

Smart City + Smart Region

국가균형발전 Workshop. 국가균형발전 비전과 체계 수립

2017. 11. 09

Lee Sang Ho, Hanbat National University

Introduction

Technological Change and Socio-Space Change

What' s Going On ?
Now

Great Divergence

4th Industrial Revolution

Smart City as Future City

New Infrastructure

The Great Divergence

New Normal. Low Birthrate. Slow Growth. Technological Evolution. 4th Industrial Revolution

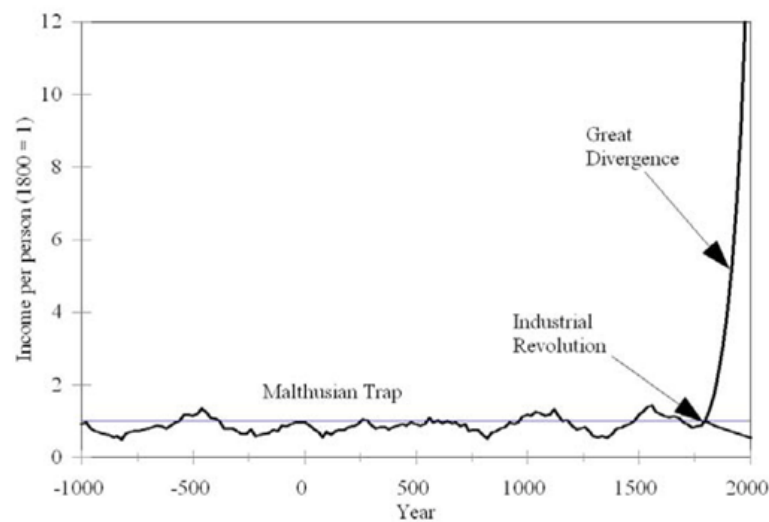
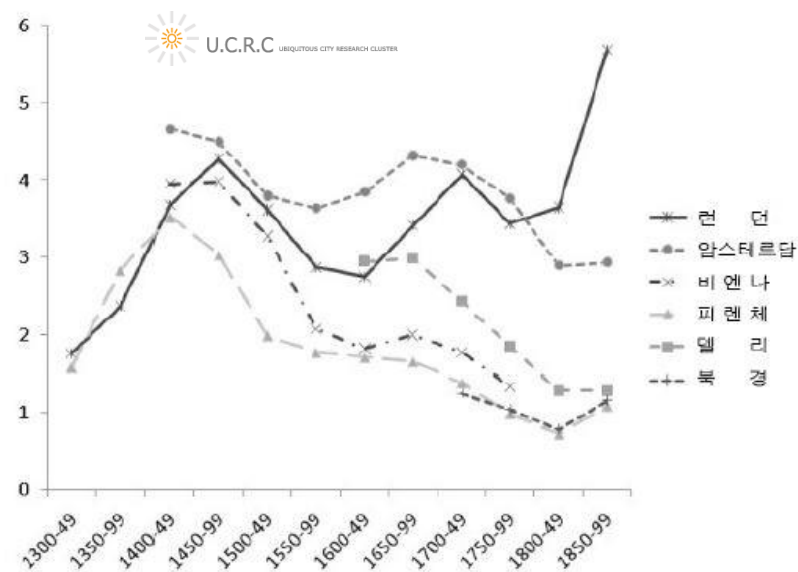
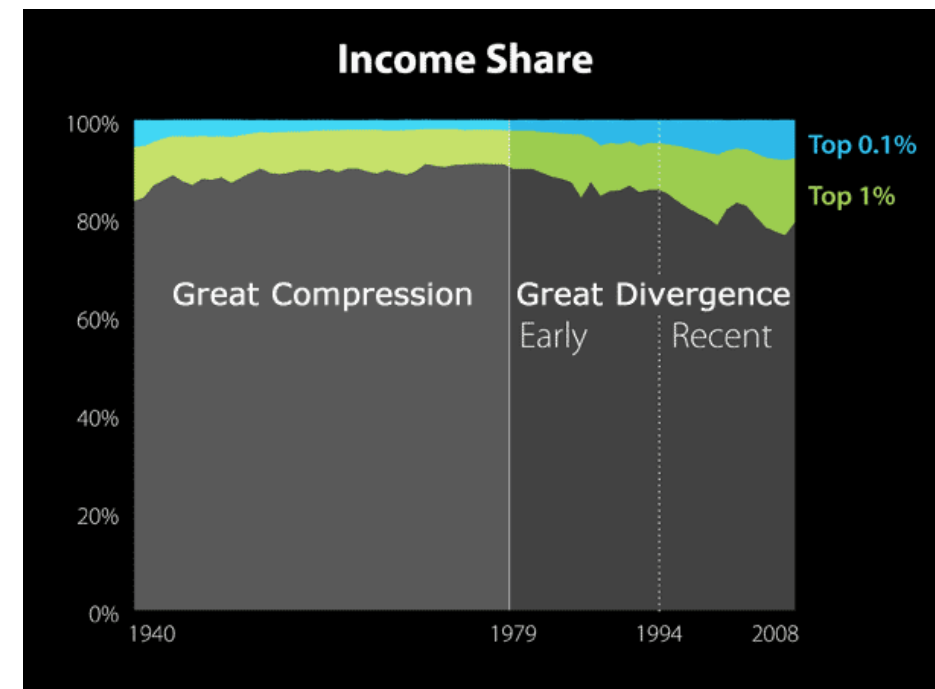


Figure 1.1 World Economic History in One Picture. After 1800 income in some societies rose sharply, while in others it declined.



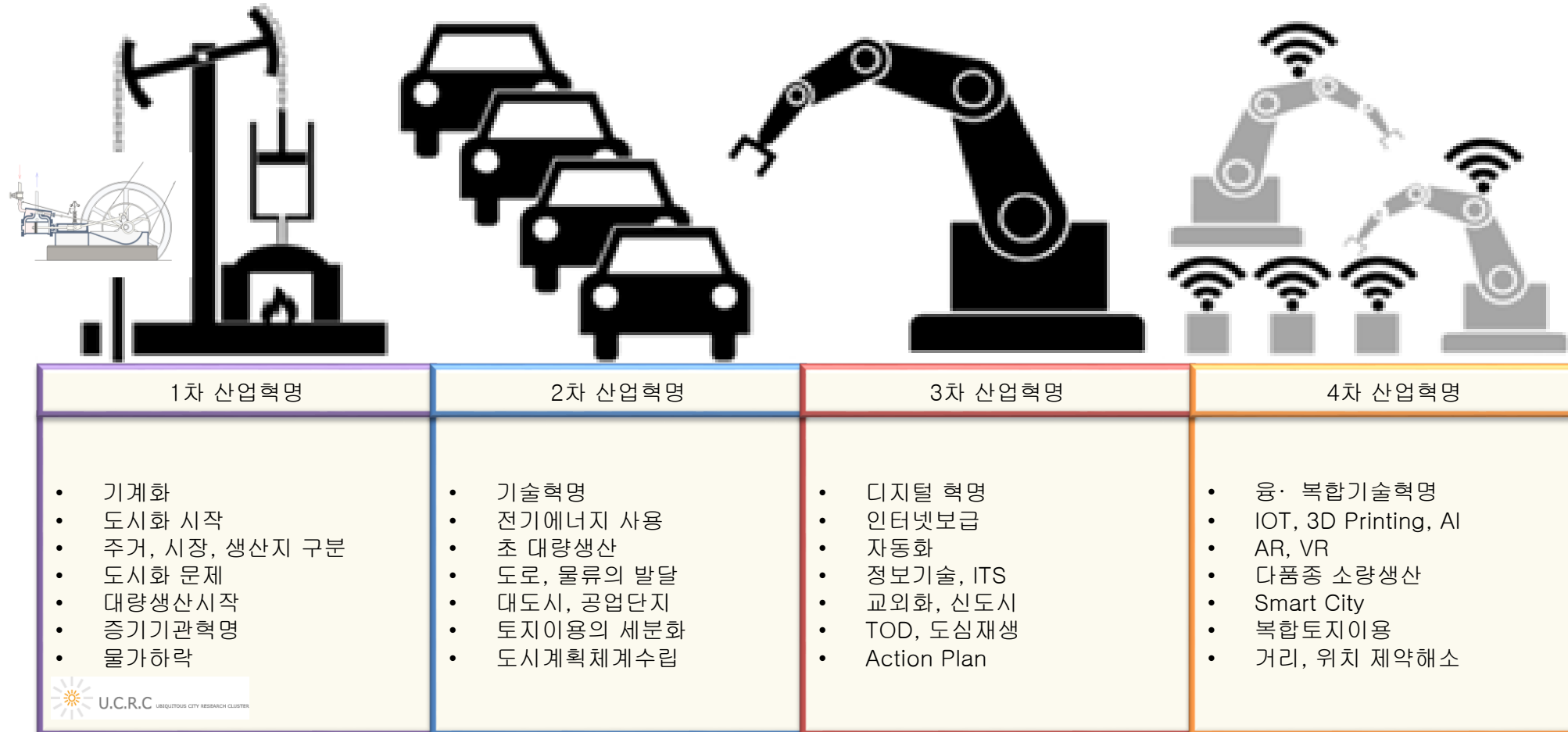
〈그림 1〉 실질임금 추세(Allen, 2009b: 52)



