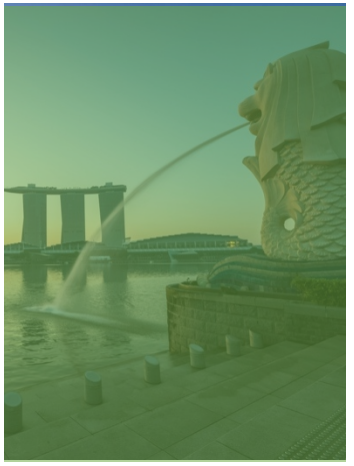







Global Smart City Trends: Analysis of 10 Global Smart Cities

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About Speaker

Lee Jung-hoon

- **Current Status**
  - Professor & Associate Dean of Graduation School of Information, Yonsei University, Seoul, Korea
- **Current & Past R&D Consulting Projects**
  - Project Manager, Smart City Community & Living Lab. Strategy, Dae-gu City Hall, Republic of Korea, October 2017-January 2018
  - Project Manager, Digital City Innovation Index Development for Seoul Metropolitan City, Seoul Digital Foundation, Republic of Korea, September 2017-November 2017
  - Project Manager, Smart City Project Performance Measurement, Busan Metropolitan City, Republic of Korea, September 2017-October 2017
  - Project Manager, Smart City Civic Engagement Project (affiliated with IoT based Open Smart City Platform Projects), Ministry of Science, ICT & Future Planning, South Korea (2014-2016)
  - Project Manager, Social-Welfare U-Service Development Project for Urban Regeneration. Ministry of Land & Transport, South Korea (2014-2016)
  - Project Manager, U-City R&D Project Phase II, Ministry of Land & Transport ,South Korea (2013-2018)
  - Project Researcher, u-City Planning & Development Master Plan, Busan Metropolitan City, Korea (2011-2012)
  - Associate Project Manager, u-City Planning & Development Master Plan, Seoul Metropolitan City, Korea (2010-2011)
  - Project Manager, Citizen centered U-Service Development, U-City R&D Project Phase I, Ministry of Land & Transport (2008-2011), Korea

▪ Smart City Concept

"Smart City is **an regional innovation platform or system** in which collectively discovers & develops new growth power in order to deal with urban issues with citizens, city officials, private companies etc. through intelligent & efficient management of environment, energy, urban infrastructure, & buildings using advanced ICT." Jung hoon Lee (2015)

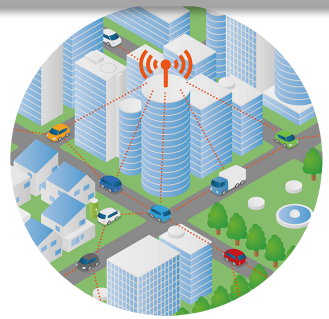
The Evolution of Smart City Definition

/Source Yonsei University, ISi Lab

Info/Digital City

- Focus on tech. development and application
- Development of online service is a key factor

Ubiquitous City



- Extended concept from info/digital city
- Building an evolved embedded info infra converging digital tech and city area

Intelligence/ Knowledge based City

- Seek new technological innovation through research, technology and knowledge base industry

Smart City

- Solve various city issues such as energy, environment, transportation, health, etc.
- Improve the quality of life, create jobs and promote a higher value-added business

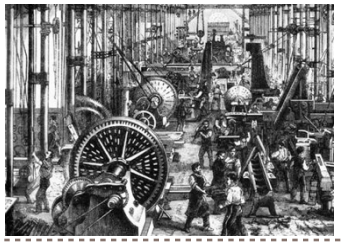
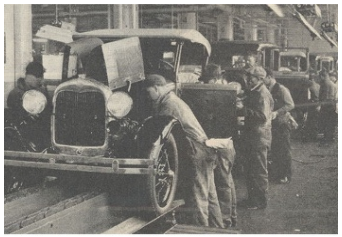
image sources 1: http://www.seagate.com/kr/ko/services-software/data-recovery-services/partners/
image sources 2: http://dogpigw.tistory.com/23
image sources 3: http://blog.whois.co.kr/150
image sources 4: http://nataliechelliah.wordpress.com/2013/01/29/smart-cities/

▪ The 4th Industrial Revolution

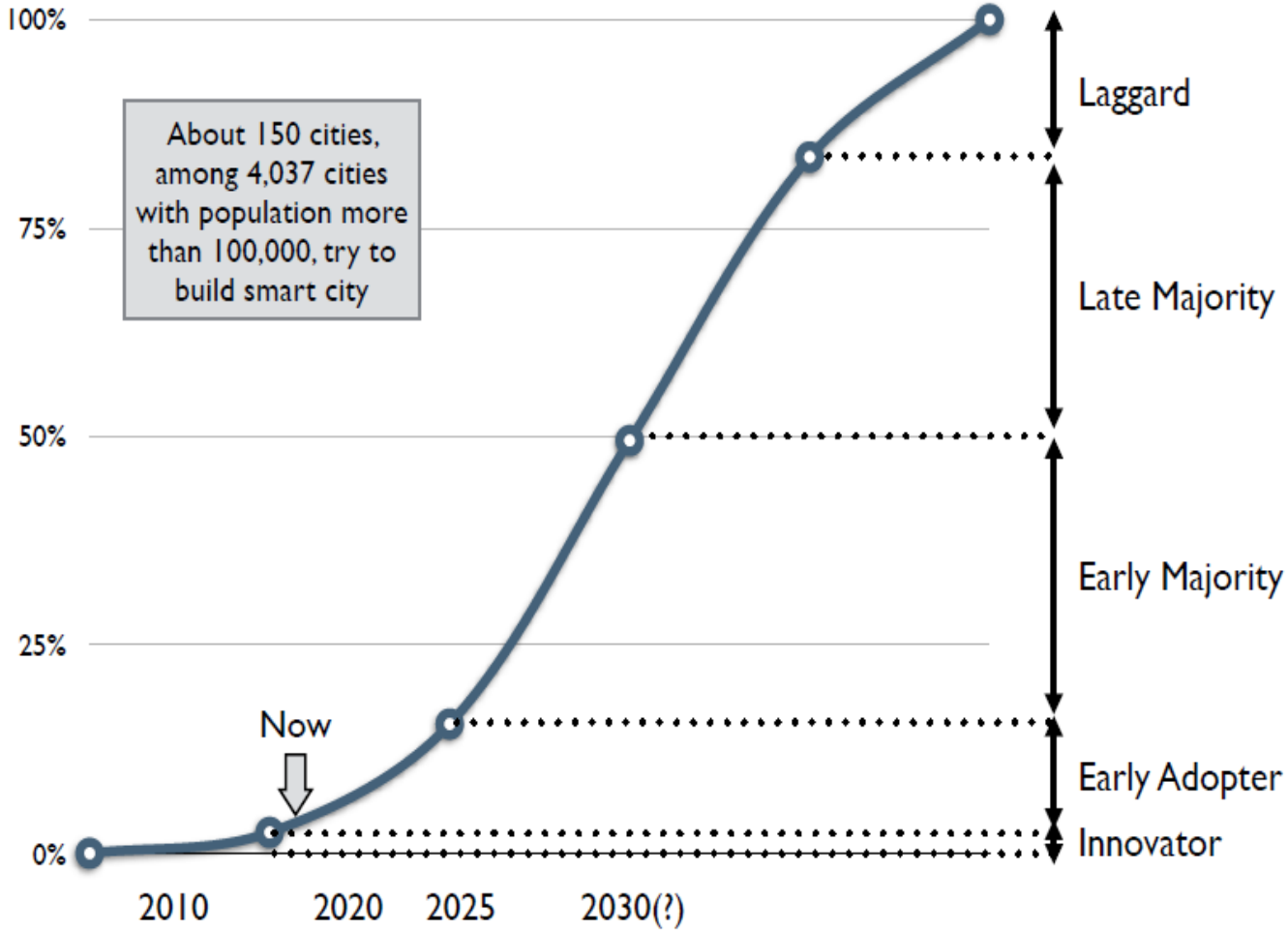
The changes of cities in the era of 4th industrial revolution

