2017

Univer+City
for sustainable growth

Prof. Heung-No, Lee (GIST)

17th October, 2017

[Program of 9th Joint Korean-German Conference]

October 16th

19:30 – Reception

Moderation	Kyung Hee LEE
	Christoph Pollmann
Welcome Address	Jang Hyeon YOON (Mayor of Gwangju)
	Hwang-Sik KIM (Chairman of ADeKo & former Prime Minister)
	Stephan Auer (German Ambassador to Korea)
Welcome Keynote	Sang-Bae LEE (Director General of Strategy Industry Headquarters, Gwangju)
Performance	Gwangju Culture Art
Toast	Hwang-Sik KIM and Jang Hyeon YOON

October 17th

08:00 – 09:00 Registration

09:00 – 09:30 Opening Session 1

Moderation	Sun Young Park
Welcome Address	Hwang-Sik KIM (Chairman of ADeKo & former Prime Minister)
	Jang Hyeon YOON (Mayor of Gwangju)
	Stephan Auer (German Ambassador to Korea)
	Frithjof A. Maennel (Deputy Director General of BMBF)
	Christian Müller (Director of strategy department, DAAD)
	Seung-hyeon MOON (President of GIST)
	Byung Seok JEONG (President of CNU)
	Ki-Chul LIM (President of KISTEP)

09:30 – 09:45 Opening Session 2

Ungyu PAIK (Minister of Korean Ministry of Trade, Industry and Energy) *(tbc)*

09:45 – 10:15 VIP Photo Session & Coffee Break

◆ **Presentation**

- Every session has simultaneous interpretation (K-E) so that you can make your presentation in Korean or English. However, presentation material needs to be in English. Please send us your material no later than October 13.
- Presentation materials.- Presentation materials.

1. Type of Application: Microsoft PowerPoint
2. Please let us know if you want to use Videos, Sound, Internet etc.

2. Official and Social Program

◆ **Welcome Reception**
- Date: October 16, 19:30~
- Venue: Convention Hall (4F), Kimdaejung Convention Center
- Program: Welcome Keynote, Welcome Address, Cultural Performance, etc.
- Dress Code: Comfortable Attire

◆ **Opening Ceremony**
- Date: October 17, 09:00~10:00
- Venue: Convention Hall (4F), Kimdaejung Convention Center
- Program: Welcome Address, Photo Session

◆ **Panel Discussion & Closing Ceremony**
- Date: October 17, 16:30~17:30
- Venue: Convention Hall (4F), Kimdaejung Convention Center

3. Tour Program

◆ **Night Tour**
- Date&Time: 19:00-22:00, October 17, 2017
- Course: Asia Culture Center→Chungjangro→Sajik Park Observatory Tower

◆ **Technical & Culture Tour**
- Date&Time: 09:00-17:30, October 18, 2017
- Course: KEPCO→Medical Microrobot Center→Gwangju Design Biennale 2017

4. Useful Information

◆ **Registration**
- Online registration: If you have not registered yet, please visit www.adeko2017gwangju.kr and register.
- On-site registration desk: Please find your ID card at the registration desk. It is located in Convention Hall Lobby (4F)
- Registration for DAAD Alumni: When you are a DAAD Alumni please register also at the DAAD registration booth.

Agency. miceoneco., ltd
Tel.+82-62-382-2083,Fax.+82-62-382-2088,E-mail.julyra@miceone.co.kr, jani221@miceone.co.kr

Agenda

- Smart city?
- Smart city projects around the globe
- University led smart city project for sustainable growth
- Summary

City

- History of Cities, BC 7K years
- Now, people in developed nations reside in cities
- Why?
  - Jobs, economy of scale, Wealth of human networks and markets, water and energy, sewage system
- Problems of modern cities?
  - Heavy traffic, high living and educational costs, crimes, safety, disasters, eradication of jobs due to 4th IR, loss of uniqueness in local culture, income inequalities, social conflict …

Smart City, What & Why

Smart City?

- Solve problems of cities using **smart** technologies, **improve the lives of city dwellers**, improve efficiency in living, build environment friendly and self sustainable energy grid, develop unique local culture, revitalize the local economy

Key Parts

- Smart **Energy**, Smart **Evn**, Smart **Traffic**, Smart **Safety**, Smart **Medicine**, Smart **Edu**, Smart **Gov**, Smart **Work**, Smart **Culture**, Smart **Tourism**, Smart **Community**

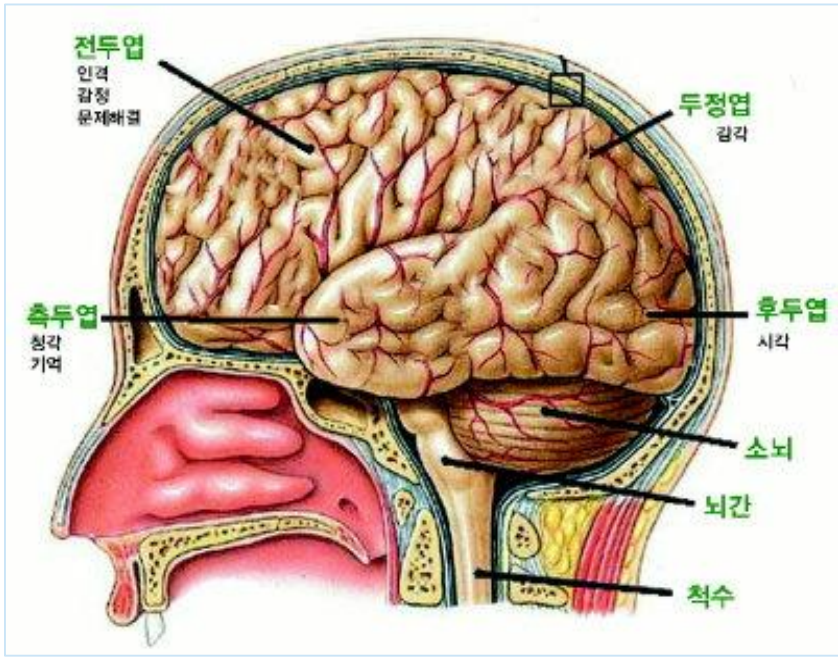
What is Smartness?