제도(개인 소유권 제도), 문화(기업가적 수완성과 창의성), 경제(기술 진보와 혁신의 수익성), 결핍으로 부터 나온 생존 욕망 (Kenneth Pomeranz, 2016)

4th Industrial Revolution

Strategies to 4th Industrial Revolution



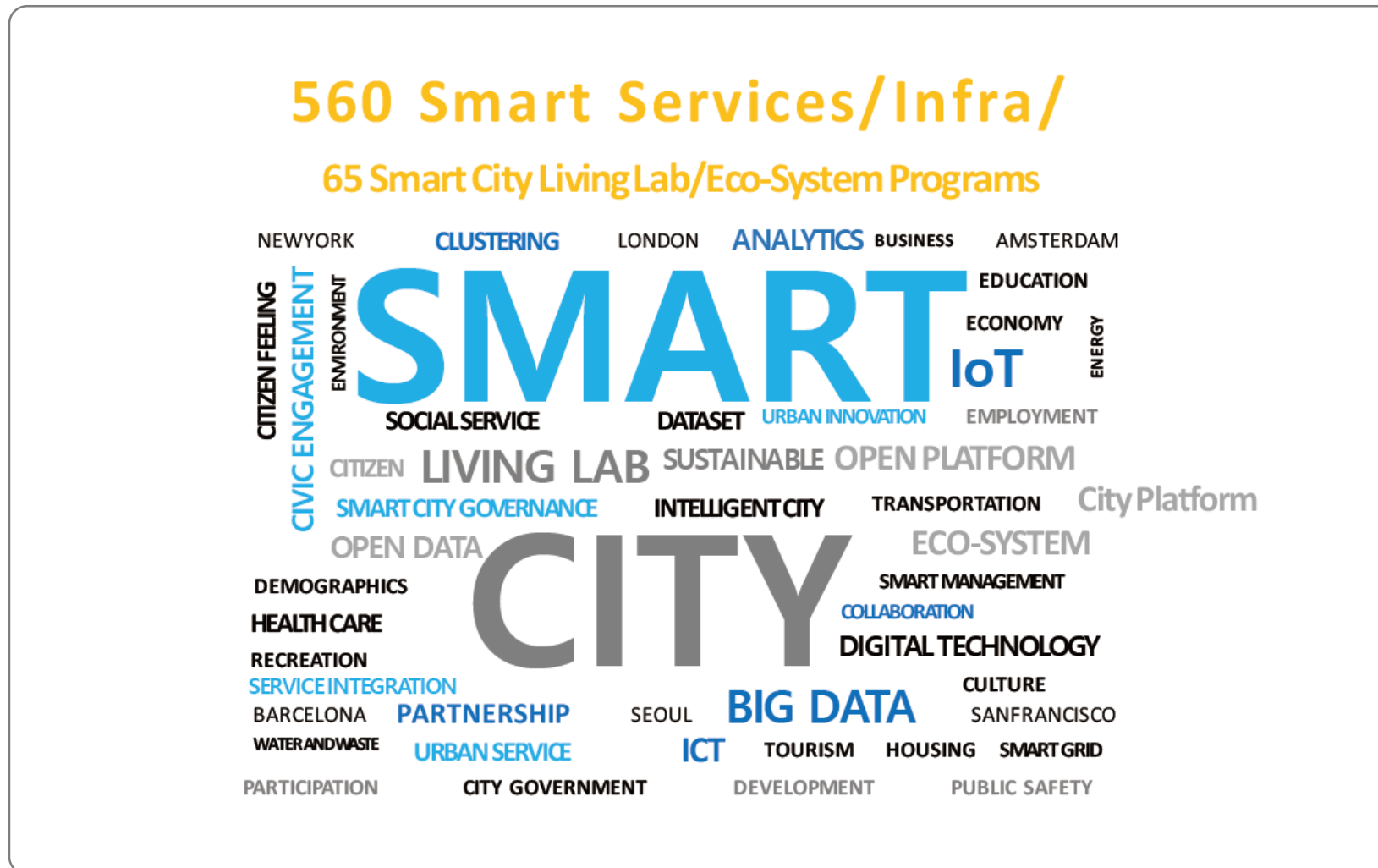
유완, 2017

1st I.R. James Watt, 증기기관, 방적기, 경공업, 영국
 2nd I.R. Tomas Alva Edison, 전기, 컨베이어벨트, 포드, 테일러, 중화학공업, 미국
 3rd I.R. 컴퓨터, 인터넷, Digital IT산업 미국, 일본, 독일
 4th I.R. CPS, 스마트팩토리, 독일

이상호, 2017

Smart City

ICBM– IOT, Cloud, Big Data, Mobile, Living Lab, AI

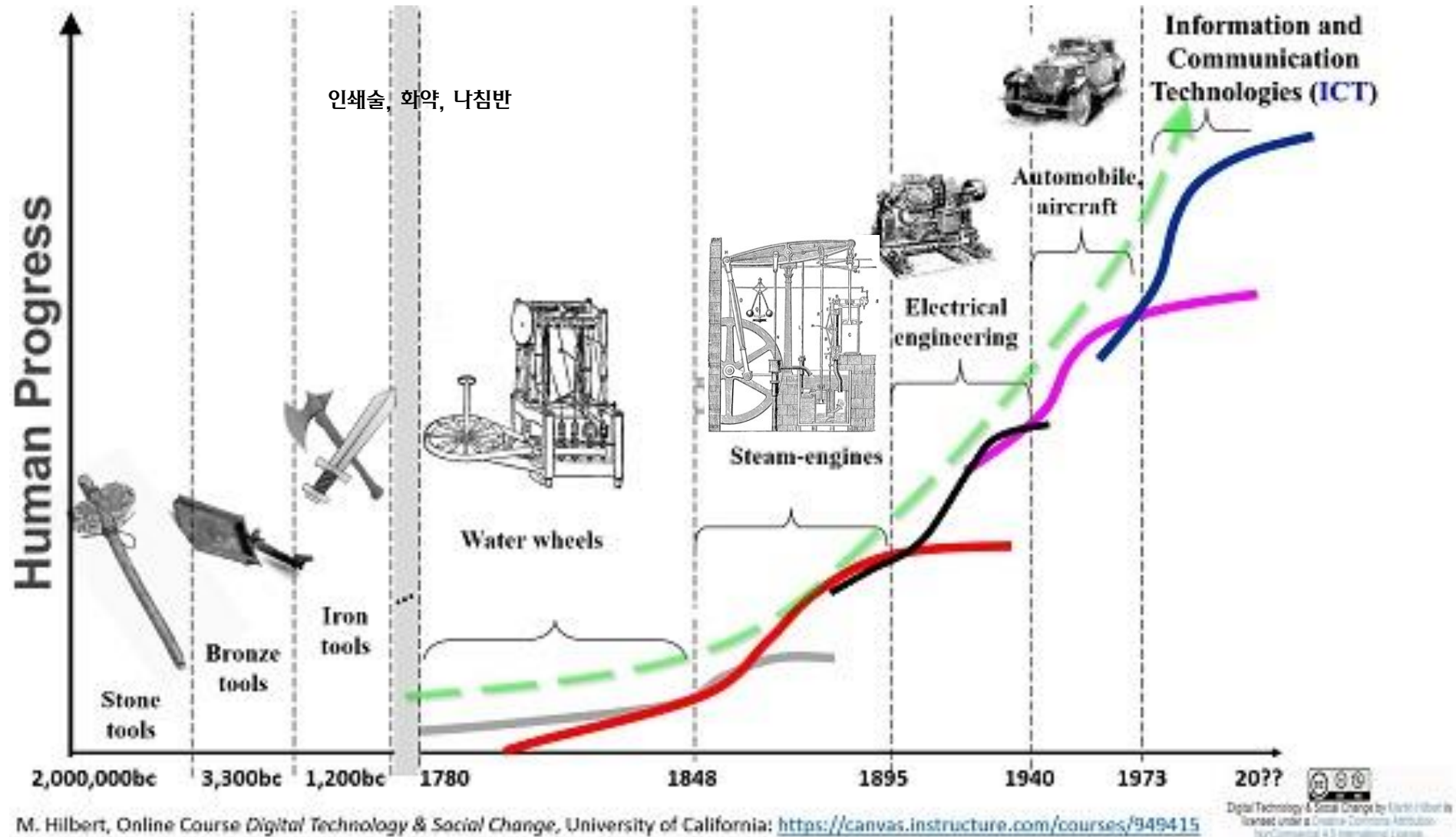


Smart City

Smart City is a ICTs and EcoTs embedded traditional spaces, where citizens can get any informational and eco services through any ICTs and EcoTs embedded infrastructure as well as traditional elements anywhere anytime.