The industrial revolution had constantly effect on not only the industries itself but also a function and form of city. The fourth industrial revolution, which is based on such technologies as IoT, CPS and AI, is expected to enhance citizen's quality of life by efficiently distributing city's resources to citizens, thus solving the urban problems.

Urban Change due to Industrial Development

	1st Industrial Revolution	2st Industrial Revolution	3st Industrial Revolution	4st Industrial Revolution
Industry Changes	Vapour-based mechanization revolution 	Electric power based mass production revolution 	Computer and internet based knowledge information revolution 	IoT/CPS/AI based intelligence revolution 
	Late-18th century	20th century	1970s	Present
Change of Cities	Agricultural cities	Industrial cities	Digital cities	Smart cities
	Intercity travel was limitedly possible while maintaining agriculture-based society	As industrial revolution and transportation had developed, intercity travel was freely possible and urban population started to increase.	As the development of information and communication technologies allowed to share urban information, rapid urban concentration phenomenon occurred.	Based on IoT, CPS and AI technologies, smart city is expected to enhance citizen's quality of life by efficiently distributing city's resources to citizens, thus solving the urban problems.

Smart City in Innovation Model



Source: J. Hwang, ICGSC 2016

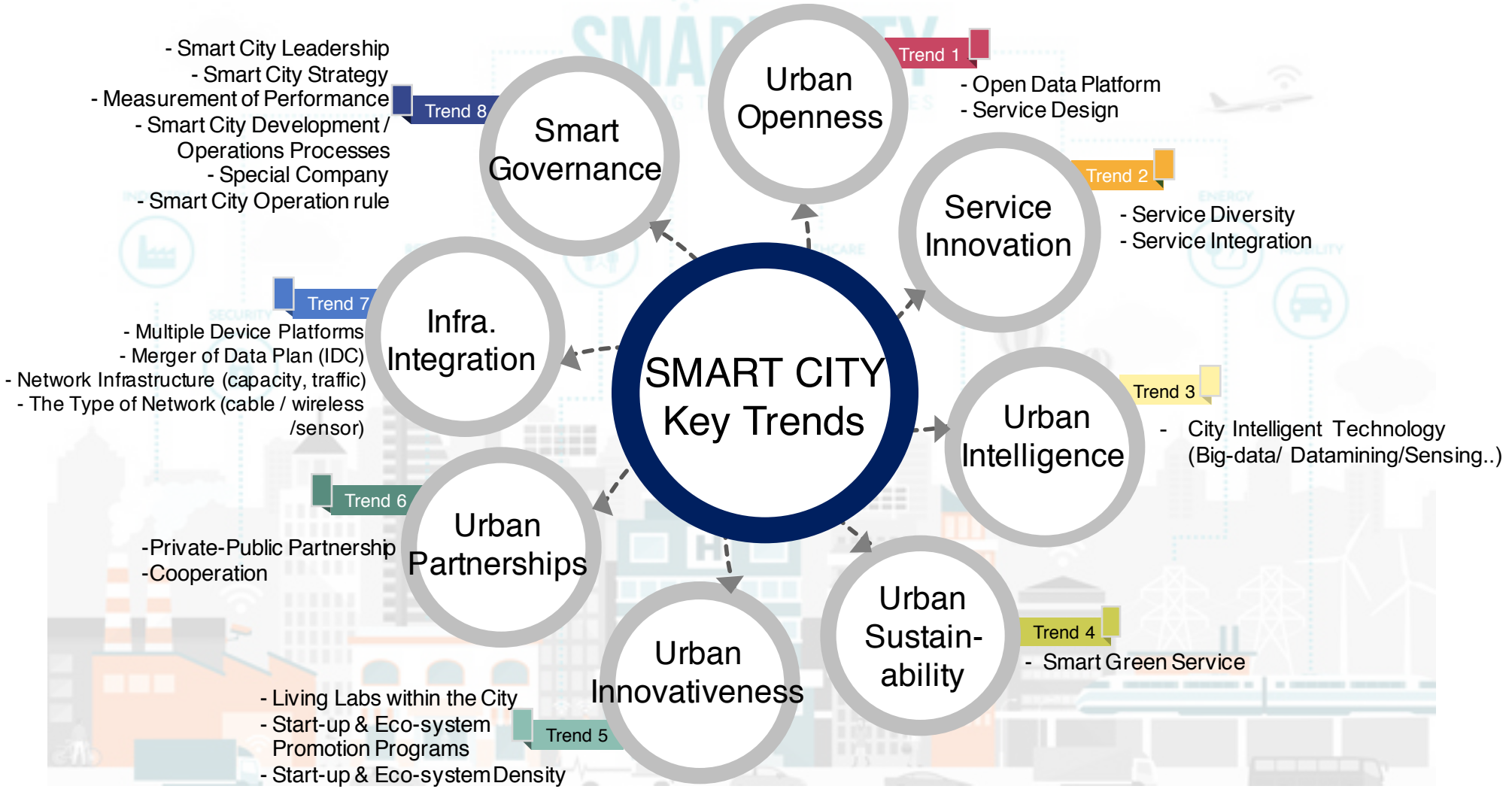
▪ Word Cloud about “Smart City”

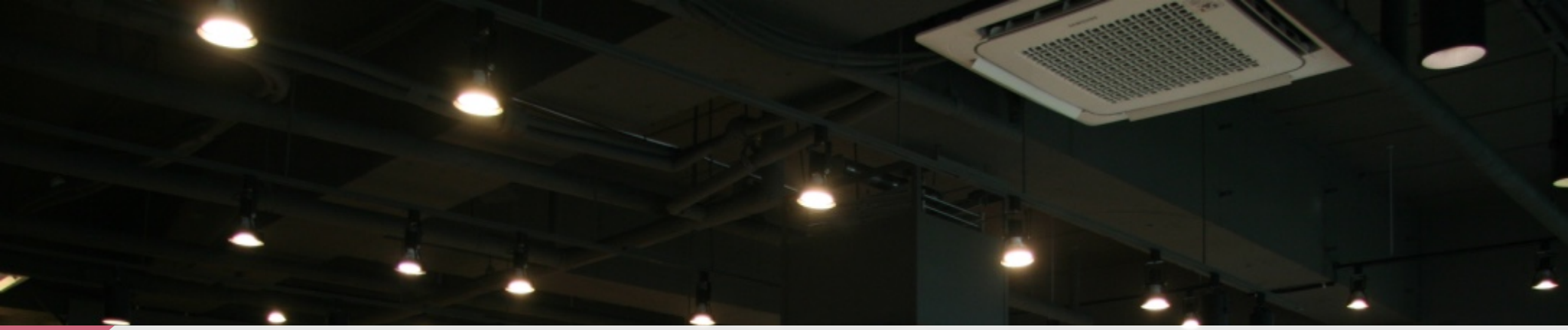
*This Word Cloud is based on the 2017 Smart City Index report from Isi Lab.