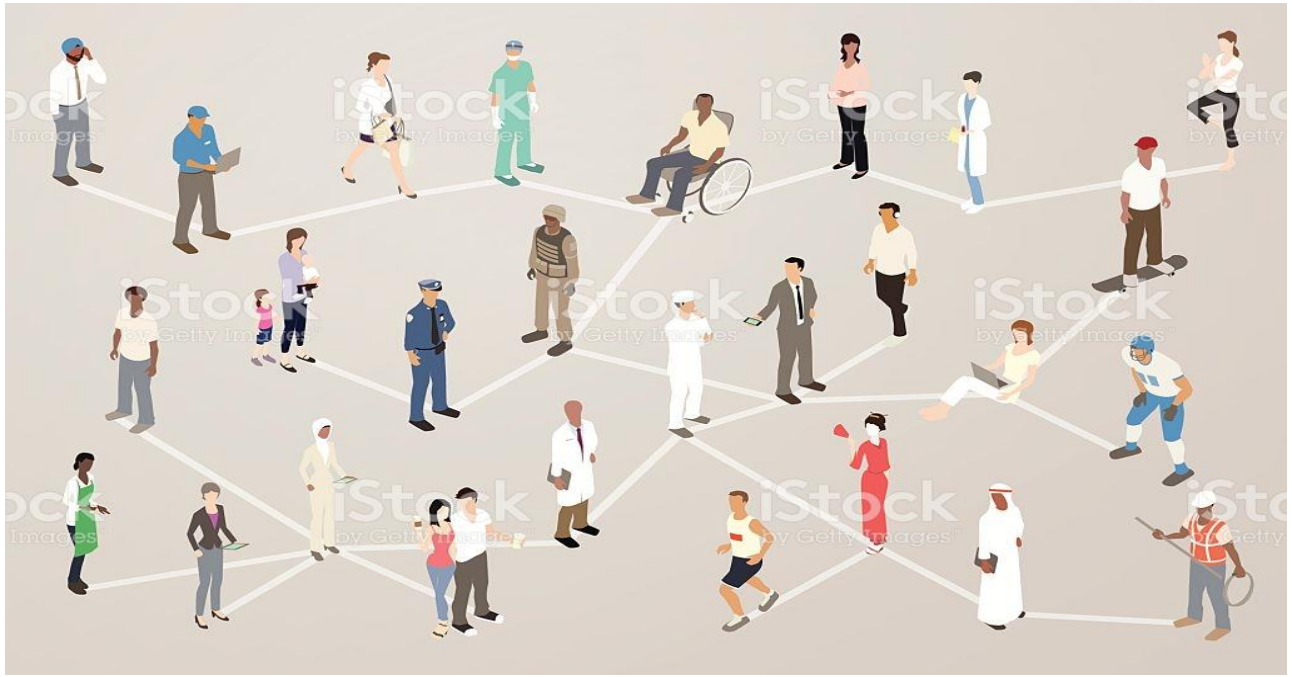
Brain, network of cells

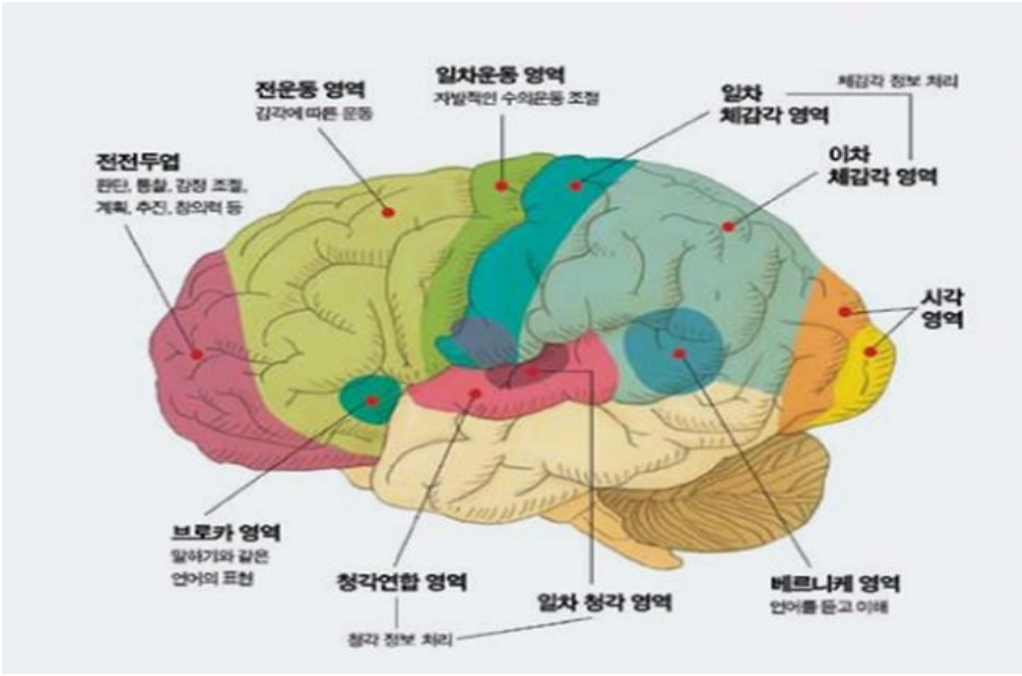
Human Intelligence is in the Brain.

And, it is in Social network.

Human has Life.



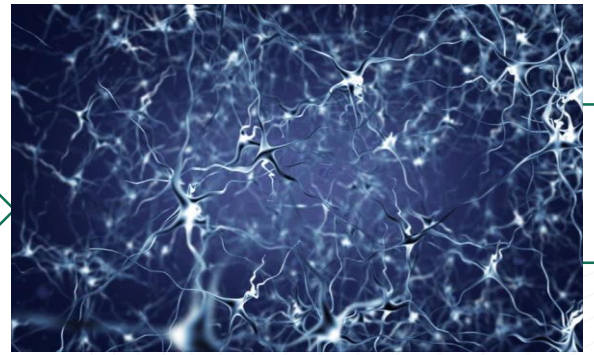




Brain: Network of Cells, Product of Social Network

Situational Awareness

(Signal + Experience)



Sensors

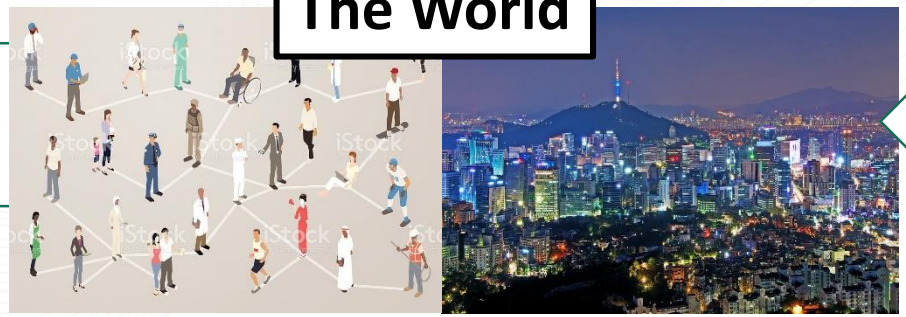
: Reception of the signal

Seeing
Listening
Smelling
Touching
Feeling

Asking
(Parents, Teachers)

Reading a book
Watching the TV
SNS

Through Sensing!



Actions

: make decisions

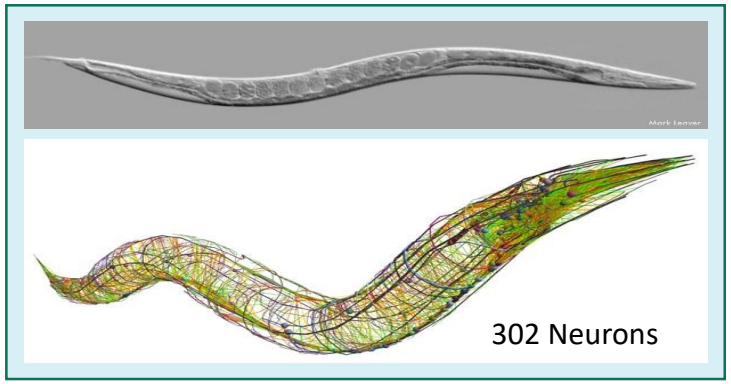
walking
Eating
Wearing
Studying
Playing…

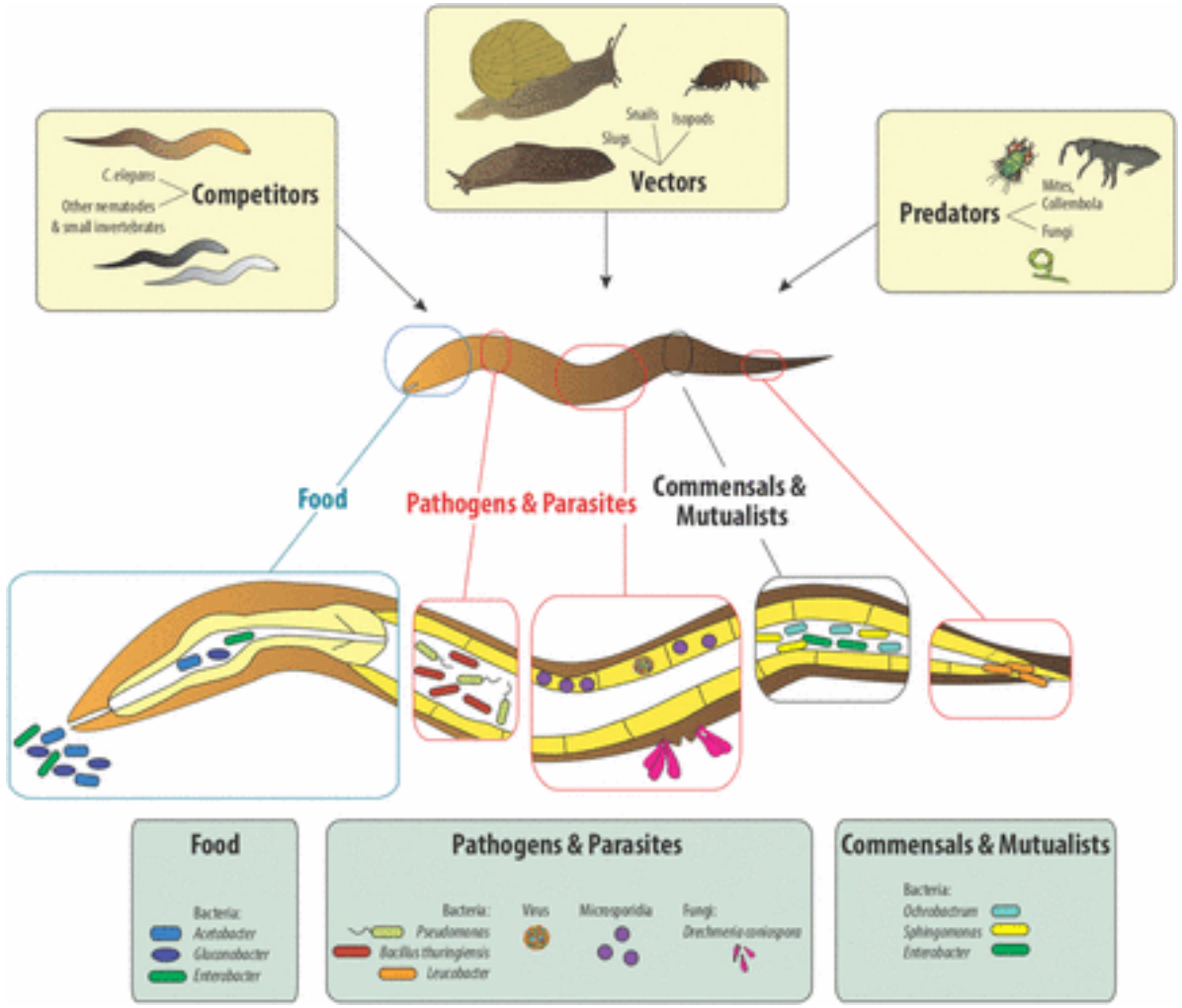
Politics / Economy / Society

Cooperation / Sharing / Trust / Responsibility

Decide!