New Infrastructure

New Normal, Smart Cities, Smart Regions, Smart Infrastructure



[Primitive-Mesopotamia, Egypt, India, China], [Ancient-Greek and Roman, Byzantine, Persia], [Medieval-Pre R, Romanesque, Gothic], [Modern-Renaissance, Baroque], [Contemporary-Morndernism, Post-M]

원시사회, 고대사회(노예사회), 중세사회(봉건사회), 근대사회(절대왕정), 현대사회(자본주의), 미래사회(?-정보지식)
 농업용수 댐-수로, 주작대로, 항만, 철도, 도로, 공항, 고속철도, 정보통신망 NII-BcN-WiFi, SCSN-SRSN

Smart City and Smart Region

Technology, Society, Space

What' s Going on Smart Cities
기술변화가 도시공간을 어떻게 변화시키고 있는가 ?
City' s Elements

Eco Intelligence City

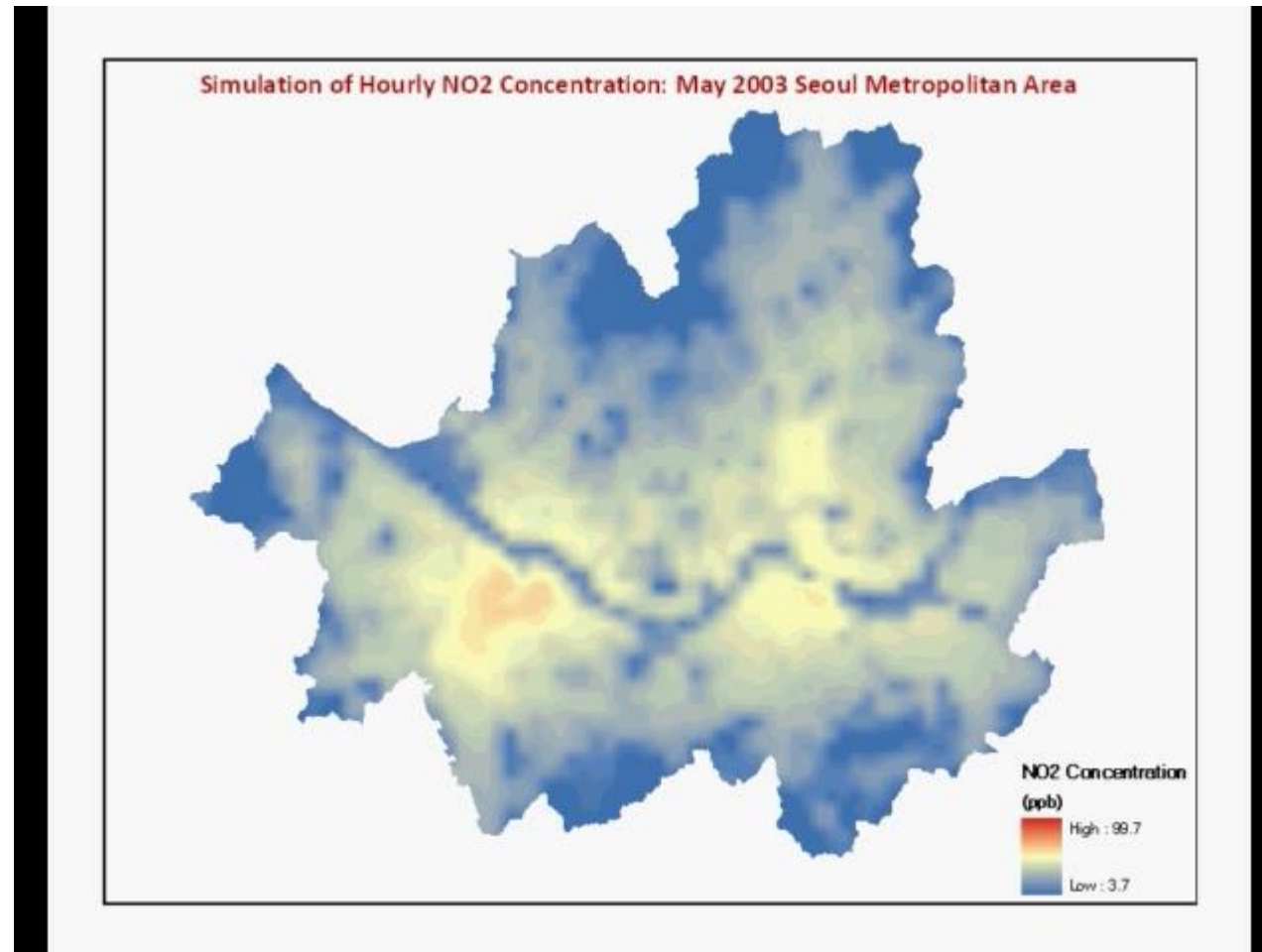
IoT City

Citizen Sensored City

Big Data City

City of Eco Intelligence

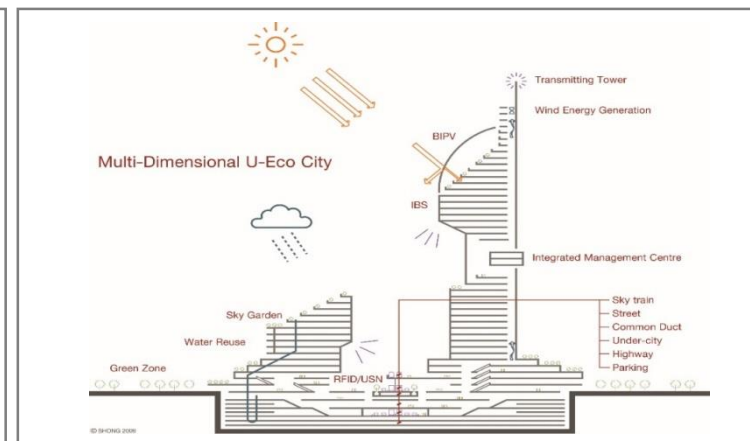
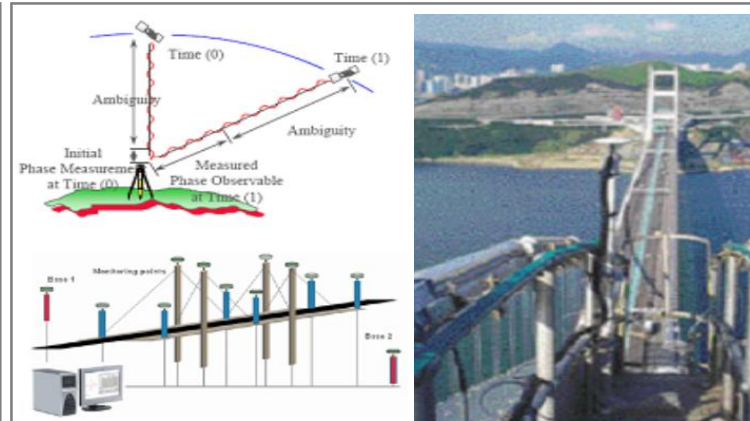
Eco Intelligence System for Low CO₂ Emission



