Smart City and Mobility

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Contents

I  Smart City

II  Smart Mobility
Smart City

- The definition of smart city varies greatly from country to country. In general, it is a platform for improving the quality of life for citizens, enhancing the sustainability of cities, and fostering new industries by utilizing the innovative technologies of the Fourth Industrial Revolution. (Korean Smart City Portal)

- A smart city is an urban area that uses different types of electronic methods and sensors to collect data. Insights gained from that data are used to manage assets, resources and services efficiently; in return, that data is used to improve the operations across the city. This includes data collected from citizens, devices, buildings and assets that is then processed and analyzed to monitor and manage traffic and transportation systems, power plants, utilities, water supply networks, waste, crime detection, information systems, schools, libraries, hospitals, and other community services.
Simply, smart city is a city to improve urban life quality with the help of enhanced ICT (Information and Communication Technology). So there might be no single definition.
Smart City

Three layers of “smartness”:

- Adoption and usage, often leading to better decisions and behavior change
- Smart applications and data analysis capabilities

The tech base includes networks of connected devices and sensors

Traditional infrastructure (physical and social)
Smart cities use data and technology to make better decisions. Smart applications in eight domains affect multiple aspects of the quality of life.
The result?

A more efficient, responsive, and sustainable city . . .

. . . that delivers better outcomes for the people who call it home

30–300 lives saved each year in a city of 5 million
30–40% fewer crime incidents
8–15% lower disease burden
15–30 minutes shaved off the daily commute
25–80 liters of water saved per person per day
20–35% faster emergency response times

McKinsey & Company: Smart Cities: Digital Solutions for a More Livable Future
Magok District in Seoul

- Future full smart service map
# Sejong smart city

## Values of the Sejong National Pilot Smart City

<table>
<thead>
<tr>
<th>Human-centered and People-oriented City</th>
<th>A Decentralized City that Respects Sharing, Fairness, and Diversity</th>
<th>A City that Realizes the Convergence of Services based on Smart Technologies</th>
</tr>
</thead>
</table>

### A City where All of These Improve Resident Happiness

<table>
<thead>
<tr>
<th><strong>Post-materialism</strong></th>
<th><strong>Decentralization</strong></th>
<th><strong>Smart Technology</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifestyle, Work-life Balance, Human-centered + Eco-friendly</td>
<td>Sharing, Openness, Dispersion, Respect for Diversity, Resident Participation</td>
<td>Data-driven Artificial Intelligence Blockchain, Creative Innovation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Mobility</strong></th>
<th><strong>Healthcare</strong></th>
<th><strong>Education and Jobs</strong></th>
<th><strong>Energy and the Environment</strong></th>
<th><strong>Governance</strong></th>
<th><strong>Culture and Shopping</strong></th>
<th><strong>Living and Safety</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Gradually reducing the number of cars down to the 1/3 the normal level while maintaining economic sustainability and convenience.</td>
<td>Response (treatment) preemptively (prevention) and quickly (emergency) to emergency situations through a medical network environment.</td>
<td>Promote critical and creative thinking and provide education for start-ups and employment.</td>
<td>Demonstrate a participatory climate change neutral city through urban new renewable energy and e-mobility.</td>
<td>Encourage residents to solve urban issues directly and experiment with basic income using a local currency.</td>
<td>Provide various cultural experiences and a convenient shopping environment through personalized forecasting services.</td>
<td>Monitor abnormal signs through an artificial intelligence-based living safety system and respond promptly.</td>
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</tbody>
</table>
### Sejong smart city

- **Smart City Scheme**

<table>
<thead>
<tr>
<th>Urban Design</th>
<th>Architectural Design (Design Competition)</th>
<th>Urban Public Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Twin</td>
<td>Collaboration Space</td>
<td>Service Linked Integration Function and Linked Standard Data / Protocol</td>
</tr>
<tr>
<td>Standard Platform in Connection with Service Data</td>
<td>Urban Sustainable Simulation</td>
<td>Management of Linked Integrated Data and Common Function Management (Connection to Payment, etc.)</td>
</tr>
</tbody>
</table>

#### Innovative Service

- **Mobility**
  - Integrated Network of Cars
  - Quick Arrival to the Scene for Urgency
  - Smart Home Doctor
- **Healthcare**
- **Education and Jobs**
- **Energy and Environment**
- **Governance**
- **Culture and Shopping**
- **Living and Safety**

#### Basic Service

- **Traffic**
  - Traffic Control / Traffic Information / Smart Road / Smart Signal / Smart Crosswalk
- **Safety and Security**
  - Public Safety Structure using CPTED and Response to Emergency, Earthquake, Disaster, and Fire
- **Urban Facilities**
  - Urban Infrastructure Management / Underground Facilities Management / Road Facilities Management

#### Blockchain Platform

- Creation and Circulation (Payment) of a Local Currency and Rewards (Incentives)