C elegans


302 Neurons


Competitors
C.elegans
Other nematodes & small invertebrates
Vectors
Snails
Isopods
Slugs
Predators
Mites, Collembola
Fungi
Food
Pathogens & Parasites
Commensals & Mutualists
Food
Bacteria:
Acetobacter
Gluconobacter
Enterobacter
Pathogens & Parasites
Bacteria:
Pseudomonas
Bacillus thuringiensis
Leucobacter
Virus
Microsporidia
Fungi:
Commensals & Mutualists
Bacteria:
Ochrobactrum
Sphingomonas
Enterobacter

Brain and Intelligence?

- Brain by **sensing**, be aware of world, make **actions**.
- **World** gives back **responses** to brain's decisions.
- **Brain learns** from reaction of world and enhances decision making ability.
- **Ability to make good timely decisions** is Intelligence.

Artificial intelligence

The four big figures

Artificial Intelligence Machine Learning Method 'Deep Learning' Research Nerd

Yan Rekoon
- Professor, New York University
- Facebook Artificial Intelligence Research Director

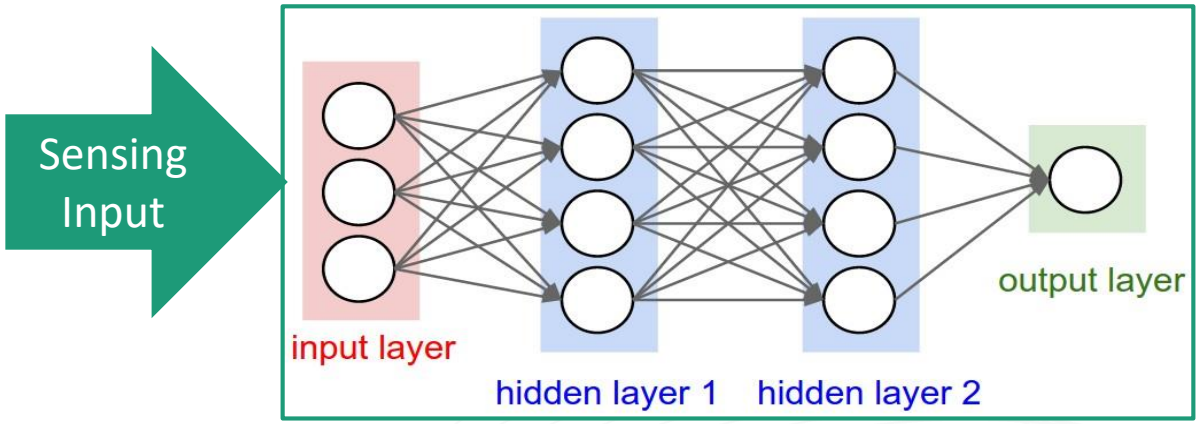
Jeffrey Hinton
- Professor, University of Canterbury, Canada
- Google Scholar

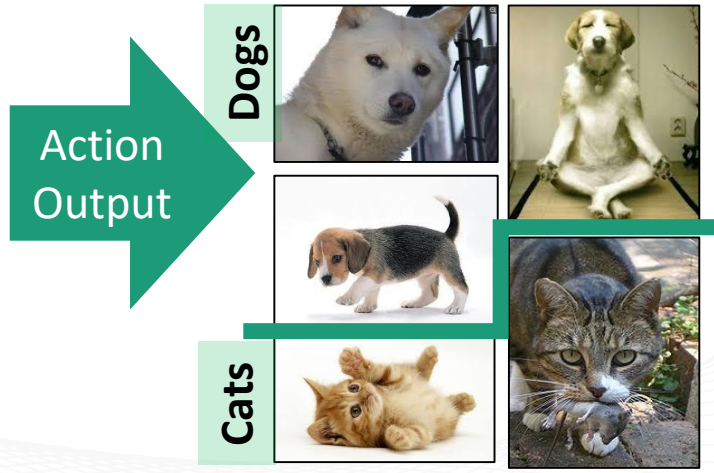
Joshua Benjio
- Professor, University of Montreal, Canada
- Collaboration with IBM

Andrew Ng
- Professor at Stanford University
- Silicon Valley Baidu Artificial Intelligence Research Fellow