Energy Metering System, CO₂ Eco Monitoring System

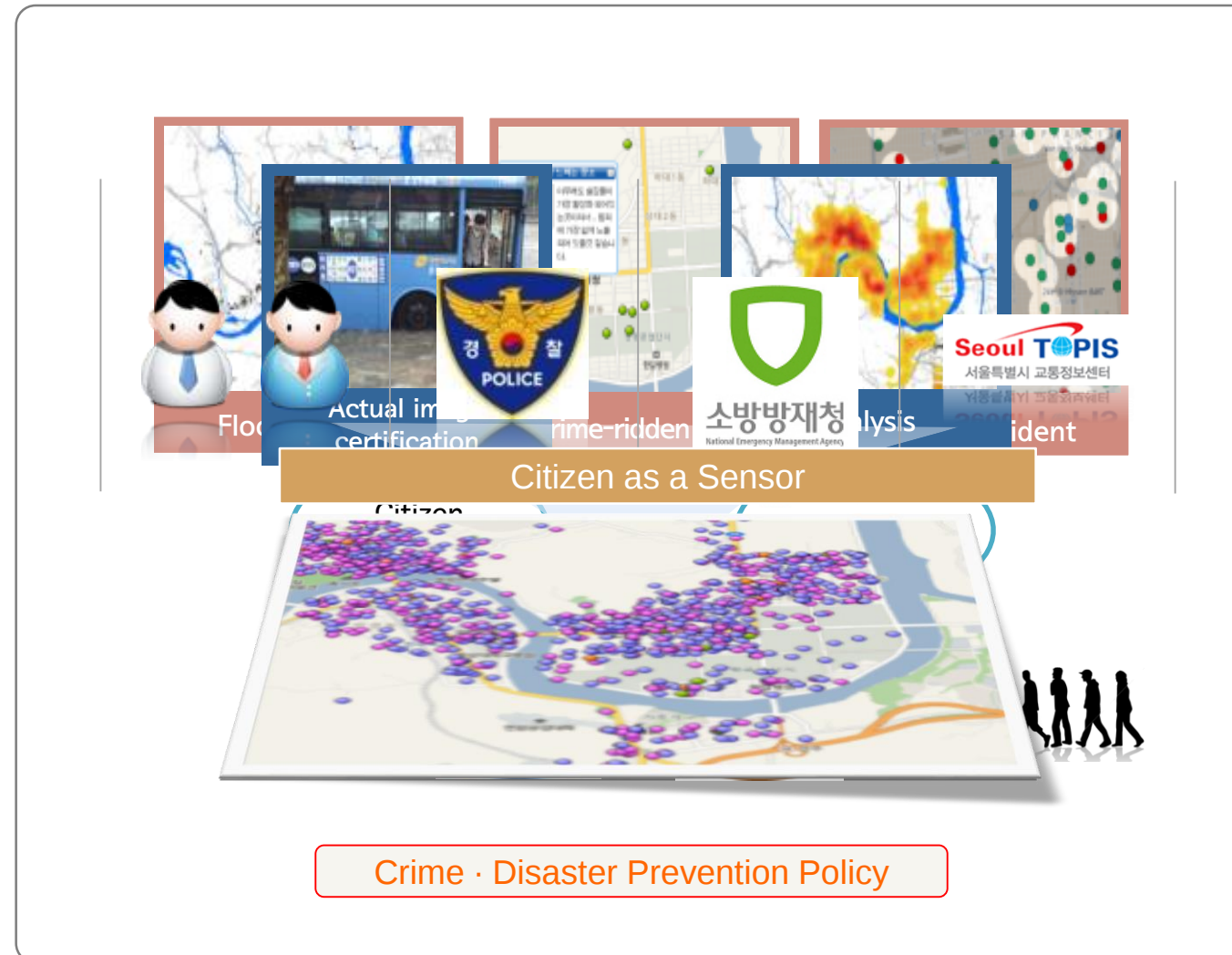
City of IoT Infrastructure

IoT infrastructure System for Low Cost High Efficiency



Citizen Sensored City

Citizen Initiated City



Citizen made safety Map through collective intelligence

시민이 교통위험지역, 범죄 예상 지역, 홍수 등 방재 예상 지역에 관한 정보를 GIS 공간 정보에 제보
공공정부가 시민 제안 위험 정보를 검증하여 예방 조치를 취하거나 시민에 정보를 제공하여 안전도시 구축
GIS 기반 민원지도 서비스

Big Data City

Real Time Based Transparent and trustable Data

パーソントリップ調査データを用いた人の流れ（東京都市圏）
People Flow from Person Trip Survey Data (Tokyo area)

Smart Region

From Smart City To Smart Region

What' s Next in Cities and Regions
지역은 뉴노멀에 어떻게 대응할 것인가 ?

Future of Cities and Regions

Paradigm Shift
Smart Region

Technological Innovation and Social Change

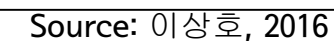
저출산 고령화에 따른 축소도시 Compact City

4차 산업혁명과 ICTs 기반의 Smart Knowledge Society

연계와 협력-선택과 집중에 기반한 저비용 고효율 네트워크 도시



65 Smart City Living Lab/Eco-System Programs

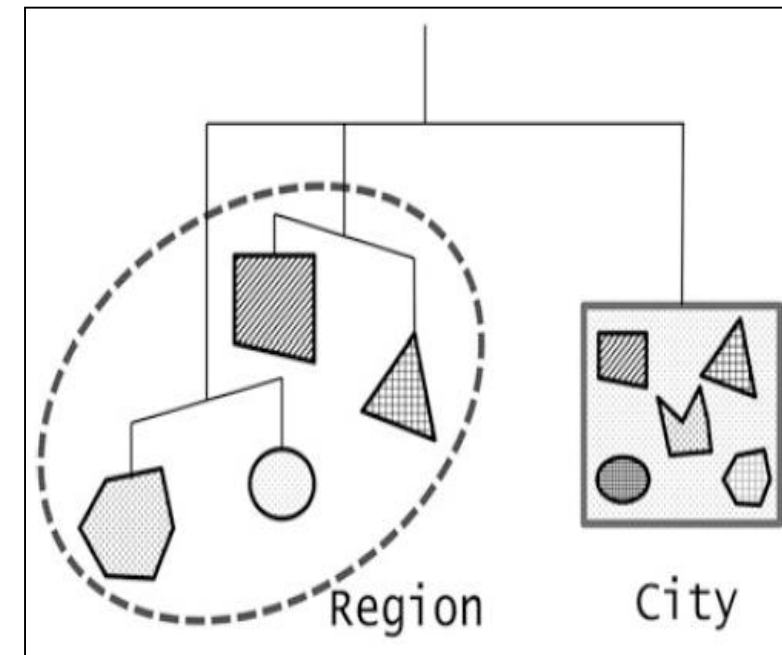
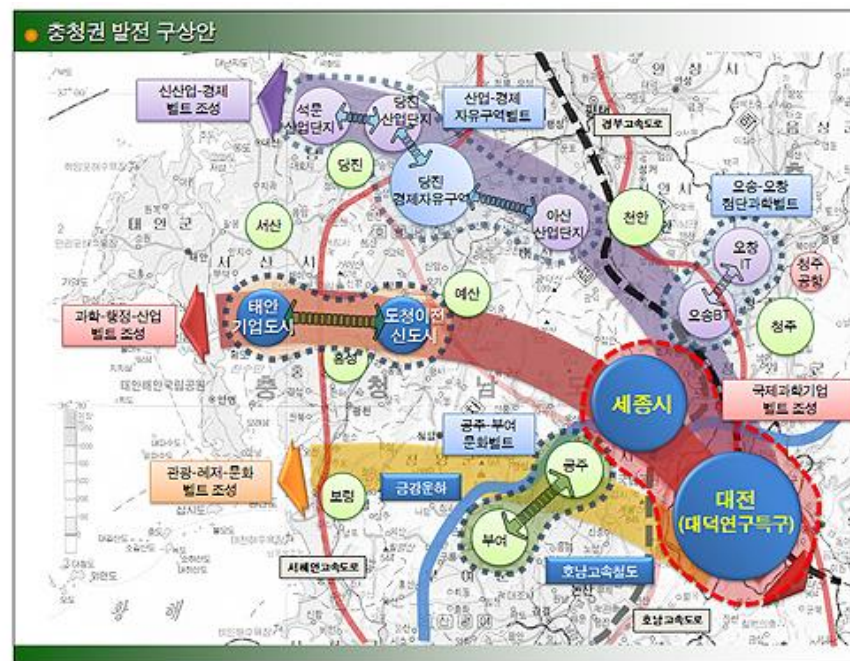


Smart Region

Networked Smart Cities

Orientation on Smart Region

지역간 경쟁...대전 세종 충청권 경쟁발전 vs 지역간 상생...대전 세종 충청권 상생발전
단절과 경쟁 vs 연계와 협력
규모의 경제, 지역간 계층구조 vs 범위의 경제, 지역간 네트워크 구조



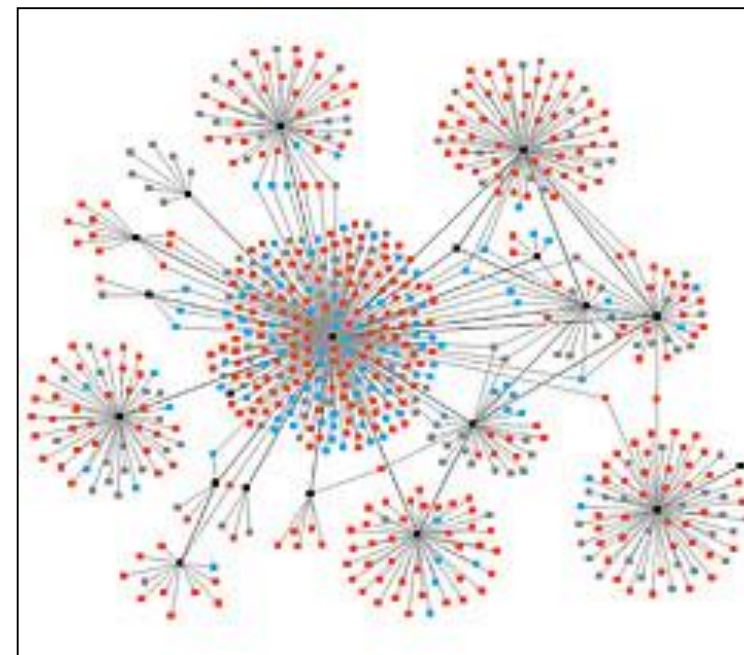
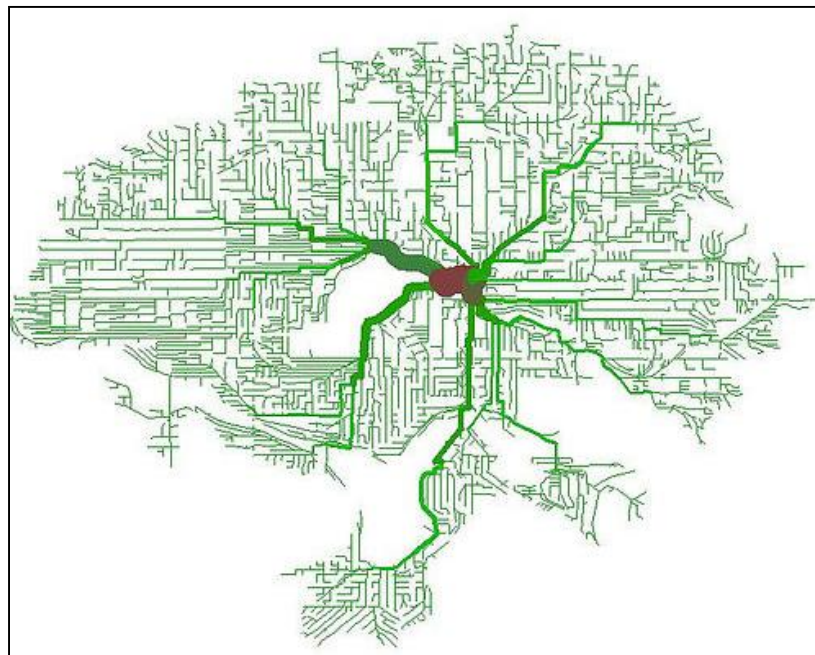
Source: 이상호, 2016

