilience : Sustainable urban development
- Sustainable financing solutions : investment coming from multiple sources
- Emerging issues: security, privacy, innovation procurement, new business models

Smart Cities

- Open Data

- Cities has started investing opening up urban data and making them available to third parties
- Mostly **static** datasets and GIS information. Only recently open IoT datasets is emerging
- Different solutions / providers followed by different cities result to **legacy systems**. Opening up data from such systems requires integration effort (APIs, alignment of data formats, documentation)
- Integrated **urban data platforms** allow opening up data of new infrastructures resulting in avoiding vendor lock-in for cities, city lock-in for vendors
- **Breaking the silos** can encourage new IoT infrastructure investment, offering disruptive solutions. Encouraging co-creation and innovation
- **Future market mechanisms** for the data economy have to facilitate opening up data, as licensing model does not seem adequate enough