Artificial Neural Network

Dogs & Cats

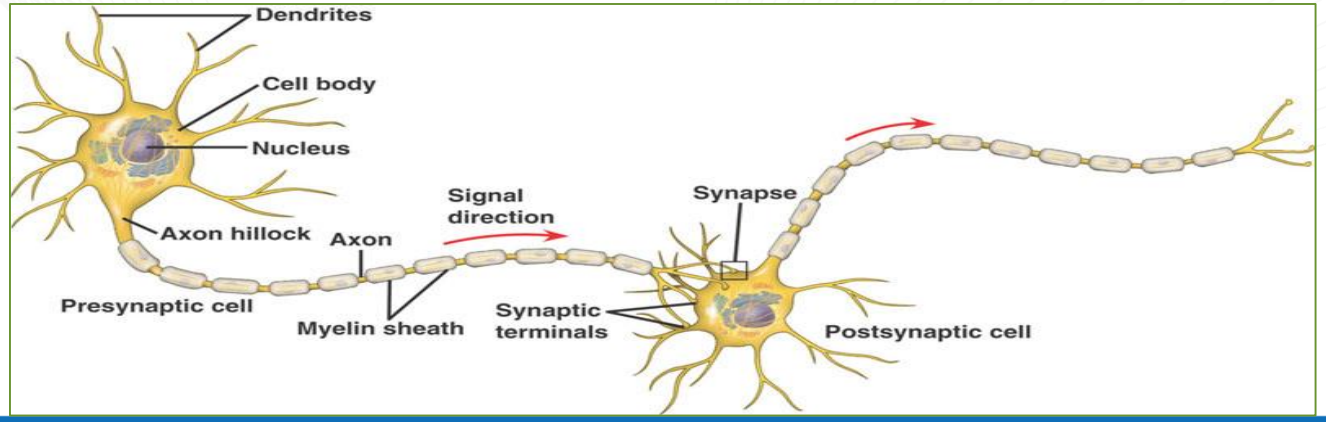


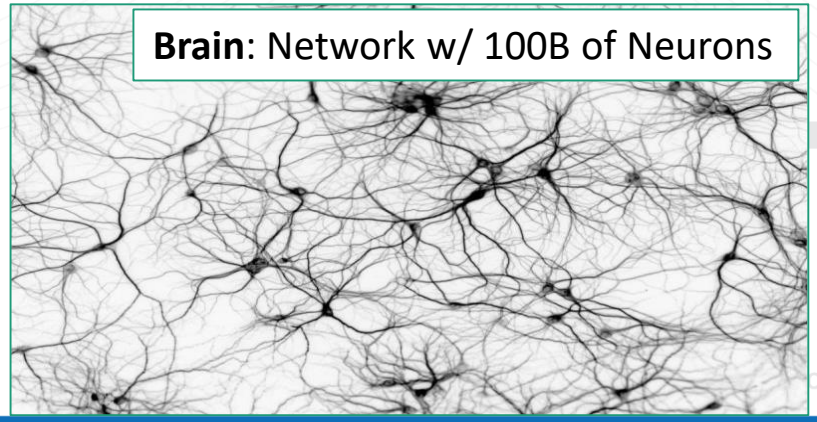


√ Training : Massive Sensing Sample → Network Connection → Decision

√ Classification : Sensing Input, Situation Judgement, Present Results

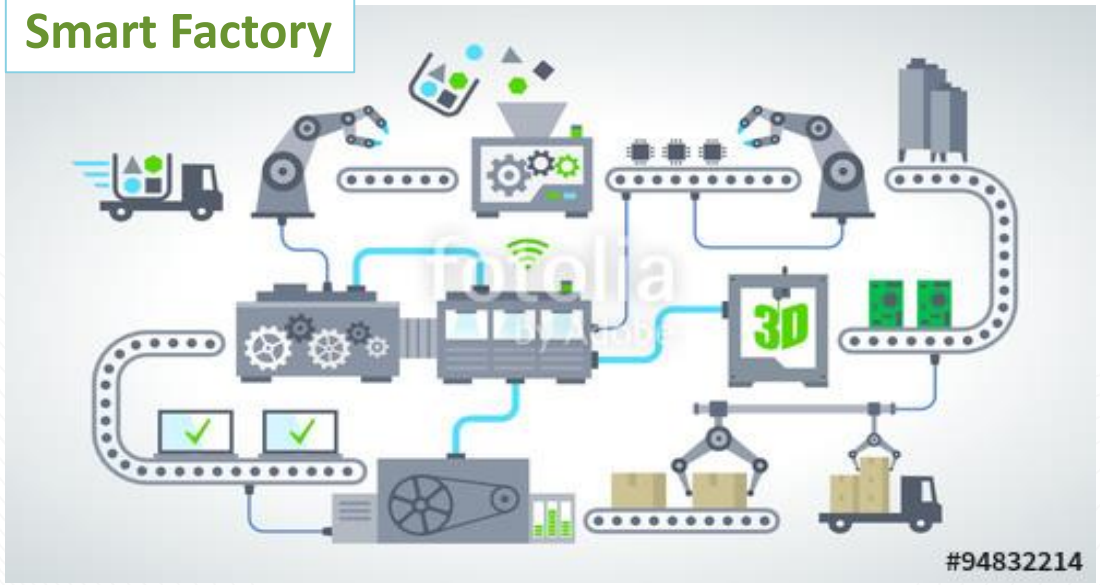
√ Growing via Learning



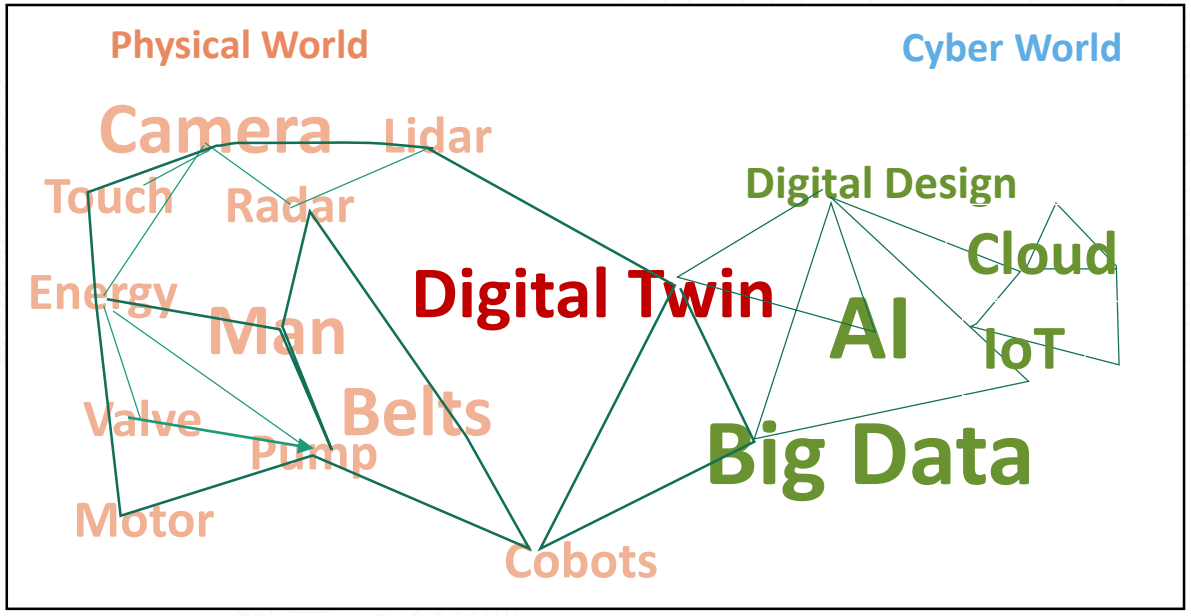


Hannover Messe, 2017

Smart Factory



Production on Demand



- Digital Factory
- R.T. Surveillance
- Prediction
- Value creation
- On demand
- Precision
- Productivity up

Industry 4.0 and 4th Industry Revolution

What's the difference?

4th IR was named by Klaus Schwab as the theme of WEF 2016.

Schwab aims to describe rapid techno-socio-economic changes erupting in the industrialized world.

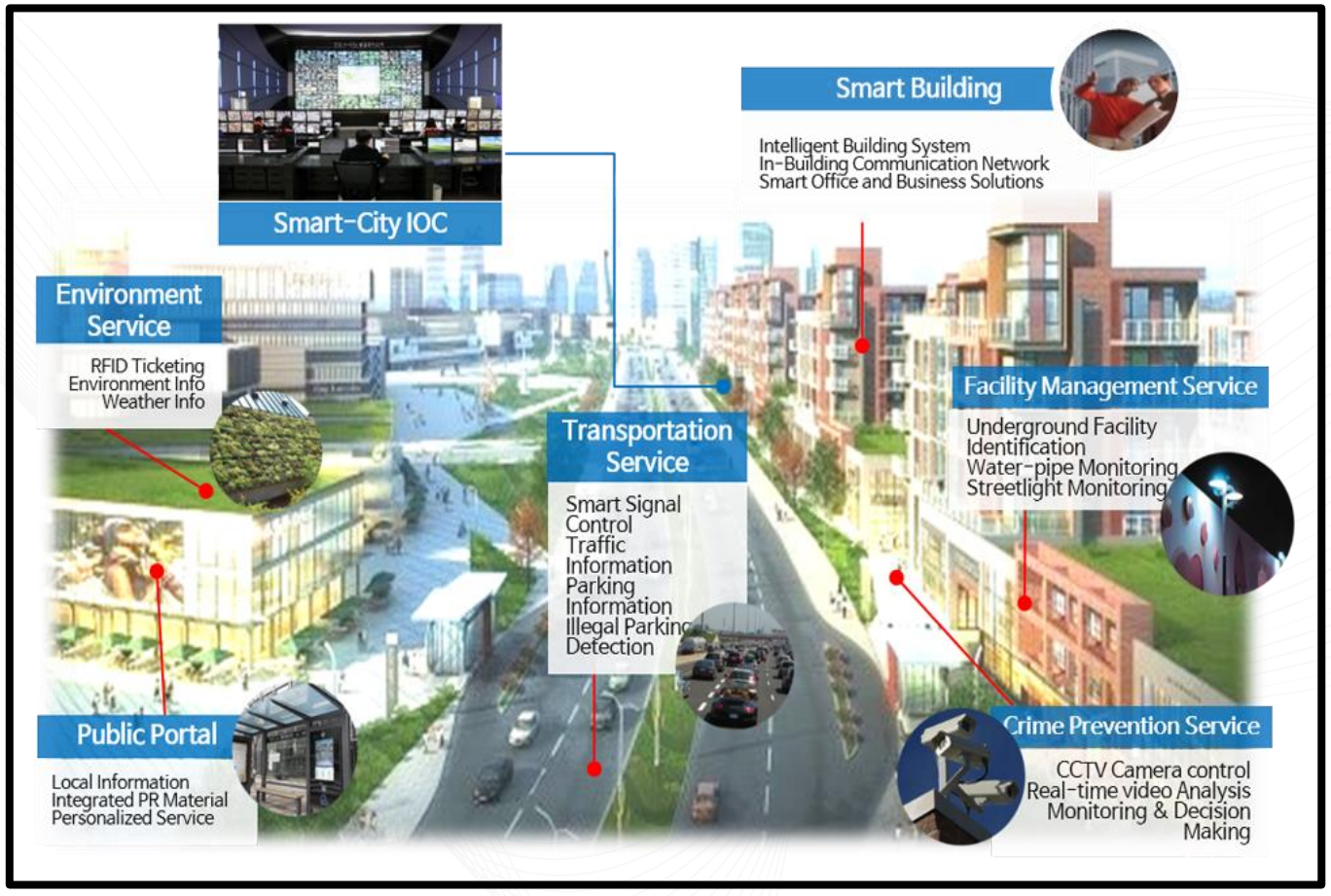
4th IR is to make all systems smart.