Smart City Key Trend

GRADUATE SCHOOL OF INFORMATION
YONSEI UNIVERSITY

*Provision of **Smart City Key Trends** around Global-leading Cities starting from 2012*





Key Trend

1 **“Urban Openness” is…**

“Open Innovation Environment ”

Citizen-centered Innovation in the development of an effective smart city service creates an environment that can lead to openness of the city centering on **"citizen participation"** and **"open data"**

◆ Urban Openness I *Civic Engagement*

Citizen's participation based on the citizen-led open innovation platform effectively contributes to the creation of new social and public values by solving urban problems.

Changes in Civic Engagement

- The concept of citizen participation evolved from simple participation - voting to idea suggestion, co-operation and co-creation

→ Ultimately, citizens should aim for co-creation through voluntary participation

Participation	Participating in a vote on smart city services or ideas
Suggestion	Direct suggestion of ideas through forms like smart city competition
Co-operation	Citizens' participation in communities run by governments and companies
Co-creation	Citizen-led community-driven community

Cases | Busan "Haeundae Citizen Community"

- Based on the Haeundae Centum City, Smart City development project based on Internet (IoT), various stakeholders including citizens worked to find smart solutions and solve various urban problems

Implications

- ✓ Implementation and development of citizen participation program from 2015 (Yonsei University - Kyungsung University)
- ✓ Implementation of online-offline citizen participation platform
- ✓ Strengthen incentives for citizen participation
- ✓ Establish network link between enterprise start-up ecosystem

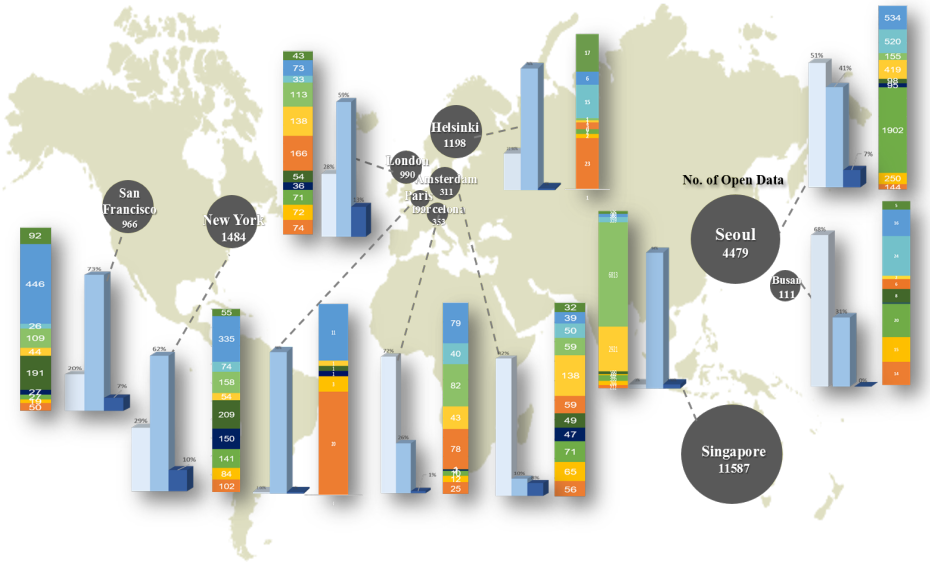
image sources : Sample: App·Web(676), Infra(119) / Source : Yonsei University, ISi Lab
http://blog.naver.com/PostView.nhn?blogId=syokolla&logNo=221038395860&parentCategoryNo=&categoryNo=17&viewDate=&isShowPopularPosts=true&from=search http://www.ecolover.co.kr/print_paper.php?number=31036

◆ Urban Openness I *Open Data*

Diversity of Open Data is the root of innovation and prospected as the most important infrastructure in the 4th industrial revolution for implementing " Data driven Smart City"

Status

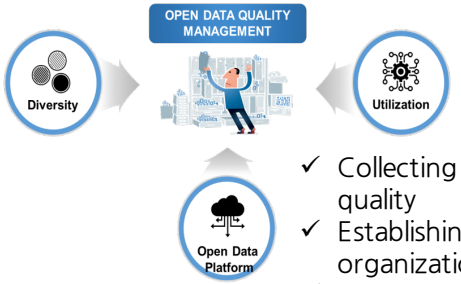
- Diversity of Open data is the root of innovation and prospected as the most important infrastructure in the 4th industrial revolution for implementing " Data driven Smart City"



Case | Singapore "Data.gov.sg"

- Owning data over 11,000 from 70 public agency
- Providing open data of Economic, Education, Environment, Health, Transportation etc.

Implications



- ✓ Collecting various types of Opendata and ensuring quality
- ✓ Establishing BigData Center and Initiating organization for supportment
- ✓ Acquiring technology of global standard and data Interface
- ✓ Establishing and vitalizing open BigData Platform of Smart City

Sample: App·Web(676), Infra(119) / Source : Yonsei University, ISi Lab

Key Trend

1 **“Urban Openness” in the Future…**

“Establishing Open Innovation Environment”

In order to secure the openness of the city, the vitalization of Civic Engagement at the process of Co-creation and the quality of open data should be done

Key Trend 2

"Service Innovativeness" is…

"Securing service diversity and interoperability"

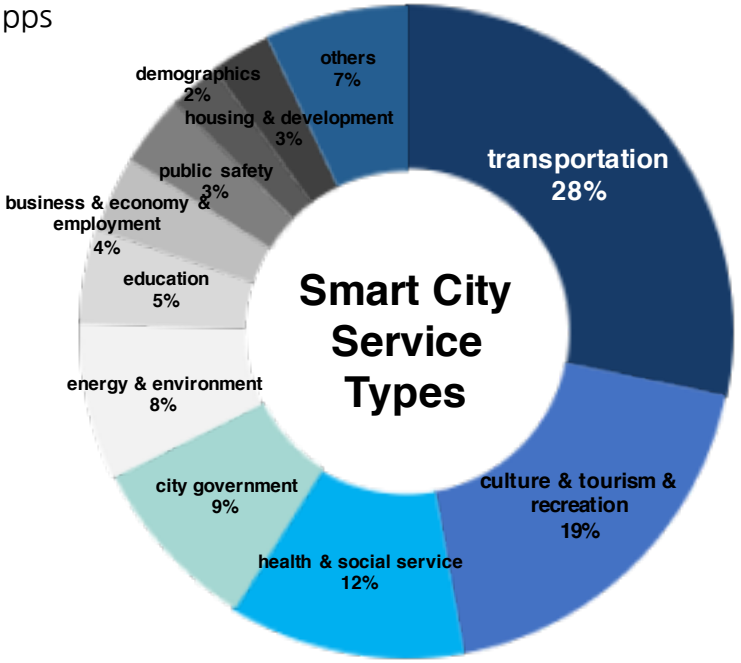
The development of innovative services in the city will bring diversity of services and secure interoperability