#### Smart Contract Management

- Start-up Incubation
  - Innovation Gym
  - Training for Start-up Support
  - Allocation of Walking Space
- Monitoring & Operation
  - Urban Monitoring
  - Event Handling
  - Operation of Urban Infrastructure

#### Urban Integrated Data AI Center

- Data Lake (Big Data)
- Data Collection
- Data Store
- Data Map
- Data Management
- Artificial Intelligence Analysis
  - Artificial Intelligence Analysis Platform
  - Artificial Intelligence Analysis Work Space
  - Artificial Intelligence Learning Program
- Start-up Incubation
  - Innovation Gym
  - Training for Start-up Support
  - Allocation of Walking Space

#### Data Infrastructure

- Basic Infrastructure
- Wired/Wireless Network
- IoT (Sensor) Network
- IoT Platform

#### Urban Planning (Statutory)

- Basic Conception Plan
- Development Plan (Land Utilization Plan)
- Implementation Plan (District Unit Plan)
Smart City

- *Smart City 1.0* places a strong emphasis on high-quality technological infrastructure, which seamlessly connects computers, sensors, devices and possibly also people. The use of technology is often justified in retrospect with a reference to the value for tackling urban problems.

- In *Smart City 2.0*, urban problems are the starting points for urban policy and there is an open eye for the use of high-quality technological tools. The priorities are usually different than in the case of *Smart City 1.0*.

- *Smart city 3.0* promotes initiatives of citizens (individually, in a neighborhood or as part of a network), companies, and (knowledge) institutions. The municipality facilitates the use of ICT and creates the necessary infrastructure.

*(Herman van den Bosch, Professor at Open University of The Netherlands)*
Contents

I  Smart City

II  Smart Mobility
Mobility vs. Transport

From the Transport era to the Mobility era

**Mobility : New norm**
- The ability to *move freely* or be easily moved (Cambridge Dictionary)
- A contemporary paradigm in the social sciences and humanities that explores the movement of people, ideas and things (Wikipedia)

**Transport (Transportation in US) : Traditional norm**
- The movement of people or goods *from one place to another* (Cambridge Dictionary)
- A system of vehicles, such as buses, trains, aircraft, etc. for getting from one place to another (Cambridge Dictionary)

교통(交通) : Gyo-tong (in Korean), Jiao-tong (in Chinese)
- To be connected, transportation, communication
- Jiao-tong University : University of Communications
The action of transport is defined as a particular movement of an organism or thing from a point A (a place in space) to a point B. Modes of transport include air, land (rail and road), water, cable, pipeline and space.

The field can be divided into infrastructure, vehicles and operations. Transport enables trade between people, which is essential for the development of civilizations.

Transport infrastructure consists of the fixed installations, including roads, railways, airways, waterways, canals and pipelines and terminals such as airports, railway stations, bus stations, warehouses, trucking terminals, refueling depots and seaports. Terminals may be used both for interchange of passengers and cargo and for maintenance.
- So, what’s the mobility?

- ‘The ability to move freely or be easily moved’ (Cambridge Dictionary)

- ‘Mobility’ means movement with more freedom or flexibility. Thus, mobility industry or components should be defined in terms of mover’s freedom or flexibility.

- But since railway or maritime transport has limited freedom in terms of operation, we do not mention it as a ‘mobility service’ right now.
Mobility Development

Mobility 1.0
- Pre-industrial time
  - Agricultural focus
- Waterways as most important traffic routes
- Horses and carriages

XVIII century and earlier

Mobility 2.0
- 1st industrial revolution
  - Steam-based technology
  - Industrialization
  - Metallurgy, machine building
- Expansion of rail and local public transport
- Bicycle as a horse substitute
- Steam ships displace sailing ships

XIX century

Mobility 3.0
- 2nd and 3rd industrial revolutions
  - Automation
  - Electrification
  - Mass production
  - Start of digitalization
- Expansion of roads and air transport
- Motorization with individual cars
- Car as a backbone of mobility
- Rail blossoms

XX century

Mobility 4.0
- 4th industrial revolution
  - Convergence of industry and technology
  - Digitalization, Internet of Things
  - Social media
  - Individualization and mass-customization
- Massive data growth – “Data highways”
- Mobility Big Data
- Integration of modes, new (shared) mobility services
- Autonomous driving
- Mobility-as-a-Service – Usage rather than ownership

XXI century

Source: The future of the Mobility 3.0, Arthur D. Little, 2018
Changes

Consumer trends and new mobility solutions

- Urbanization
- Individualization
- Sharing Economy
- Security
- Hyper-connectivity
- Gamification
- Sustainability

Change of attitudes and behaviors

- Expectations towards personalization of the offering and development of more tailored push offers
- Increasing connectivity associated with internet-access democratization
- Polarized relationship to work between “job out” and entrepreneurs
- Aging population, leading to an increase in dynamic seniors, but with reduced mobility
- Expectations towards seamless journeys and intermodal integration
- Generalization of collaborative practices (sharing economy)
- Increase in environmental concerns
- Increased sense of insecurity, both digital (data protection) and physical (terrorism)