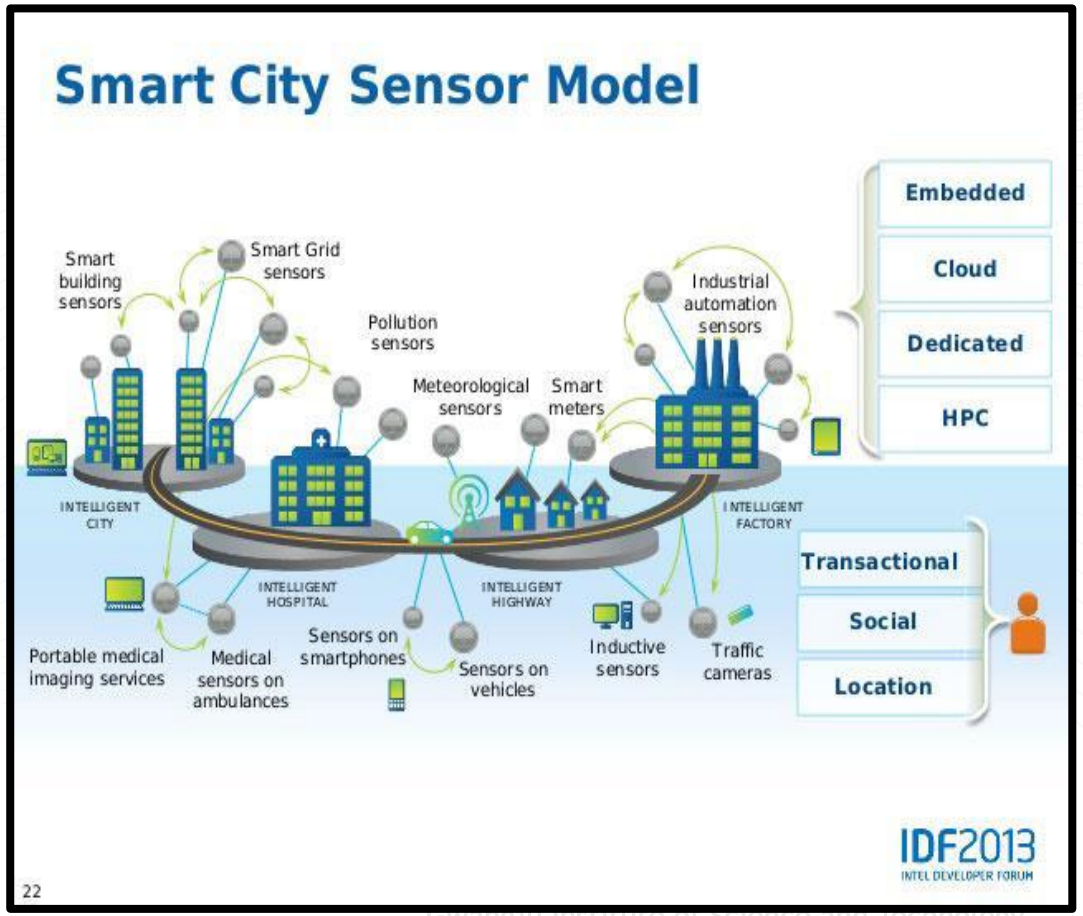
In a factory, there are things, i.e., motors, valves, belts, controllers, energy sources, robots, and etc.

- **(*IoT*) These things can be digitalized by attaching digital sensors to each of them.**
- **(*Digital twin*) A digital twin is created per each thing.**
- **(*Optimization*) A factory with digital twin can be optimized in computer designs.**
- **(*Big Data*) Digital data can be gathered, stored, and used for monitoring the status of factory.**
- **(*Prediction*) Data stored up to present can be used to figure out trend and predict the future.**
- **(*Value creation*) New value-chains, BMs, created by discovering new patterns cultivated from the stored data.**
- **(Extending "factory" to other items is 4th IR) The *smart factory* here can be extended to *smart home*, *smart traffic*, *smart school*, *smart energy*, *smart farm*, *smart hospital*, and *smart city*.**

Smart City : Sense with IoTs, Compute in Cloud, Make Timely Actions

Urban environment monitoring via intelligent sensors, provide intelligent services:
Crime prevention, signal light control, parking services, building management

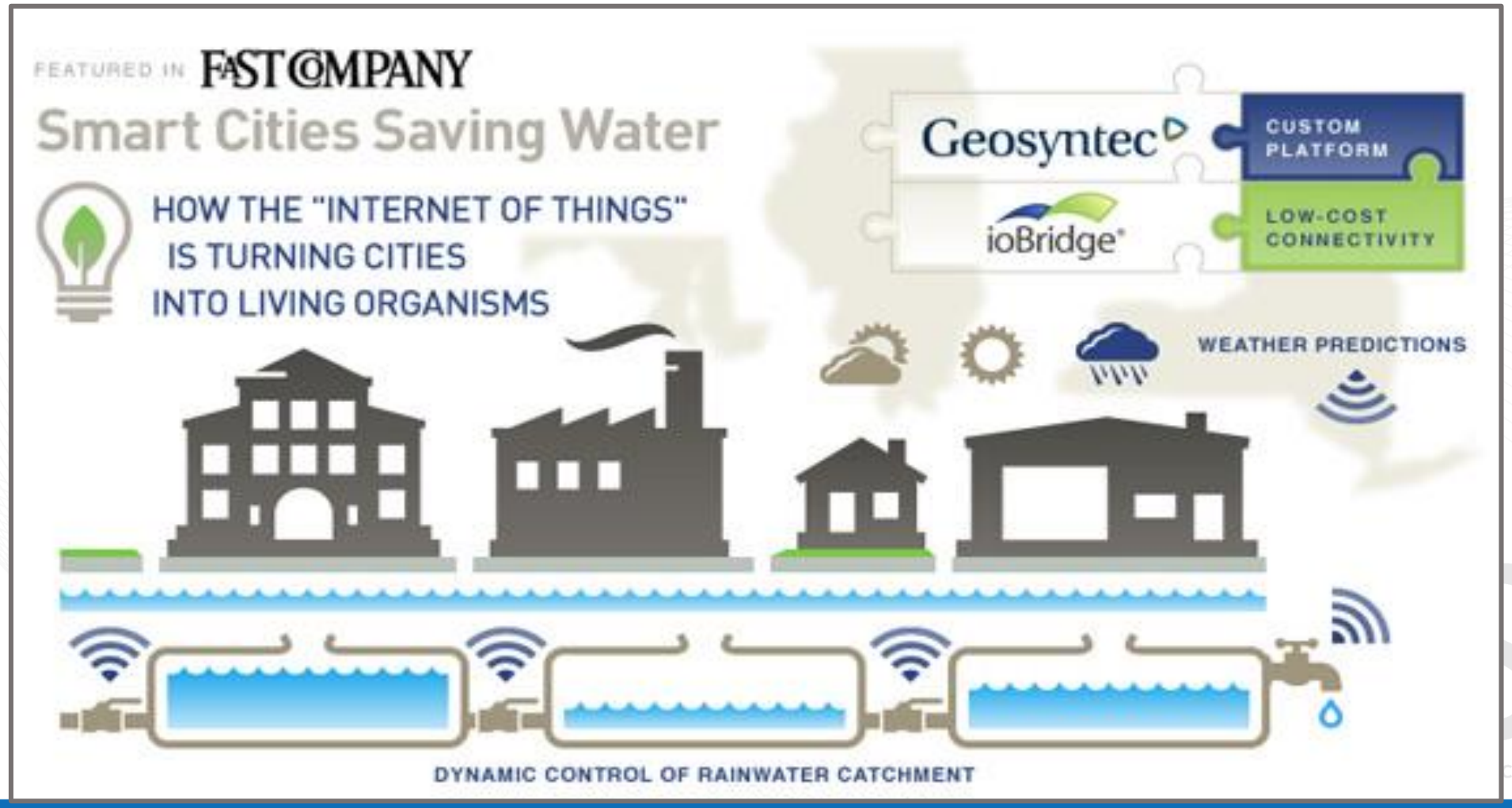




Smart City : water resource management

Improving the efficiency of water resource management in response to climate change

Ensure sustainability of smart city by building resource- and energy-independent urban circulation system



Smart Tech,
Central to 4th Industrial Revolution

In the era of 4th IR, what shall be Korea's Strategy?

- 4th IR

  Rushing in wave of socio-economic changes through out the world due to disruptive smart technologies, i.e. AI, robots, enabled by entrepreneurship, challenge, sharing, responsiveness, & cooperation.

- Korea needs to foster innovative mindset for continued growth, abandon the mindset of the past, i.e., uniform, modularized, ownership, positive regulations, government system formed and set in Korea in the past 40 years which worked well in the era of "*following economy*."

Innovation based growth strategy

❖ Invigorate creativity

- Diversification, via balanced regional developments with unique local strength
- Open immigration policy for inviting talents from overseas
- Provision of enriched STEM education opportunities for all age and gender groups

❖ Promote challenges to making innovation

- Honest Failures, Second Chances, Relayed Research, Social Safety Network

❖ Utilize the resources Korean research universities have

- Well trained STEM forces and well equipped laboratories

Smart Univer-City,

Local Innovation Platform for the 4th IR Era

K-Smart City, City = Play ground for 4th IR!