◆ Service Innovativeness

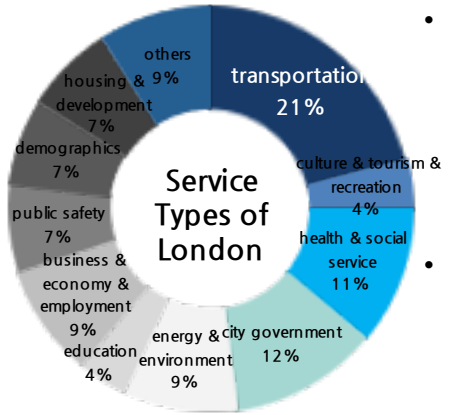
As the research of 676 apps/web service from 10 Smart City shows that the type of transportation provides the most various service

Status

- The type of transportation(average 32%) was the highest and there were many of City services of energy & environment based on Infrastructure but has low proportion on the type of apps



Case | London



- Since 2008, the city of London has been promoting the 'Smart London Innovation Network' system and the Tech city project centered on the northeastern part of London
- It is believed that the Start-up ecosystem is activated through the cooperation of organizations related with Smart City to create growth opportunities

"Service Innovation through the creation of various services"

Implications

- ✓ In some cities, Smart City services are being provided mainly by the public
- ✓ Promote service Innovation through integrating and diversify by balancing the public as well as with the private sector

Sample: App·Web(676), Infra(119) / Source : Yonsei University, ISi Lab

Key Trend

2 **“Service Innovativeness” in the Future…**

“Enhancing Citizen Experience ”

Providing various services types will build a balanced service portfolio and enhance citizen experience of the Smart city services

Key Trend 3

“Urban Intelligence” is…

“Providing Intelligent Services based on New Technologies”

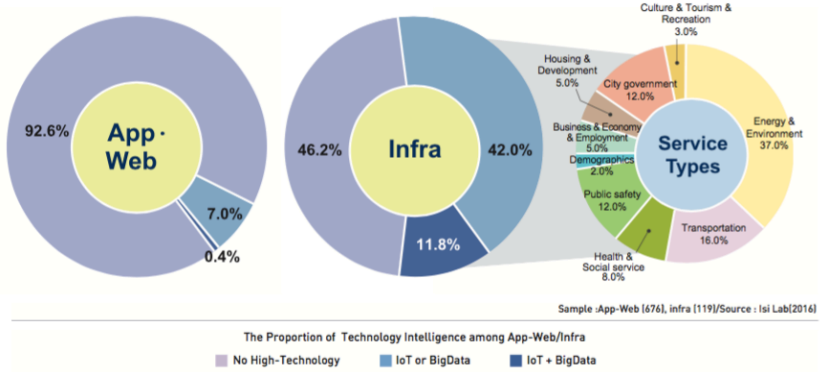
Various New Technologies such as IoT, Big Data and Artificial Intelligence(AI) offer intelligent services to solve different types of city problems

◆ Urban Intelligence

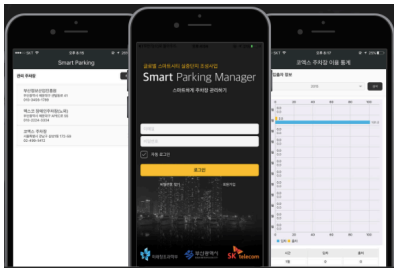
Various data such as spatial information, environmental information, and crime information collected through diverse IoT sensors provide intelligent service through real time analysis of Big Data

Status

- It is expected that the services related to urban intelligence based on new technology will be activated by smart city services based on artificial intelligence (AI), in which the environment and energy(34%) and transportation sector(17%)



Case | Busan "Smart Parking"



- It gives solutions to parking problems by providing smart parking with IoT in Haeundae, Busan
- It checks real-time parking status using smartphone to check parking space, managing smart parking information and providing fee information

Implication

✓ IoT/Big Data/AI technology and various service planning and demonstration need

✓ Need for Expansion strategy (funding) for Scale-Up with other smart cities

✓ Various incentives and negative regulations to accelerate the legal system

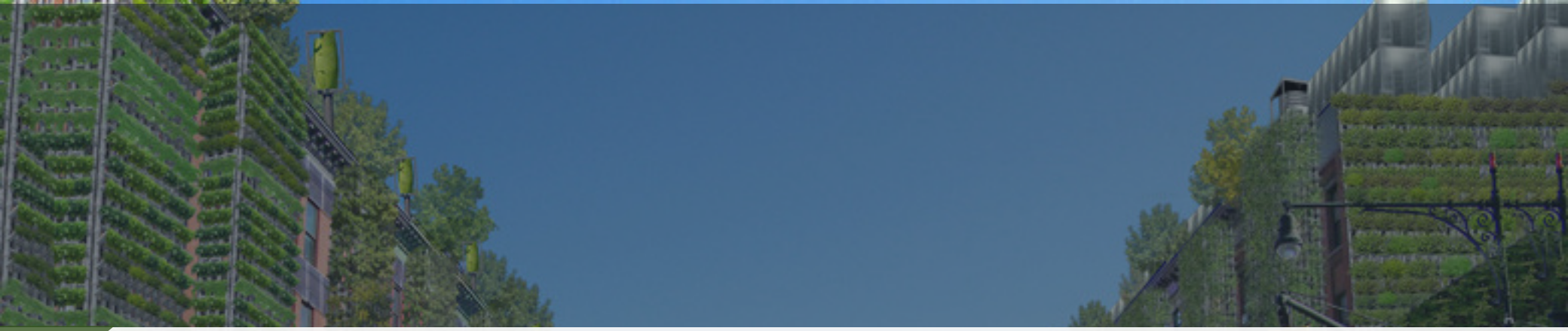
Sample: App·Web(676), Infra(119) / Source : Yonsei University, ISi Lab

Key Trend

3 **“Urban Intelligence” in the Future…**

“The Prevalence of New Technology”

Data is collected based on ICBM(IoT – Cloud – Big Data - Mobile) technology and is analyzed through artificial intelligence(AI) to manage cities. By providing urban intelligence services, the convenience for citizens increases as the technology of the 4th Industrial Revolution becomes more common



Key Trend

4 **“Urban Sustainability” is…**

“Proposing Solutions for Urbanization Problems”