Smart Region

ICTs Based Services Networked Region through Smart Cities Alliance

Definition of Smart Region

Smart Region is a Networked Smart Cities, where citizens can get any informational and eco services through sharing any ICTs and EcoTs embedded infrastructure as well as traditional elements anywhere anytime.



Smart Region

Fundamental Principles..Death of Distance

Death of Distance

거리에 따라 인프라 등 고정비용은 차이 나지만, 운영비용은 비슷

From

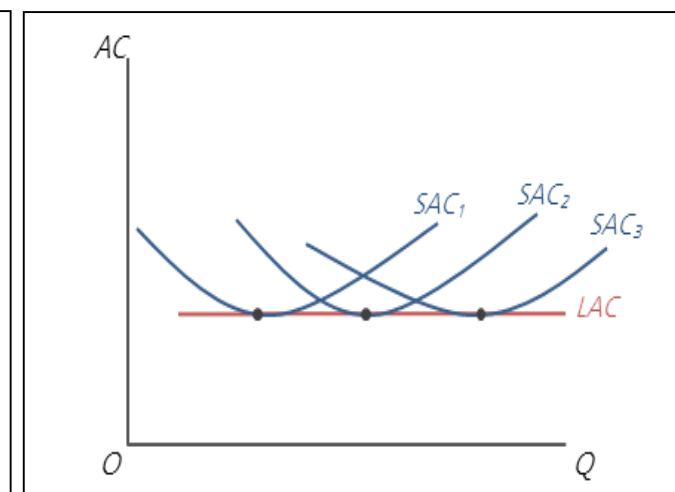
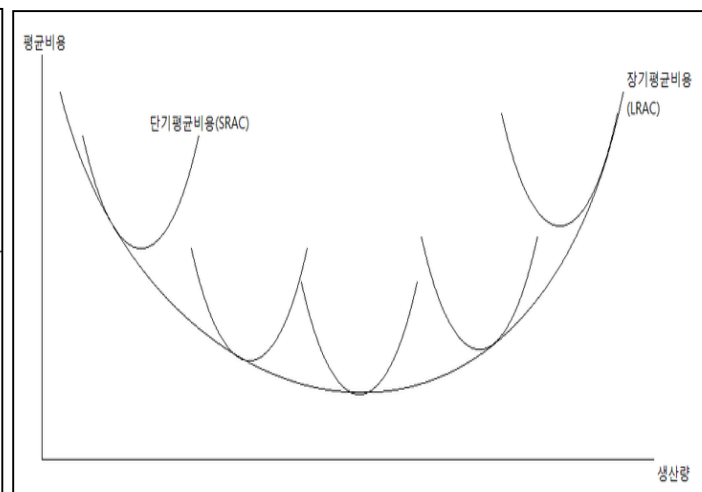
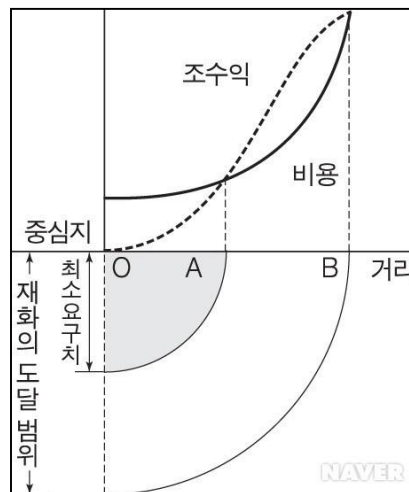
Distance Decay Function