전 세계적으로 스마트시티 수요급증

개도국 — 급격한 도시화에 따른 문제해결 차원
* 중국: 500개 智慧城市 사업계획 발표('15.7)
* 인도: 모디 총리 100개 스마트 시티 추진('14.7)

선진국 — 기후변화 대응, 도시재생 차원
* 파리 기후변화 협약('15.12)에 따른 자발적 온실가스 감축목표(INDC) 이행 수단

시장규모: '14년 400조원 → '20년 1,000조원 이상

우리나라는 다양한 스마트 시티 경험 보유

- 전후 반세기 내 고도 성장과 성공적인 도시개발 경험보유
- 2000년대부터 IT등 다양한 첨단기술을 신도시 등에 접목·운영

개도국 등 한국 도시개발 모델 선호
→ 벤치마킹 및 협력강화 희망

스마트 시티는 4차 산업혁명의 新산업 플랫폼

- 산업 파급효과가 큰 국가의 미래 성장동력

"도시수출은 새로운 발상의 전환,
기술간 융복합을 통해 중동, 인도 등 신흥국을
중심으로 스마트시티 수출 필요"
-제10차 무투회의 시 ('16.7.7)-

우리의 강점과 경험을 바탕으로 ➡ '한국형 스마트시티' 해외진출 확대 및 국내 고도화 추진

통합 도시개발

- 기획-설계-조성-운영·관리 등 전 과정 참여
- 한국형 도시수출 선단 구성 (정부-공공기관-민간기업-금융)
- 지역 맞춤형 도시 인프라 건설

경쟁력 있는 요소기술

- **에너지** 제로에너지 빌딩, ESS(에너지 저장장치)
- **교통** BIS(버스정보시스템), 교통카드, 교통센터
- **친환경 물산업** 해수담수화, 스마트물관리 물재이용(LID 등)
- **ICT** 통합관제, 스마트가로등

법 제도·문화

- 택지개발 및 주택공급 제도
- LH 등 도시개발 전문 공기업 모델
- 새마을운동 등 지역사회 개발운동
- K-Culture, K-Style 등

CITY PLATFORM

자료: K-Smart City

K-Smart City Testbed Projects

Special Law Passed/Enacted 2017

1. Name changed from U-city to Smart City
2. Not only for formation of new cities but also revitalization of old cities
3. Federal funding and investments
4. Standardization
5. Exports

- **To build and provide an IoT-based smart city platform**
- **To provide urban services focused on citizens' experience**
- **To improve city's competitiveness**
- **To support globalization as an international city**

Smart City : Busan/Songdo/Sejong, Korea

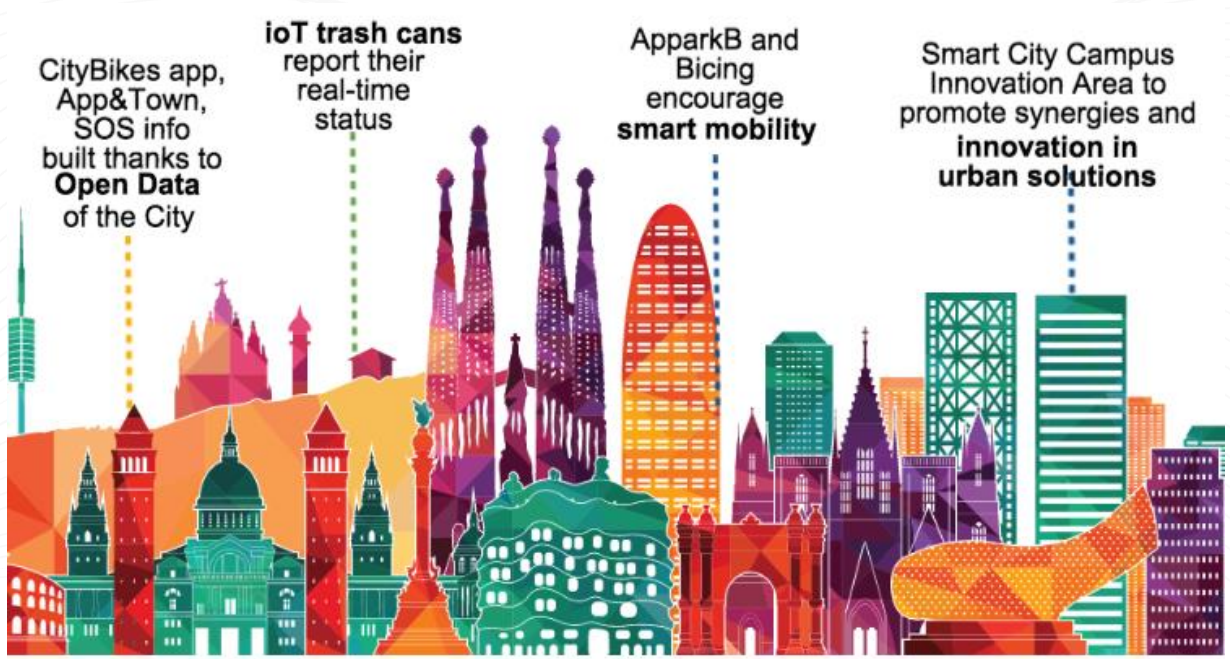
- ◯ Smart Lighting / Energy / Transportation
- ◯ Public Facilities / Safety
- ◯ District Heating and Cooling
- ◯ Waste Management System

Smart City : Berlin, Germany

- ◯ Smart Management and urban society / Housing / Economy / Mobility / infrastructures
- ◯ Public Safety
- ◯ Open Public Data

Smart City : Barcelona, Spain

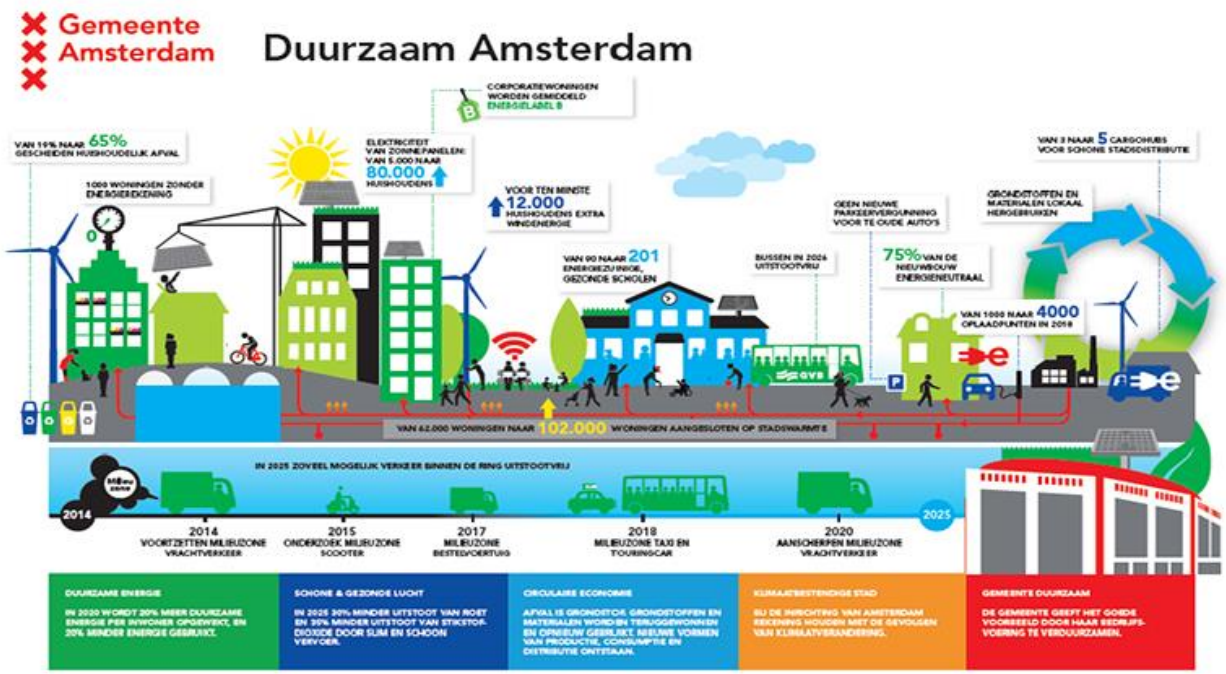
- ◯ Smart Lighting / Energy / Transportation
- ◯ District Heating and Cooling
- ◯ Zero Emission Mobility
- ◯ Open Government
- ◯ Waste Management System