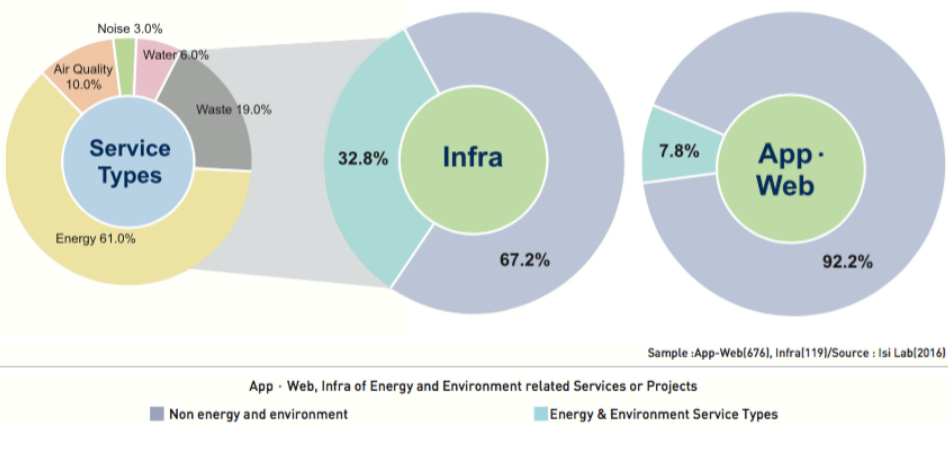
Energy, Environment, social and welfare problems caused by population growth and urbanization are solved through smart city, and thus the quality of citizen’s life and urban sustainability are improved

◆ Urban Sustainability

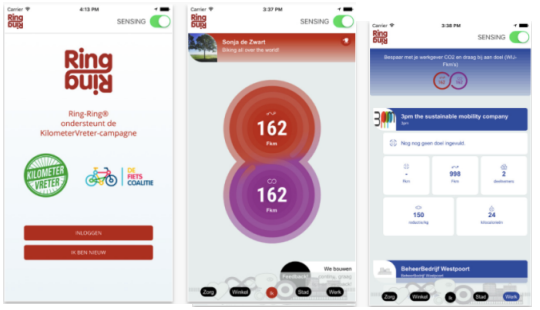
Promote urban regeneration project for activating and promoting competitiveness in the developed countries, such as North America and Europe, urban environmental focused smart city project in developing countries such as India, Malaysia

Status

- Smart cities improve urban sustainability by solving urban problems through advanced information technology
- As a result of analyzing App & Web (7.8 %) and Infrastructure-Based services (32.8 %), smart city focuses on solving environmental problems using ICT, mainly providing energy and waste management services



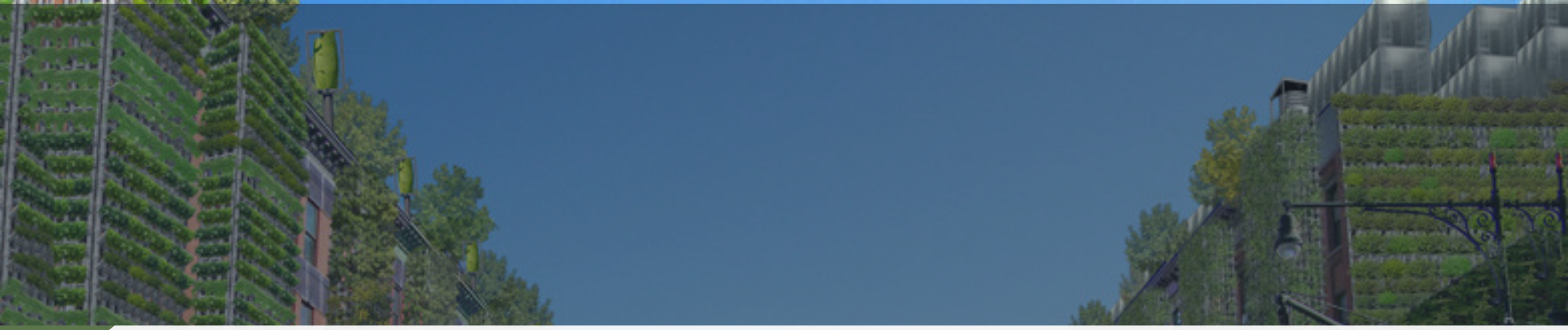
Case | Amsterdam



- Ring-Ring is a bike platform service operated by a private company
- Citizens use bicycles and switch from Amsterdam to local points as far as they travel.
- Enables exchange points between citizens and enables social and financial benefits through points

Implications

✓ In addition to infrastructure, need services to increase urban sustainability by citizen participation



Key Trend

4 **”Urban Sustainability ” in the Future…**

“Changes in Citizens’ Behavior”

Instead of focusing on urban and environmental infrastructure, it is essential that the city uses intelligent information technology to promote the sustainability of urban activities and improve the sustainability of cities through changes in the city

Key Trend

5/6

“Urban Innovativeness” is…

“New Urban Innovation Ecosystem(Start-up & Living Lab)

It refers to the degree of innovation that creates new value through new ecosystem building (start-up & living lab) through exploring, developing and commercializing new services by introducing technologies and methods that have not been done so far

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“Urban Partnership” is…

“Cooperation System among Various Urban Minds”

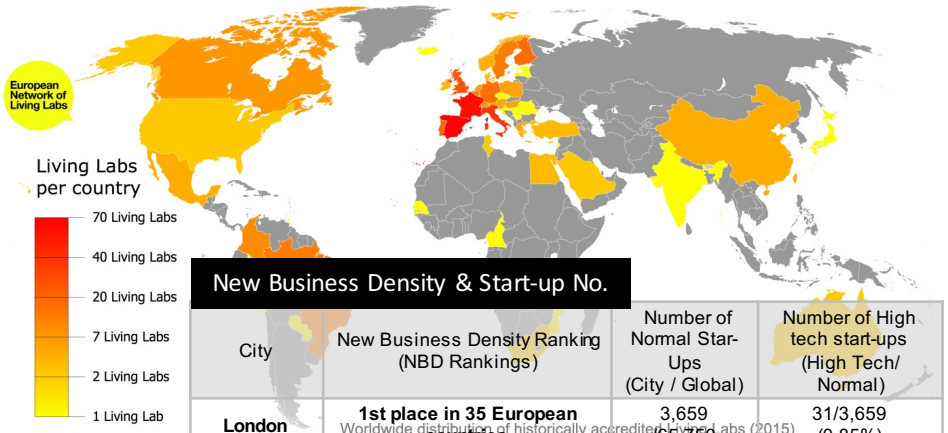
Cooperative partnership is a cooperation system that can promote the development of smart city services and infrastructure through various cooperation partnerships among cities

◆ Urban Innovativeness

People address various urban issues in the form of "Living Lab", which focuses on user-breaking innovation, which is a user-integrated transformation space and such open innovativeness encourages and promotes activities that provide innovative services for troubleshooting

Global Living Lab and Startup Status

- In Europe, the European Network of Living Labs (ENOLL) is formed to share and cooperate with knowledge. Asian cities are also gradually developing living labs.

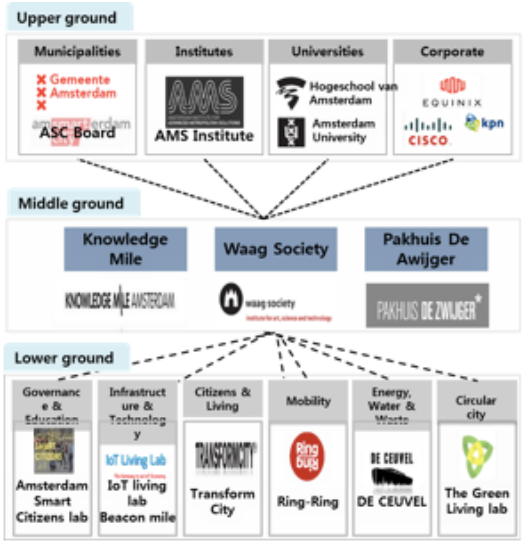


New Business Density & Start-up No.