Source: The future of the Mobility 3.0, Arthur D. Little, 2018
## Smart Mobility Technologies

<table>
<thead>
<tr>
<th>Technology Enabler</th>
<th>Smart things</th>
<th>Smart data</th>
<th>Smart architecture</th>
<th>Smart systems</th>
<th>Smart human-machine interaction</th>
<th>Smart working &amp; living in the future</th>
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<tbody>
<tr>
<td></td>
<td>Cheap, small, durable sensors</td>
<td>Connectivity for every product</td>
<td>Near-field communication</td>
<td>Gigabit bandwidth</td>
<td>Wireless power</td>
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<td></td>
<td>Virtual simulation</td>
<td>Data discovery</td>
<td>Data brokering</td>
<td>Data-context aggregation</td>
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<td></td>
<td>Blockchain</td>
<td>Software-defined anything (SDx)</td>
<td>Micro-services</td>
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<td></td>
<td>Self-learning systems</td>
<td>Artificial intelligence</td>
<td>Robots and bots</td>
<td>Autonomous vehicles</td>
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<td>3D-printing</td>
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<td>Multi-dimensional scanning</td>
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<td>Audio visual interaction</td>
<td>Augmented reality</td>
<td>Virtual reality</td>
<td>Gesture control</td>
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<td>Virtual workspace</td>
<td>Intelligent home</td>
<td>E-learning</td>
<td>Gamification</td>
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<td>Collective intelligence/crowd sourcing</td>
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<td>Handhelds/wearables</td>
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<td>Enterprise social graph</td>
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</table>

*Source: The future of the Mobility 3.0, Arthur D. Little, 2018*
• **Connected and Autonomous Vehicles**

• **Zero Emission Vehicles (ZEVs)**

• **Car sharing**: Car sharing, which began in the U.S. in 1994, is one of the most mature forms of shared mobility. We define car sharing business as Peer-to-Peer (P2P) Car sharing and Business-to-Consumer (B2C) Car sharing.

• **Bike sharing**

• **Ride sourcing/Transportation Network Companies (TNCs)**: Ride sourcing services (also known as transportation network companies or TNCs) are services that offer on-demand rides by connecting drivers using their personal vehicles with passengers hailing a ride, typically via smartphone. Ride sourcing/TNC services have grown rapidly since the launch of Uber (black cars only) in 2010 and the subsequent launch of Sidecar (June 2012), Lyft (June 2012), and UberX (July 2012) in San Francisco, California with a peer-to-peer service.

• **Smart Freight**: Platooning
**Smart Mobility Solutions**

- **Alternative Transit Services**: While public transit routes remain fixed, other innovative services are implementing technology to increase the flexibility of their operations. Alternative transit services, which include paratransit, employer shuttles, and microtransit, have the potential to supplement/compete with existing bus and rail routes. These services can incorporate flexible routing, flexible scheduling, or both.

- **Shared Mobility Public-Private Partnerships and Data Sharing**: Shared mobility public-private partnerships (PPPs) involve a public entity, such as a public transit agency or a city, and a private mobility provider entering into a partnership or agreement to operate a mobility service. They are becoming an increasingly popular option for public agencies to potentially lower costs, expand the reach of impacts, or improve the service quality of public transportation services.

- **Block chain**: Blockchain, the underlying structure behind cryptocurrencies like Bitcoin, is a decentralized ledger that allows for financial transactions and smart contracts to be executed without intermediaries. Although the technology has been used thus far mainly for currencies and financial transactions, some experts are speculating that the technology could be used for various mobility service transactions.
Smart Mobility Solutions

- **3D Printing**: 3D printing shortens supply chains, since goods can be manufactured closer to the end consumer. Global transportation needs could therefore be more focused on raw materials and less on moving parts and finished goods. When finished goods must be transported to their final destination, these distances could be much shorter; therefore, it is important to consider 3D printing as a trend that could potentially shorten delivery distances of products.

- **Drones and Unmanned Aerial Vehicles (UAVs)**: The last mile problem refers to the inefficient transport that occurs at the last phase of freight movement when goods are delivered to homes and factories. The last-mile portion of a delivery trip typically is responsible for a significant amount of local pollution and local congestion.

- **On-Demand Trucking**: Often, shippers and truckers have to pay a large portion – around 45 percent of the total revenue – to brokers to connect truckers with goods. “Uber for freight” can cut down on trip price and delivery time by connecting truckers to shippers on-demand to optimize routing.

- **Hyperloop**: Hyperloop, a high-speed rail train technology that relies on magnets to carry pods in a vacuum tube.
Discussions

- *Data governance*
- *Open Platform*
- *Objective of smart things*
- *Full utilization of existing data and technology*
Thank you