규모의 경제와 규모의 불경제 발생, Economies and Diseconomies to Scale

To

Distance Homogeneous Cost Function

거리에 따라 비용 동일, Constant Return to Scale



Smart Region

Economies from the Economies of Scale to The Economies of Scope

Economies of Smart Region

규모의 경제, 지역간 계층구조 vs 범위의 경제, 지역간 네트워크 구조

From

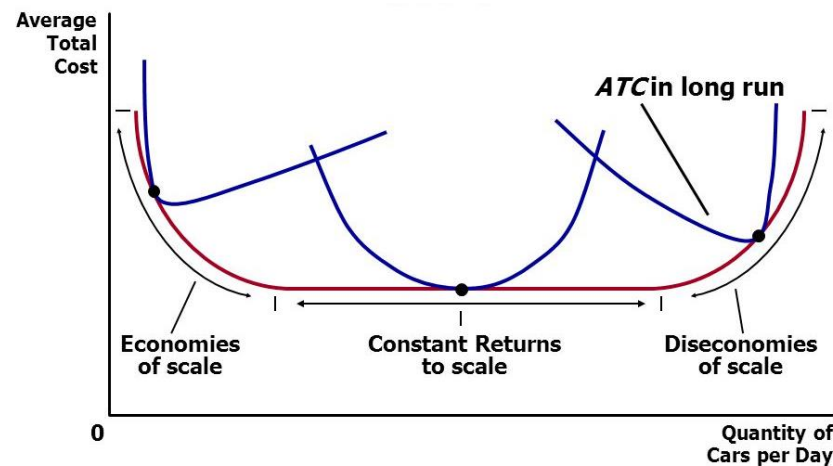
Economies of Scale, Scale of Economies

생산규모가 증대될 수록 생산비용(장기평균비용)이 감소
분업전문특화

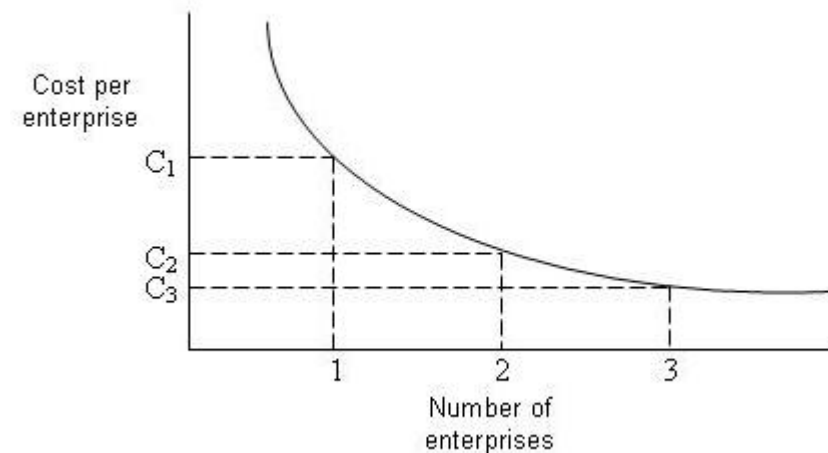
To

Economies of Scope, Scope of Economies

두기업이 한제품을 생산하는 것보다 한기업이 두제품 생산이 효율
공동이용과 합병



U.C.R.C. URBAN CLUSTER RESEARCH CENTER



Source: 이상호, 2016

Smart Region

Structure from Central Places to Networked Places

Homogeneous Regional Services Network

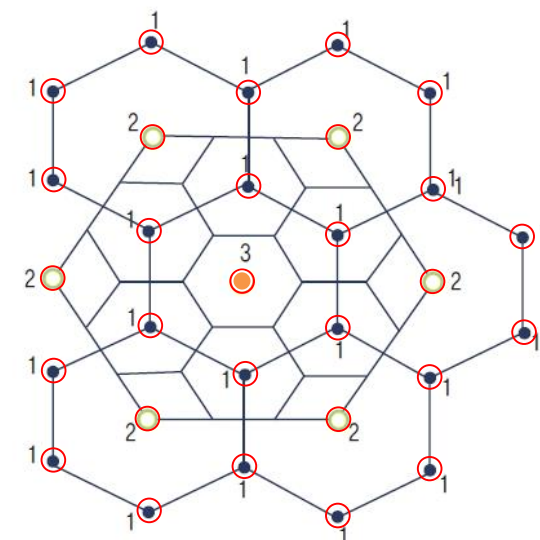
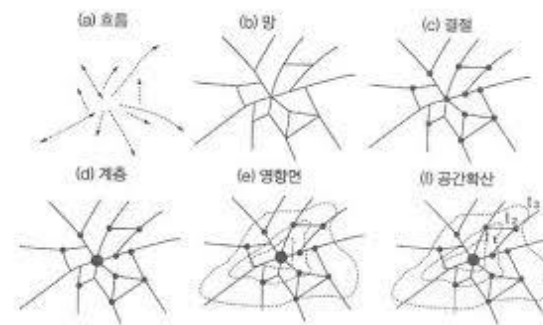
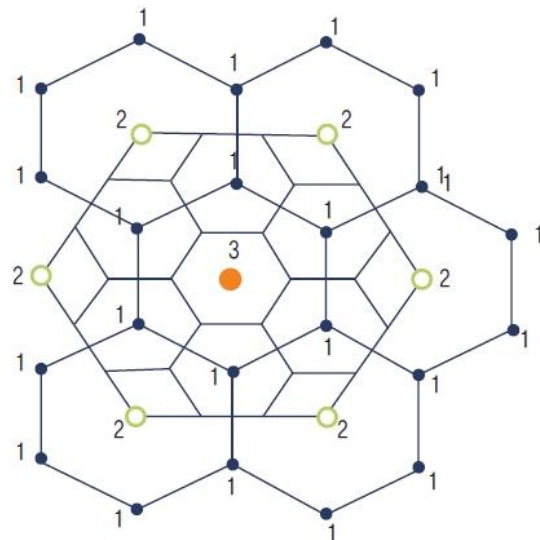
동일한 서비스를 즐길수 있는 지역간 네트워크 구조

From Hierarchical Services To Homogeneous Services

계층적 서비스 지역

Economies of Scope

동일 비용으로 서비스 공유 구조 체계가 갖춘 지역



Smart Region

Values from Hierarchical to Homogeneous Services Network

Values of Smart Region

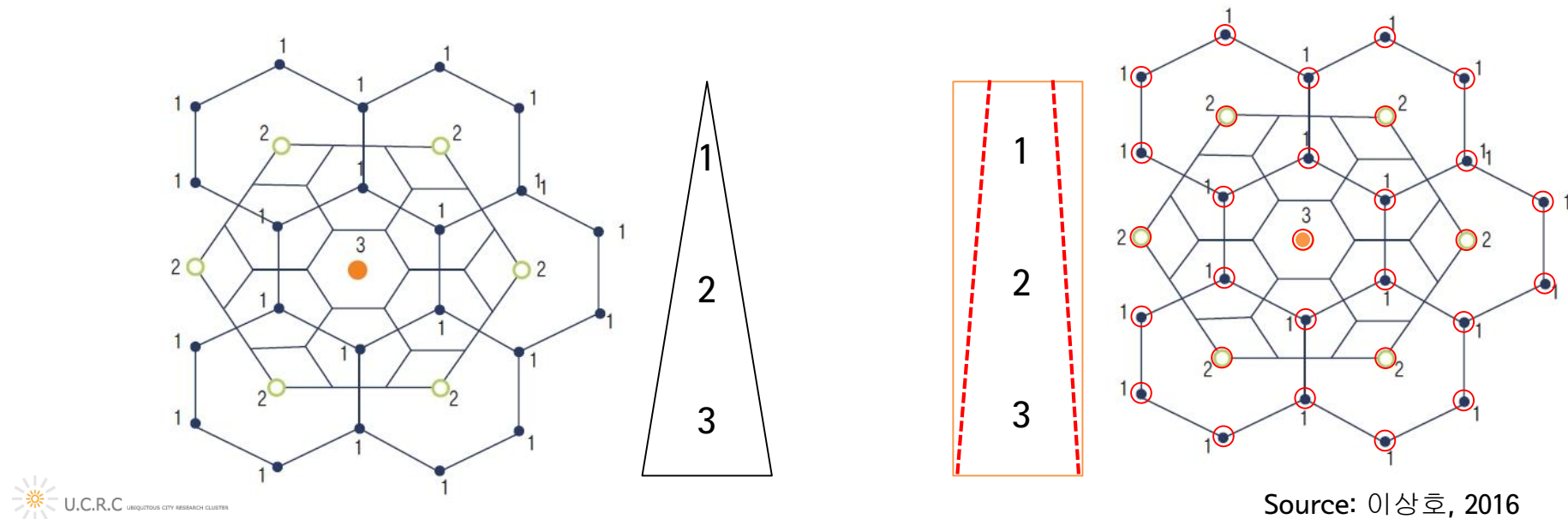
삶의 질 향상과 일자리 창출 그리고 지역격차 해소

Improving Quality of Life and Increasing Job Creation

4차산업혁명에 따른 일자리 창출과 고차서비스의 공유

Regional Disparity Free

교육, 의료 복지 등 고차서비스의 공유를 통한 지역격차 해소



Smart Region

Types of Higher Level of Services Sharing such as Education, Healthcare and Global Services

Higher Level of Services Sharing

서비스 실현을 위한 인프라 수준에 따라

Point Service Network City

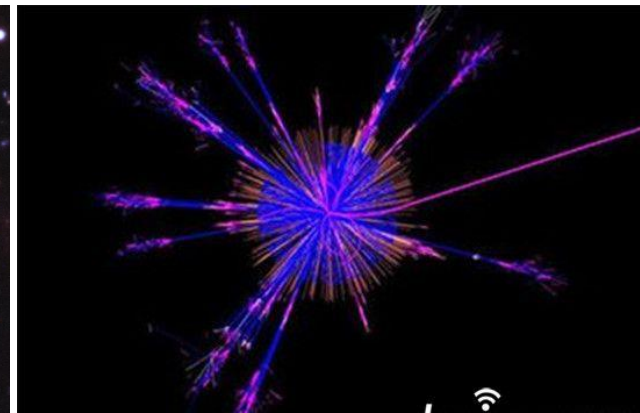
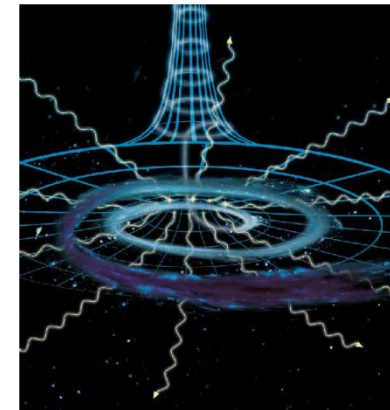
도시지역 원격 의료/교육 Services

Linear Service Network City

고속철도/도로 Smart Factory Services

Space Service Network City

메가시티 Global Services



Smart Region Examples and Impacts

Smart Region Targeting from Technology Push to Demand Pull

What' re Examples in Smart Regions
세계는 스마트리전을 어떻게 준비하고 있는가 ?

Future of Cities and Regions

Smart Region Example

Smart Region Effect

World Smart Region[1]