City	New Business Density Ranking (NBD Rankings)	Number of Normal Star-Ups (City / Global)	Number of High tech start-ups (High Tech/ Normal)
London	1st place in 35 European countries	3,659 /65,750	31/3,659 (0.85%)
Amsterdam	2nd place in 35 European countries	317 /65,750	4/317 (1.26%)
Barcelona	14th place in 35 European countries	298 /65,750	1/298 (0.34%)
San Francisco	4th place in 40 U.S.A Cities	5,531 /65,750	42/5531 (0.76%)
New York	6th place in 40 U.S.A Cities	297 /65,750	3/297 (1.01%)

Case | Amsterdam

- It provides research, workshops, training and consulting on the theme of expanding civic engagement as a regional research center for meeting and exchanging citizens
- It invites specialists to organize events for each topic, solving community problems, effects, connections with citizens, and environmental issues



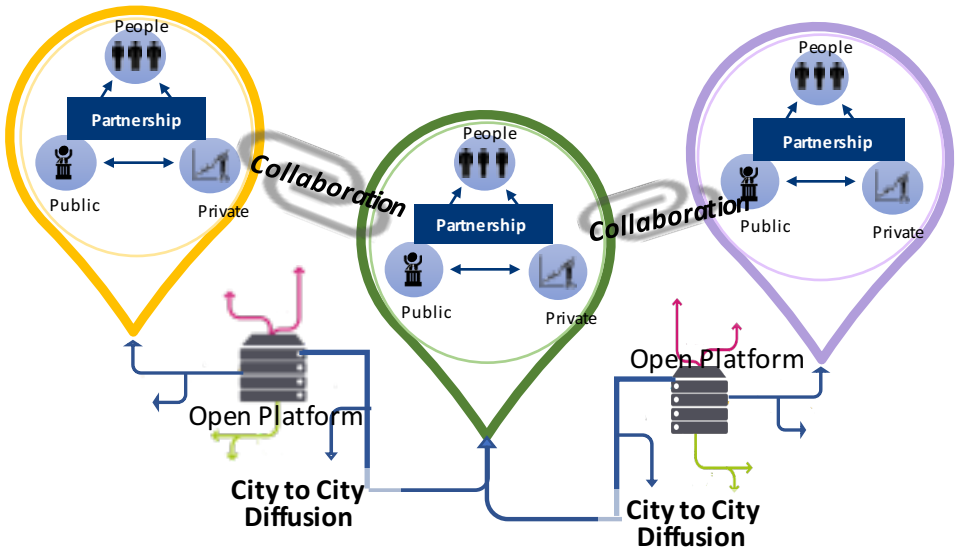
[Community ecosystem structure in Amsterdam]

nple: App·Web(676), Infra(119) / Source : Yonsei University, ISi Lab

◆ Urban Partnership

From the existing citizen-government cooperation partnership model to 'citizens', the futuristic Smart Cities will be implemented while sharing the know-how and resources of Smart Cities in each city through open platforms

Concept



▪ Cross - Border Data Flows
Cross-border data flow to create new value between cities

▪ Economy of Scale
If new service values spread across cities, economies of scale can be realized globally

*City to City : cooperation city to city

Case

Public Crowd Funding Platform (Milan)

- Establish platform for crowdfunding based on People, private and public cooperation partnership in 2016
- Protects 5-11 years old through apps, smart watches, and game content and provides well-being services

C2C Urban Platform Cooperation [EU]

SHARINGCITIES

- Shared City: A collaborative network to share and solve common problems in six European cities, including London, Milan and Lisbon
- The EU considers 'economies of scale', and with about 40 companies, platform interoperability and common standards

Implication

✓ Effective financing and public value achievement by building smart city crowd funding platform based on People, private and public cooperation partnership

✓ Launch overseas market and scale-up strategy through C2C cooperation network

Key Trend

5/6

”Urban Innovativeness and Partnership” in the Future…

“Creating and Expanding an Open Innovation Ecosystem”

It is necessary to build the open innovation ecosystem in order to expand the living lab. It will promote the innovation-driven economy of the city, thereby developing the entrepreneurial spirit for the new growth engine and economic base, and expanding the base of the start-up ecosystem and investment for a solid start-up ecosystem

&

“PPPP”, ”C2C”

Crowd funded PPPP(Public-Private-People-Partnership) based on Smart City Living Lab + Civic engagement ecosystem and community-led living labs based on collaborative systems are expected to created a variety of Smart City projects and achieve more Smart City innovation through C2C(City to City) collaboration