Smart City : Amsterdam & Malmö

- ◯ Smart Living / Working / Mobility
- ◯ Public Facilities
- ◯ Open Public Data

Amsterdam



Malmö - the Green Digital City

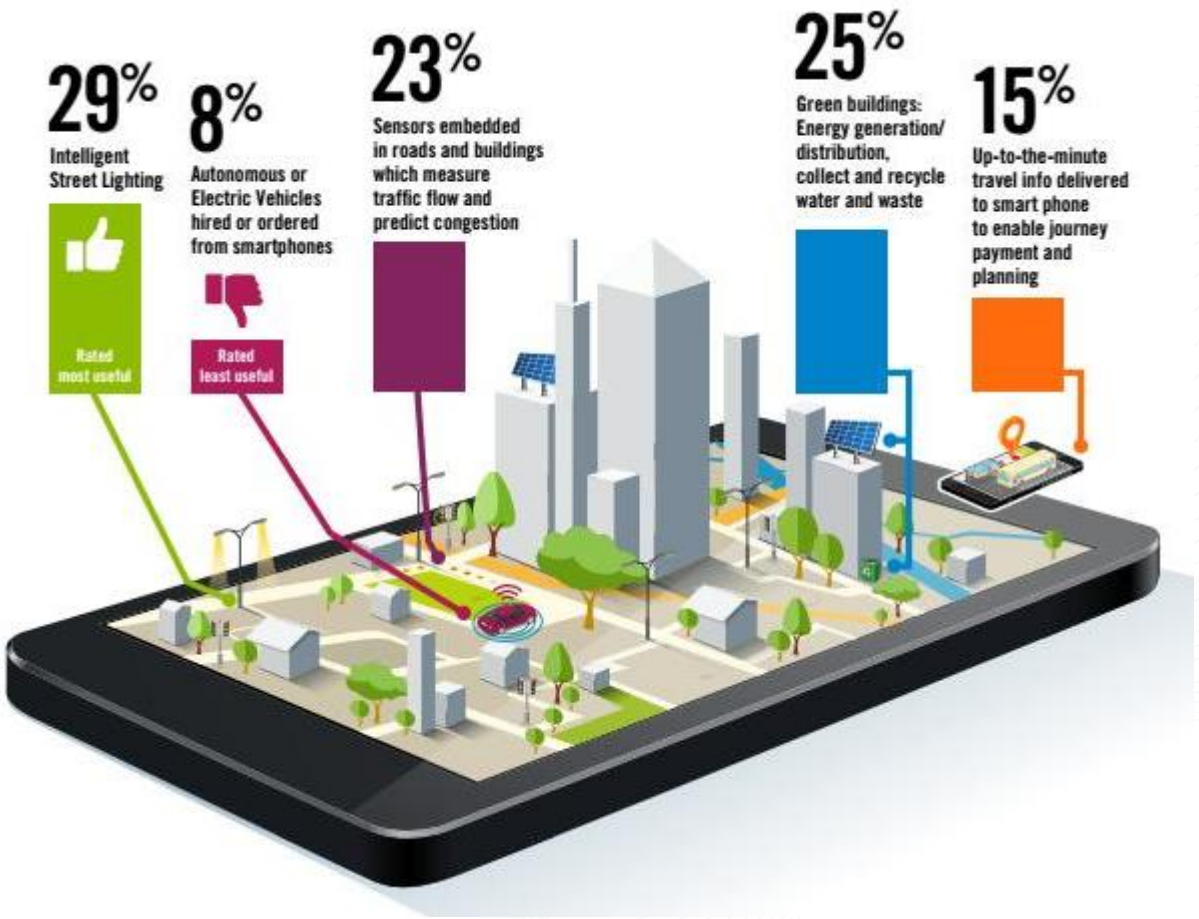
Malmö – the smarter city

For Malmö, the sustainable city is a smart city. We see the connections between all our goals as a sustianable city and find common solutions for multiple challenges.

Malmö stad

Univer+City!

Smart City : Glasgow, UK



- ◯ Smart Lighting/Energy/Transportation
- ◯ Health care & Public safety
- ◯ City Data Hub
- ◯ Sensitized home to help reduce energy wastage

* Integrated Services across health, transport, energy, and public safety

Policy Outlook

Smart City testbeds could go obsolete easily!

- **Open platform**, evolution via cycles of continued innovations possible!
- **Open HWs & SWs**, testable with new services and devices!
- **Learning and evolution continue and solve more complex problems!**

City shall have **Live-Work-Learn-Play** elements → **Continued innovations**

1. Open HWs & SWs, work as Living Lab!
2. Collected data from energy grid, traffic, IoT sensors is open!
3. On-off line meeting and showing space for exchange of ideas!
4. Problem oriented research & education opportunity!
5. Maker Space, making ideas into reality
6. On-stop support place for venture start-ups
7. Leisure & sports complex, shopping centers

Smart City, human/IoT networks, evolving via learning!

Sensing

Situational Awareness

Actions

IoT sensors

See, Listen, Sniffs

Monitoring traffic

SNS, News : monitoring citizen's feedback

Data collection and storage

Traffic light control

Parking services

Energy control

Temperature control

Make city run without fault

Open Platform

Human resource development/
Establishment of production platform

- **Fostering the 4th industrial technology ecosystem**
- **(win-win corporate culture)**
  Internationalization Center, Start-up support center
  education/law/VC.
- One-stop start-up support center
- Establishment of R & BD infrastructure

Makers Movement

Garage Culture

Production of prototype 21 days, Seeed Studio(中)

Maker Faire

Spread of maker spaces (Korea)

AI Science Venture Town (GIST and Gwangju City Proposal)

National AI Institute → AI Campus → AI Venture Town

자료: GIST.(2017). 국정과제 소개 자료(Leaflet)

10 years, 1 Billion USD

Smart Sensors, Smart Energy, Smart Cars, Smart Culture

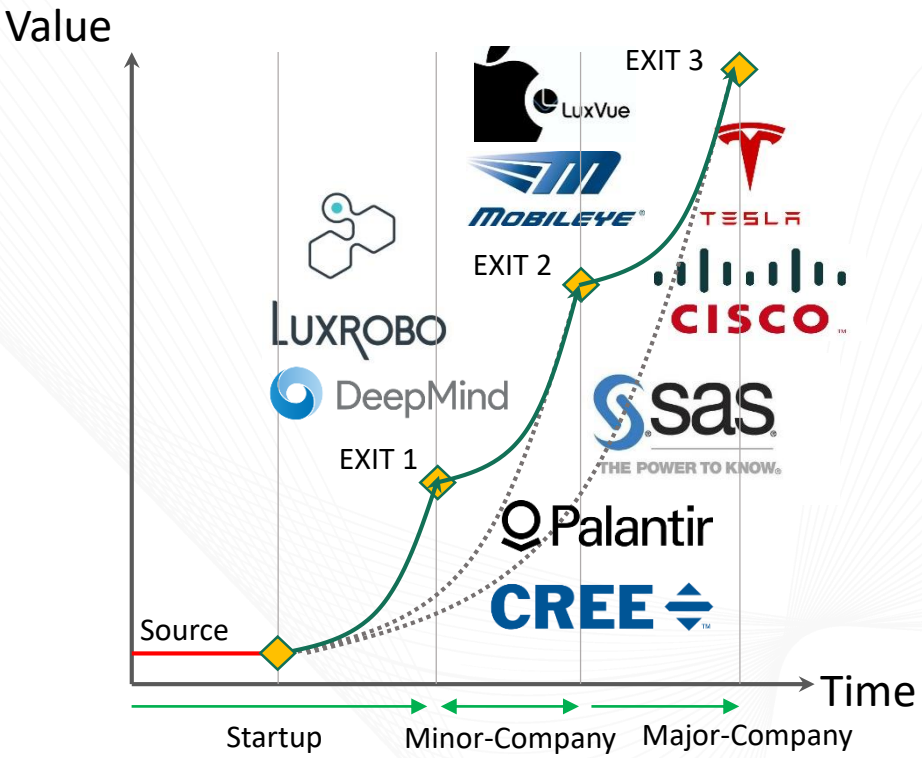
사업기간	2018~2027년(10년)
사업예산	1조원(국가 인공지능 연구원 설립 0.4조원, AI Campus 조성 0.3조원, AI 기반 창업생태계 조성 0.3조원)
위 치	광주·전남(장성) 연구개발특구 첨단 3지구(66만㎡, 20만평)
주요사업	①국가인공지능연구원 설립(인공지능 R&D, AI 시험·인증 플랫폼 구축) ②AI 기반 Campus 조성(AI 기반 광 융합기술 육성, AI 전문인재 양성, MOOC 기반 시민교육) ③AI 기반 창업생태계 조성(AI 기반 기업 및 창업지원, 기업 수출 지원 등)
기대효과	①미래기술 기반 전략적 R&D 및 연구혁신 생태계 고도화 ②과학기술 융합형 전문인재 육성 및 첨단기술 기반 양질의 일자리 창출 ③지역 전략산업 혁신(광융합 기술산업, 자동차, 에너지, 문화기술 등) ④지역의 고부가가치 신산업 육성 등