Smart Region Targeting from Technology Push to Demand Pull

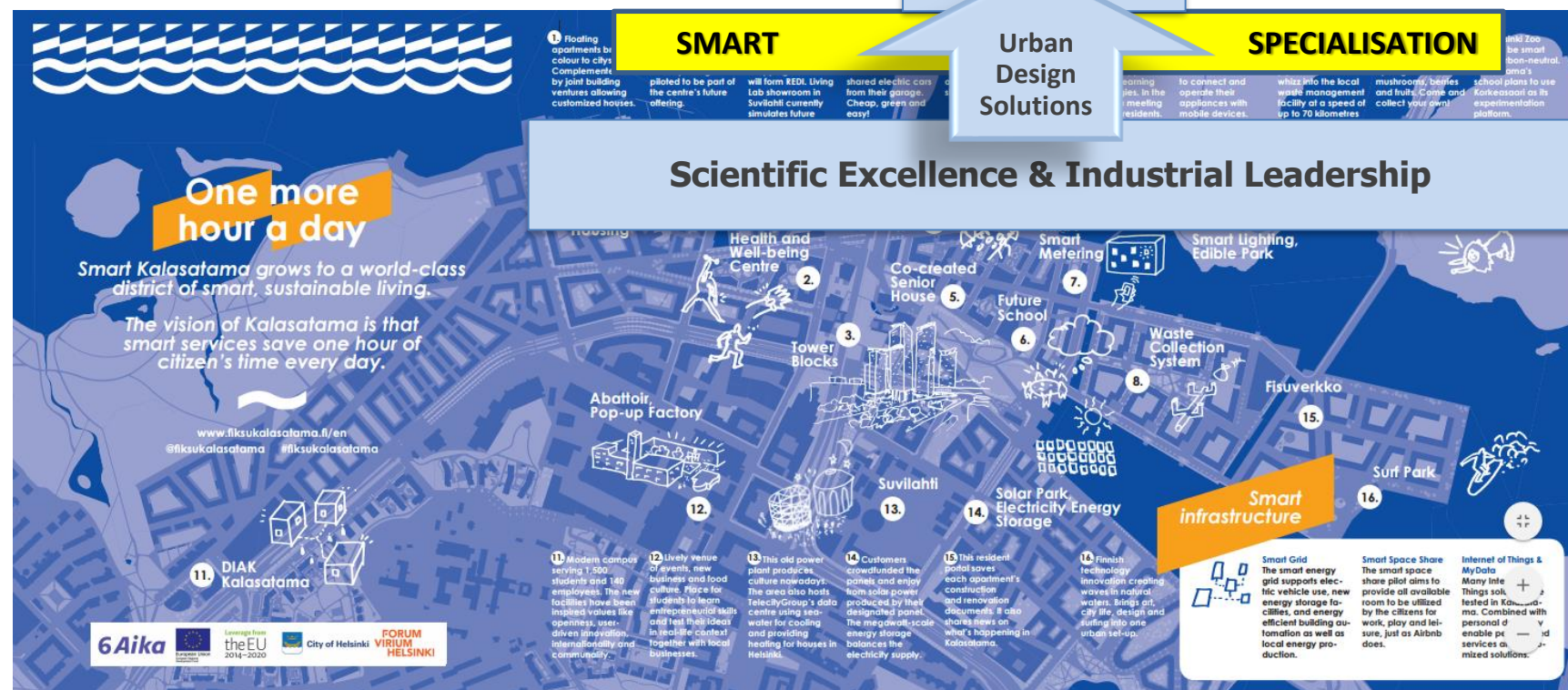
[EU] Towards Smart Regions and Cities

Horizon 2020 Frame for Research and Innovation:
How to Speed up and Scale up EU 2020 Implementation



Source: 김한준, 2016

[Finland] Helsinki, Kalasatama smart District



World Smart Region[2]

Smart Region Targeting from Technology Push to Demand Pull

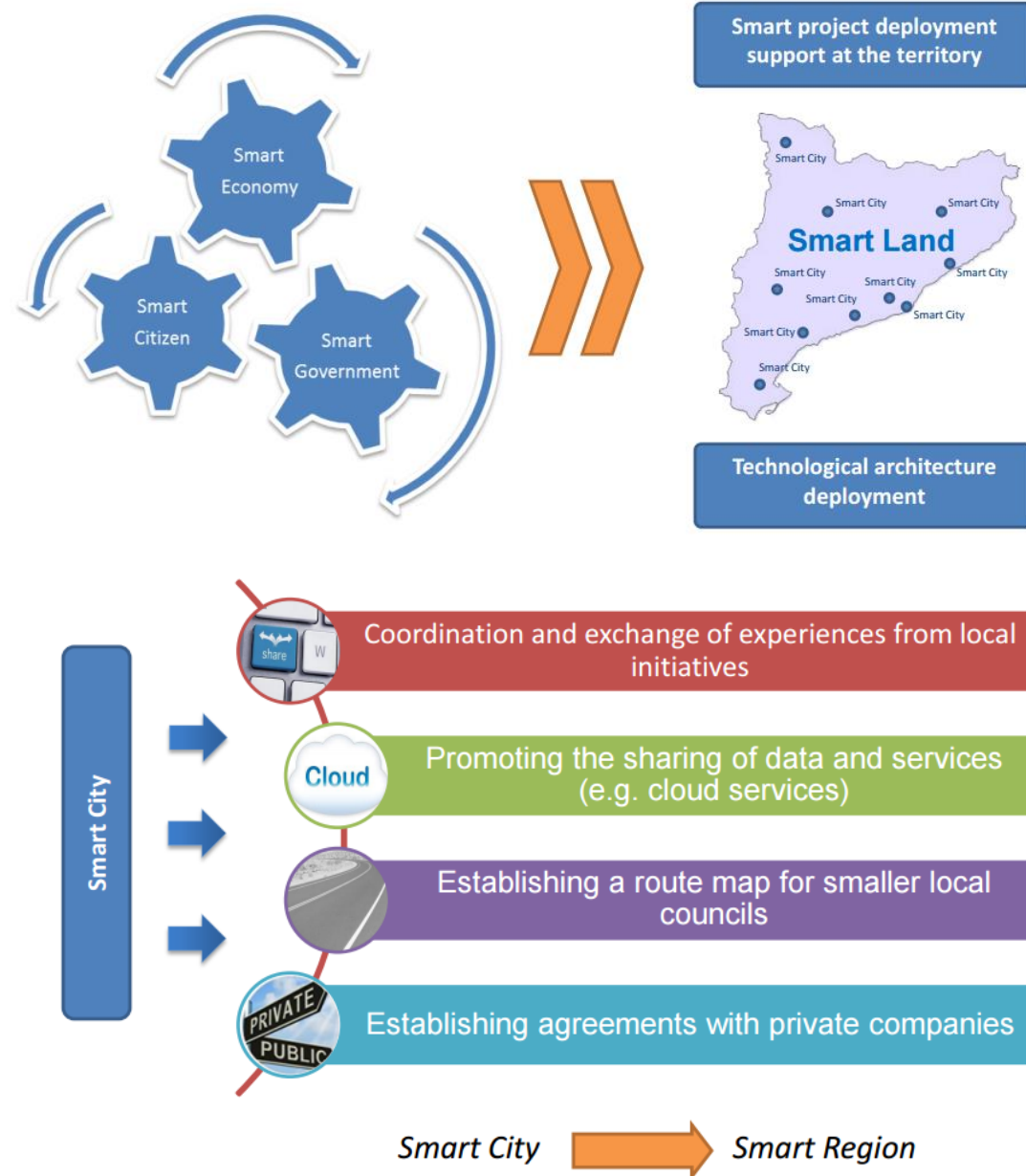
[Spain] SmartCAT-alonia

카탈루니아 지역에 스마트 시티 프로젝트를 공공 민간 협력으로 붐업하여 전개시킨다.

이를 통해 스마트 도시가 확산되어 스마트 지역이 된다. 그것이 스마트 국토이다.



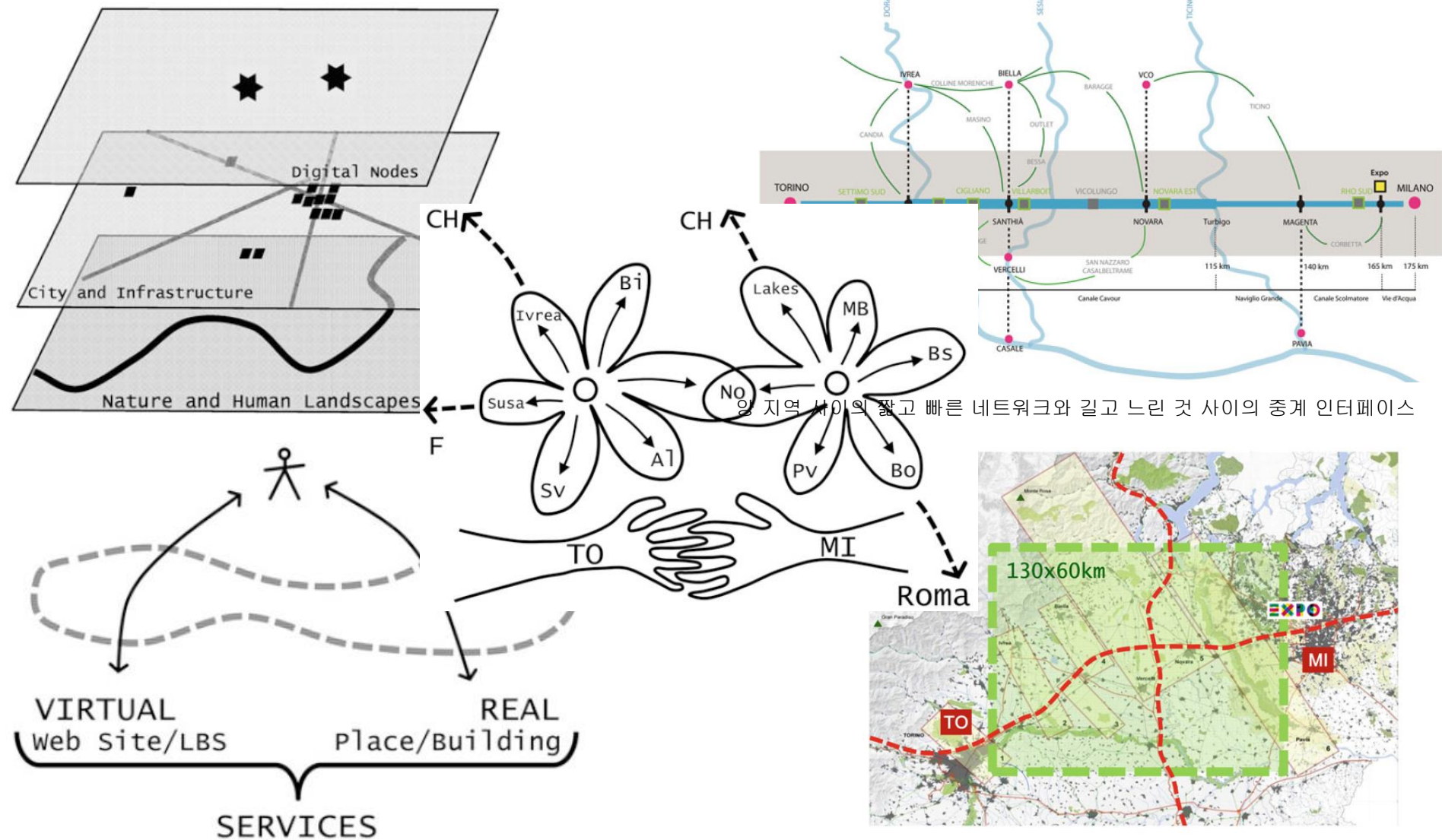
Source: 김한준, 2016



World Smart Region[3]