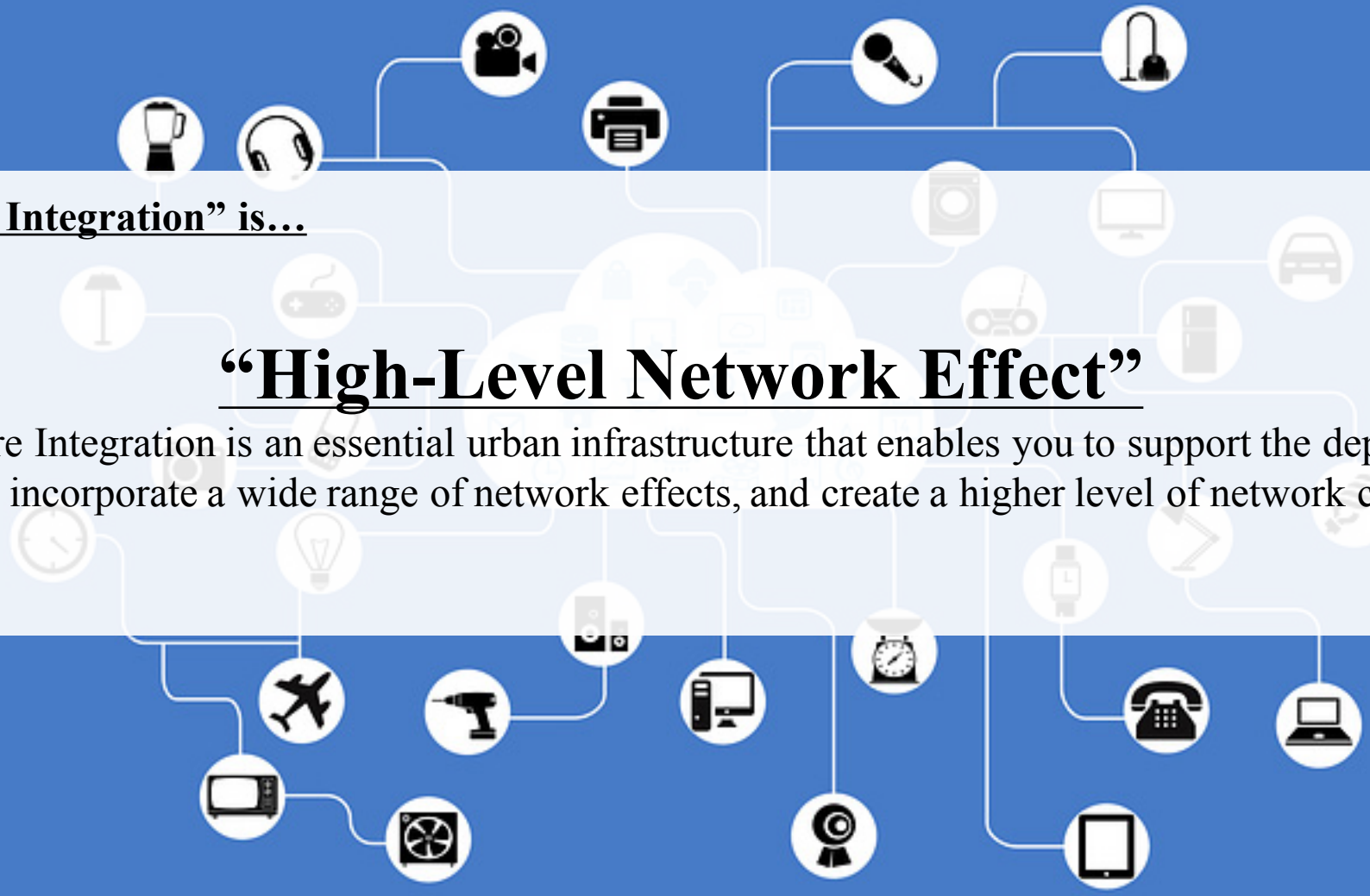
Key Trend

7

“Infra. Integration” is…

“High-Level Network Effect”

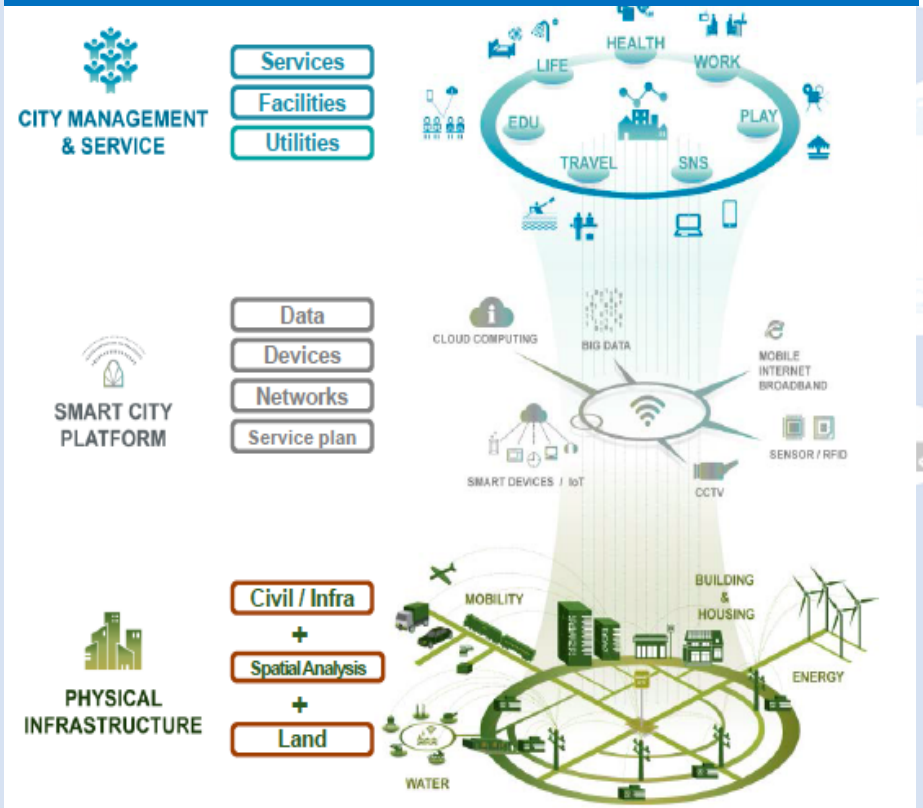
Infrastructure Integration is an essential urban infrastructure that enables you to support the deployment of smart cities, incorporate a wide range of network effects, and create a higher level of network connectivity



◆ Infra. Integration

In order to expand smart city services and improve citizens' convenience, it is necessary to build an integrated infrastructure, expected that the development of Cyber-Physical System with efficiency of city management will accelerate.

Concepts



Case | Busan " Busan Information Expressway"

[Busan Information Expressway Diagram]

introduce	• Busan high-speed self-information network that provides administrative and public services by optical cable network of administrative agency such as city, district, and residence centers etc. • a concession agreement with KT as the first private investment project (BTL) in Korea / Build operation
Benefit	• Improvement of public administration service by innovatively improving communication speed between administrative agencies affiliated with Busan City • Reduction of KRW 14.1 billion annually in telecommunication charges for network usage of Carrier leased line network

◆ Infra. Integration

From the viewpoint of scalability of Smart City, core factors of infrastructure integration are maximizing network effect by securing interoperability of open platform and installing IoT network and public Wi-Fi.

Expanding Wire-Wireless network supplement to improve citizens' digital inclusion

- ✓ The basic infrastructure / data construction of Smart City and it is the measurement of public WiFi-Hotspot coverage degree in city.
- ✓ Expanding the accessibility of smart cities by expanding the accessibility of citizen's smart Test-bed services

Securing compatibility with multiple platforms and device

- ✓ Enhance the ease of data exchange by ensuring interoperability between various devices and platforms in Smart City
- ✓ Ensuring compatibility between standard platforms in the city and heterogeneous devices