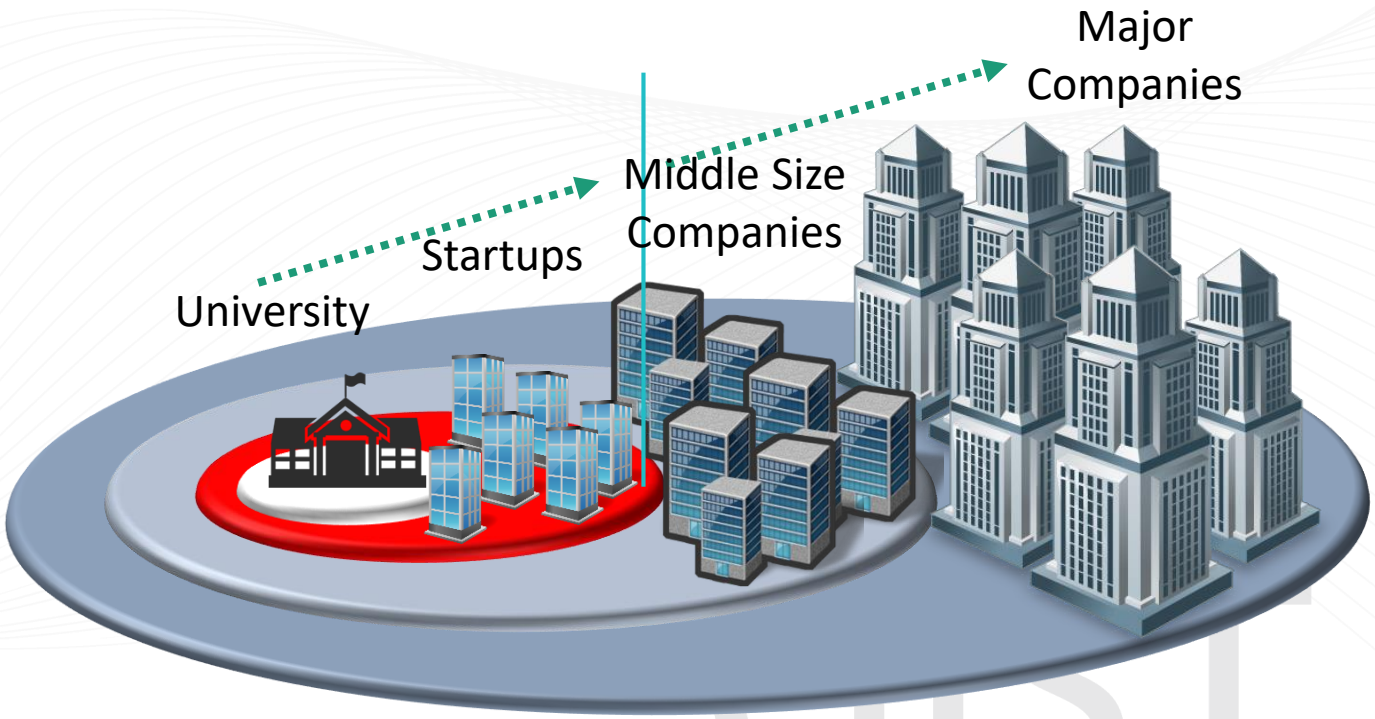
Univer+City : Central to Continued Innovation

Creation of new value-chain based on innovative technology

Venture town with abundant resource

Focused venture town for intelligent sensors, robots and AI

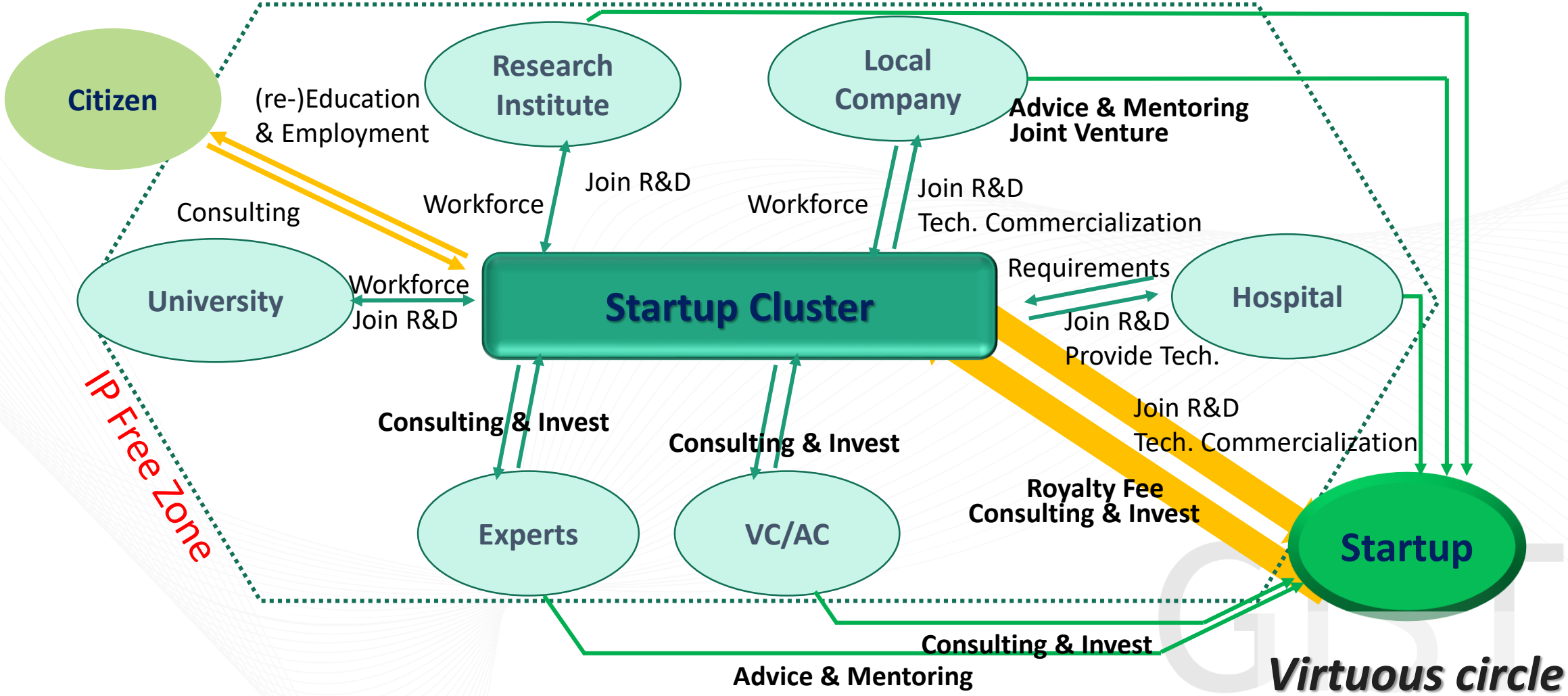




GIST proposed the above to the Korean government(MST) in 2017.

Univer+City :

Startup Cluster : AI Tech to Market, Local Economy Development on AI



GIST proposed the above to the Korean government(MST) in 2017.

Summary

- Low birth rate, aging population, income polarization, and low growth rate…
- People throughout the world come to live in cities; problems and conflicts are abound.
- Build university-led, citizen participating, open innovation platforms near research universities, and have educators, engineers, businessman, citizen come and work together to make city a better place to live!
- Provide tech based solutions to urban problems such as traffic, housing, water management, sewage managements, and city governance.
- Build an venture friendly ecosystem in which ventures can flourish coping with small and large companies based on science and technology products and services.

Conclusion

Goal: to make a creative nation in which innovation continues and help human level enhanced!

Strategy :

- Open innovation Univer-City platforms
- Provision of socio-economic safety net

There is no destined way for future.
We set the desirable future and bring it forth.

References

- H.N.Lee, MBC Radio, Aug. 23rd, 2017, https://www.youtube.com/watch?v=FuwfqCe4dOk.
- H.N.Lee *et al.*, Entreprenuial Tech0based Research Univ. (2017)
- TJ Park in POSTECH, Univer+City (2017)
- D.J.Kim *et al.*, Study on policy measures for strengthening competitiveness for Smart City (2016)
- S.G.Lee, Status and Lessons on Smart City, KRIHS(2017)
- J.Y.Lee, Direction and Strategy of Smart City Policy , KRIHS(2016)
- Busan City, Establishment of Global Smart City demonstration complex , (2015)
- McKinsey, Intelligent Information Society Medium and Long-Term Comprehensive Measures, (2016)
- H.S.Kim, ETNews (2017)
- GIST, National Task (2017)
- Global Smart City, (http://www.k-smartcity.kr)
- http://postscapes.com/what-exactly-is-the-internet-of-things-infographic
- http://tallahasseescene.com/2017/06/01/iot-sensor-market-2017-status-and-forecast-till-2022-by-players-types-and-applications/
- http://www.edmorrison.com/adapting-the-fraunhofer-model-to-the-us-market/

Thank you

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