Smart Region Targeting from Technology Push to Demand Pull

[Italia] Milan-Turin Smart Region



밀라노와 토리노 사이 메트로폴리탄 지역의 네트워크와 노드



사용자 참여형
스토리보드 구성
- 대학 및
주변지역을
포괄하여 거주민 및
관계자들의
정보입력과 콘텐츠
추가

목적
. 지속가능한 혁신
. 대학연구프로젝트
로서 생산혁신과
실험 지속
. 내부적용실험 후
시내 전역 확산
. 국제적인 차원과
시야에서 공동전개

6가지 테마영역
• 사람
• 에너지
• 환경
• 이동성
• 시티
• 음식과 건강
테마별 작업그룹조직.



Impact of Smart Region[3]

Input Output Analysis from 1990 to 2014 with Structural Path Analysis

◇ Input-output production's change analysis

- ✓ In terms of the change of industrial production, it is YES to the question that Is there the sign of the 4th industrial revolution in Korea?
 - ✓ The growth rate of ITS, ITM and KS production has increased by 2,780%, 1,533% and 1,195% respectively, greater than the average growth rate of 904% during the period from 1990 to 2014.
 - ✓ The share proportion of KS, ITM and ITS production to total industrial production shows a steadily increase of 5%, 4%, 2% during The period from 1990 to 2014.

The change of Input-Output Production

(Unit : Trillion Won) **Table 1**

Industry	Intermediate Input(Production Share)		Share Change	Production Growth Rate
	1990	2014	2014-1990	2014/1990
Agriculture	24.1 (6%=24.1/417*100)	61.4 (2%=61.4/3,769*100)	-4%	255%
IT Manufacture	25.4 (6%)	389.7 (10%)	4% ② ITM	1,533% ② ITM
Non IT Manufacture	181.2 (43%)	1408.1 (37%)	-6%	777%
Construction	51.0 (12%)	320.3 (8%)	-4%	628%
IT Service	4.3 (1%)	119.6 (3%)	2% ③ ITS	2,780% ① ITS
Knowledge Service	64.3 (15%)	768.2 (20%)	5% ① KS	1,195% ③ KS
Etc Service	66.6 (16%)	590.7 (16%)	0%	887%
Total Production	417.0 (100%)	3769.0 (100%)	0%	904%

2017 Asian Regional Science Association Fall Conference

Impact of Smart Region[3]

Input Output Analysis from 1990 to 2014 with Structural Path Analysis

◇◇ Input-Output Coefficient(A) Matrix of 1990 and 2014

- ✓ Input output coefficient represents the quantity of the i industry good that is needed to produce one unit of the j industry good.
(Homa Motamen, 1987).

Table 2

〈1990〉		1	2	3	4	5	6	7	
Unit : Million Won		Agriculture	IT Manufacture	Non IT Manufacture	Construction	IT Service	Knowledge Service	Etc Service	Total
1	Agriculture	0.0834	0.0007	0.1309	0.0208	0	0.0006	0.0083	0.2447(100%)
2	IT Manufacture	0.0029	0.3653	0.0188	0.0339	0.0248	0.005	0.0095	0.4602(100%)
3	Non IT Manufacture	0.1762	0.216	0.454	0.2974	0.0127	0.0689	0.2114	1.4366(100%)
4	Construction	0.0096	0.0082	0.0155	0.0317	0.0172	0.0541	0.0204	0.1567(100%)
5	IT Service	0.0013	0.0027	0.0022	0.0024	0.0415	0.012	0.0214	0.0835(100%)
6	Knowledge Service	0.0234	0.0491	0.0446	0.0845	0.0345	0.1147	0.1058	0.4566(100%)
7	Etc Service	0.042	0.0731	0.0638	0.0607	0.0325	0.0545	0.1083	0.4349(100%)
Total		0.3387	0.7151	0.7298	0.5314	0.1632	0.3098	0.4851	3.2732(100%)

Table 3

〈2014〉		1	2	3	4	5	6	7	
Unit : Million Won		Agriculture	IT Manufacture	Non IT Manufacture	Construction	IT Service	Knowledge Service	Etc Service	Total
1	Agriculture	0.055	0.0001	0.118	0.1286	0.0002	0.0016	0.0098	0.3133(128%)
2	IT Manufacture	0.0022	0.3876	0.0208	0.0443	0.0678	0.0211	0.0089	0.5527(120%)
3	Non IT Manufacture	0.2923	0.2212	0.5069	0.29	0.0422	0.0842	0.159	1.5958(111%)
4	Construction	0.0088	0.0129	0.0253	0.0687	0.0185	0.0387	0.0304	0.2033(130%)
5	IT Service	0.0019 (+0.0006)	0.0077 (+0.005)	0.0033 (+0.0011)	0.0033 (+0.0009)	0.14 (+0.0985)	0.0331 (+0.0211)	0.0368 (+0.0154)	0.2261(271%)
6	Knowledge Service	0.0212	0.0347	0.0361	0.0794	0.1712	0.1317	0.1236	0.5979(131%)
7	Etc Service	0.0543	0.06	0.0799	0.0385	0.1119	0.0561	0.1151	0.5158(119%)
Total		0.4359	0.7243	0.7901	0.6529	0.5517	0.3664	0.4835	4.0049(122%)

2017 Asian Regional Science Association Fall Conference

Impact of Smart Region[3]

Input Output Analysis from 1990 to 2014 with Structural Path Analysis



The Result of Structural Path Analysis

- ✓ Table 10 is the result of structural path analysis of 7 industries as shown in the table 8.
 - ✓ 290 production paths were newly created by developing new value chains and enhancing value-added, while 6 production paths were phased out.
 - ✓ A total of 238 of the 290 new paths were related to knowledge and IT, both direct and indirect.
 - ✓ Out of the 105 indirect paths, 38 took place in NITM, followed by 26 in ES, 23 in C and 18 in AM.
- Traditional industries such as NITM, ES, C, AM had a greater share of new production paths than the average of 50%.
- ✓ It means that in the era of the 4th Industrial Revolution, not only IT technology is developed, but a new business value chains are created in the course of convergence of various industries.

Table 10

1990→2014 All industries Structural Paths		Extinct Path	Newly Created Path
Agriculture	A Other Industries	0(0)	14(9)
	Other Industries A	1(0)	20(9)
	A Total	1(0)	34(18)
IT Manufacture	ITM Other Industries	2(1)	18(11)
	Other Industries ITM	0(0)	23(14)
	ITM Total	2(1)	41(25)
Non IT manufacture	NITM Other Industries	0(0)	17(10)
	Other Industries NITM	2(1)	36(28)
	NITM Total	2(1)	53(38)
Construction	C Other Industries	0(0)	20(13)
	Other Industries C	0(0)	16(10)
	C Total	0(0)	36(23)
IT Service	ITS Other Industries	1(0)	38(27)
	Other Industries ITS	0(0)	13(9)
	ITS Total	1(0)	51(36)
Knowledge Service	KS Other Industries	0(0)	19(12)
	Other Industries KS	0(0)	22(16)
	KS Total	0(0)	41(28)
Etc Service	ES Other Industries	0(0)	19(15)
	Other Industries ES	0(0)	15(11)
	ES Total	0(0)	34(26)
ITM+ITS+KS Total		3(1)	133(89)
A+NITM+C+ES Total		3(1)	157(105)
All Industries Total		6(2)	290(194)

238

() is the number of the indirect knowledge and IT related paths.
Indirect knowledge (KS) and ITM (ITS) mean a type of A-KS (NITM, NITM - ITS, ITM - ES, C

Thank you.

If you have any questions, Feel free contact UCRC

Sang Ho Lee, Ph.D

Professor, Dept. of Urban Planning and Engineering

Hanbat National University

UCRC, Ubiquitous City Research Cluster

Lshsw@hanbat.ac.kr