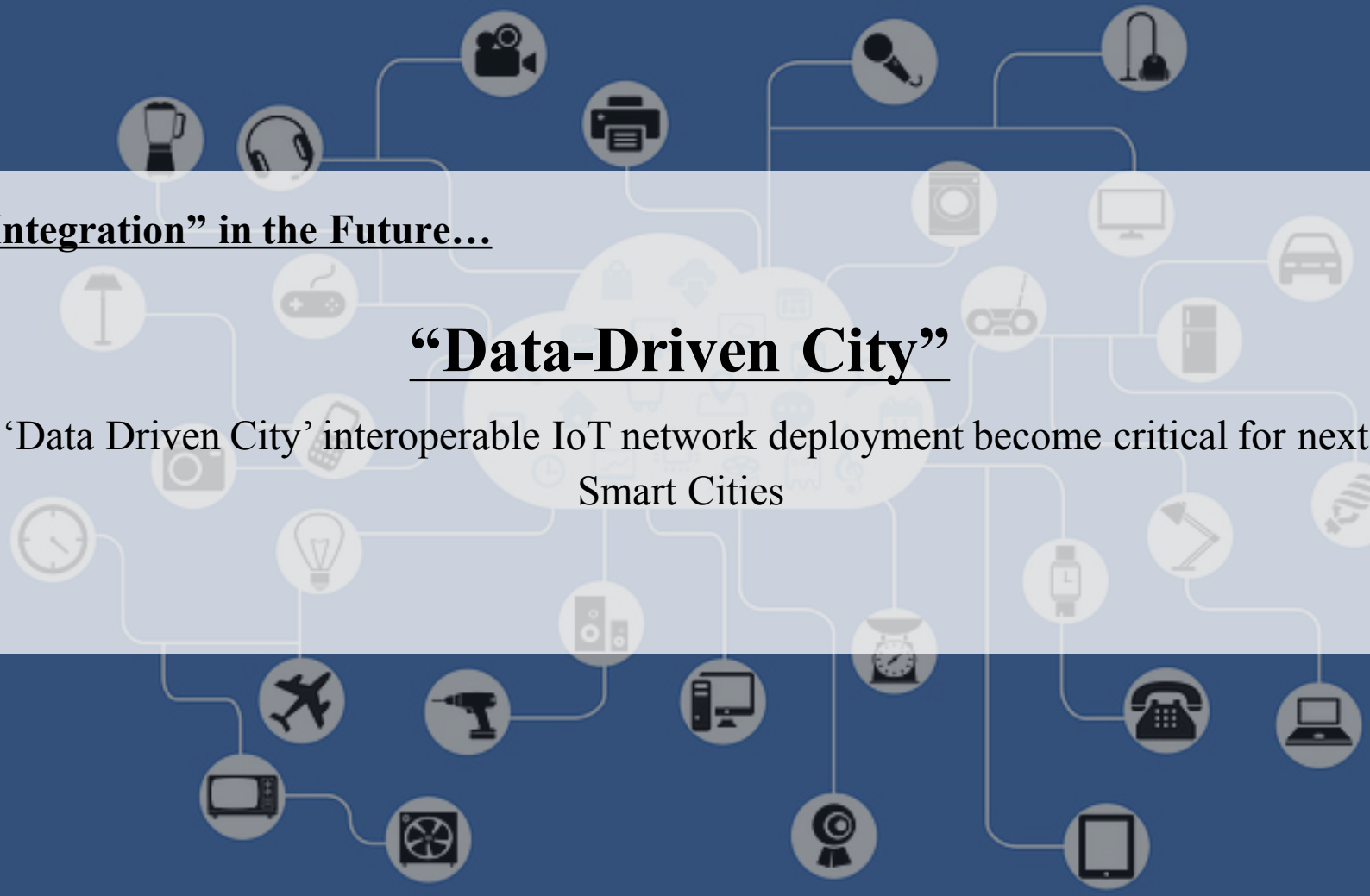
Establishing integrated data center for easy and efficient service development environment

- ✓ Urban integrated data centers will be key to creating new values by leveraging and integrating new urban data sets.

Sample: App·Web(676), Infra(119) / Source : Yonsei University, ISi Lab

Key Trend

7 **“Infra. Integration” in the Future…**



“Data-Driven City”

To build a ‘Data Driven City’ interoperable IoT network deployment become critical for next generation Smart Cities

Key Trend

8

“Smart City Governance” is…

“Smart City Governance System”

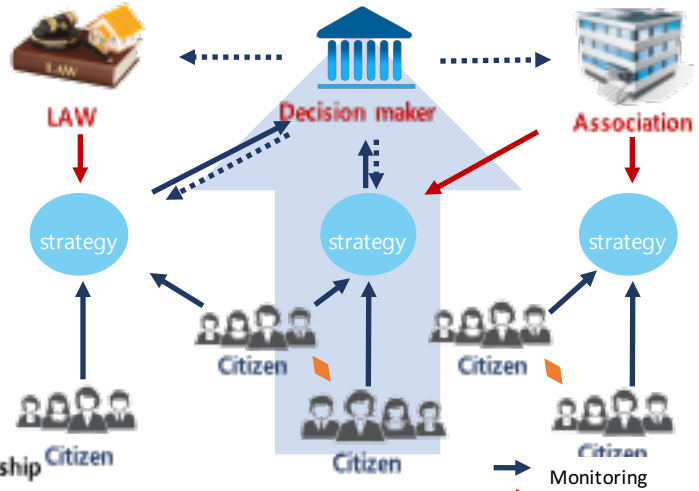
Establishing effective governance system in cities for smart cities

◆ Urban Partnership

Establishment of legal regulations and policies for systematic-build of long-term vision & strategy and support for Smart City

Status

- In order to implement Smart City, it is required to establish top-down style of leadership, dedicated organizational system, vision and strategy, and local government's own regulations



Bottom-up leadership
- Bottom-up leadership is emerging as a form of leadership not only in smart cities, but in many other areas as well

Organization System
- Smart City promotion agency and activation ecosystem

Regulations Status
Regulations Status for establishing Smart City

Vision & Strategy
- Comprehensive vision and future strategy for Smart City

Case | Barcelona

Leadership
Existence of a responsible person of Market-driven Leadership, Smart City PMO(Personal Management Office)

Ordinance
Establishment of legal regulatory policy to support smart city governance system

Organization
Organized a department dedicated to Smart City and dedicated to the overall operation of Smart City

Vision & Strategy
Establishment of long-term vision, strategy, and road map of Smart City and engagement in Smart City project in conjunction with overall city planning

Sample: App·Web(676), Infra(119) / Source : Yonsei University, ISi Lab

Key Trend

8 "Smart City Governance" in the Future…

"Leadership, Exclusive Organization, Vision&Strategy, and Balanced development of Legislation"

The city's governance system for building a smart city can be divided into four categories: leadership, exclusive organization, vision & strategy, and legislation.

04 Conclusion

"Where the 4th Industrial Revolution happens – Smart City"

- **The definition of Smart Cities changes with the 4th Industrial Revolution**
  Establishment of a data-centric smart city that takes innovation, sustainability, connectivity and inclusiveness

- **The changes in the role of Smart Cities in the 4th Industrial Revolution**
  Global Smart Cities, including Busan City, are participating in 'Civic Engagement + Living Lab'

- **Smart City Cooperation**
  In the 4th Industrial Revolution, PPP+P(Public, Private, People, Partnership) model will implement the futuristic Smart City and strengthen the capacity through the exchange of knowledge


Information System Intelligence Lab (ISI Lab) of the Graduate School of Information, Yonsei University, Republic of Korea was founded in 2004 and has been carrying out research in various fields with the aim of fostering the next generation of ICT innovation. Led by Dr. Jung Hoon LEE, Professor of Technology & Innovation Management, the lab focuses on smart city, especially the IT-based service design and implementation along with urban planning and development. Since 2007 the lab has been involved in various leading R&D projects sponsored by the South Korean government, including developing a national strategy and vision for smart city, analyzing and designing smart city services and implementation
the LG CNS, and developing Performance Man
Systems for smart city operations. The lab also
out the development of 5-year smart city master pl
both Seoul Metropolitan City and Busan Metropolitan City, South Korea's two largest metropolises. In recent years, the lab has been involved in several smart city R&D projects such as Urban Regeneration (2014-2017), Smart City R&D Project Phase II (2014-2018), and Open IoT Platform-based Smart City Test-bed Development Project (2015-2017) with South Korea's largest mobile carrier and Busan Metropolitan City. The lab has contributed towards several consulting and advisory services for ministries, government agencies and private sectors including CISCO, GSMA, SKT, LG CNS and UN ESCAP.
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