2017

4th Industrial Revolution for Happier Korea

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http://smarttech2017.org/

Abstract

Abstract -In this talk, I will spend some time on understanding the wave of new technologies represented by “Industry 4.0” and “the 4th Industrial Revolution.” Smart Factory, Big Data Analytics, Artificial Intelligence and Robots, mostly led by several groups of leading tech companies in Germany and United States, are expected to come deep into our lives and on the course to change them fundamentally. The technologies are good. They certainly bring efficiency and convenience to our lives, less hard labours and less strenuous brain work we will have to do. But our social system is old and not efficient. Because of this, fast social changes driven by technologies could cause social instability. People will lose jobs. The changes will come too fast for a large part of us to adopt. If it evolved on their own, a lot of people may would fall into predicament. The problem we must address includes social injustice derived by income inequality. The level of productivity increase enabled by the so-called disruptive technologies is expected to be very high. But the profit generated from these technologies will easily be trapped within a small group of technological elites, while the income of the ordinary people are taken away from the underprivileged who lost their jobs to smart softwares and agile robots. Of course, new markets will open up, and new jobs will be created along with them. But they are mostly for the technological aristocracy who can use these new technologies for solving problems, discovering new opportunities and providing human needs; unfortunately, not for ordinary people who lost their jobs in the turmoil. Widening income inequality problem has been the noted trait of the digital transformation era, which has grown deeper for the last couple of decades in most industrialized countries; the society has been divided and conflicts among different social groups have been aggravated. The tsunami of new technologies will worsen this already very challenging tough to deal with problem. The population in Korea, as in most industrialized countries, is growing old very fast. Young folks are not marrying and married couples do not plan for babies. In this talk, I aim to discuss how Korean as a nation is preparing to embrace this grand challenges in the era of 4th industrial revolution. Changes are deemed necessary including education, corporate work place relations, budget distributions for research and developments, responsive government systems, tax and welfare systems, fair trade relations between conglomerates and small businesses. Even new constitution are deemed necessary. All these efforts are aimed at making sure a very simple principle: technology is for people.

Abstract (Korean)

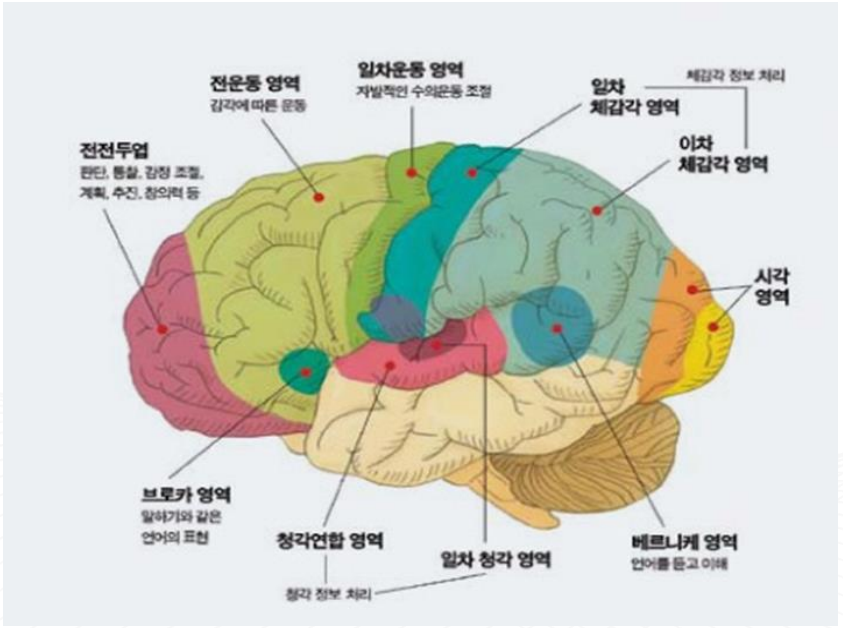
- Korean abstract -- Industry 4.0 과 4th Industrial Revolution과 함께 거론되는 Smart Factory, Big Data Analytics, 로봇 및 인공지능 등 혁신 기술을 이해하는 시간을 갖고 독일, 미국 등에서 빠르게 진행되고 있는 첨단 연구 개발 동향을 파악해 보고자 한다. 급속한 글로벌화로 전 세계가 하나의 시장으로 연결되고 있기 때문에, 이런 물결을 남의 나라에서 진행되는 일로 무심하게 바라보고서는 국가의 미래 경제안보를 담보 할 수 없기 때문에, 파괴적 기술의 출현으로 불가피하게 추동되는 미래 사회 변화 및 거대 트렌드를 이해해 보는 것은 매우 중요한 일이다. 공장자동화, 산업 로봇, 인공지능 컴퓨터의 등장으로 인류의 생산성은 크게 증대될 것으로 보이나, 그 성과는 기술을 잘 알고 활용하는 소수 기업에게 갇히게 될 수 있고, 대부분의 보통 사람들이 수행 하는 일자리들은 싼 값에 대체할 수 있게 되므로, 대규모 일자리 소멸이 예측 되고 있다. 특히, 지능형 컴퓨터가 대체하기 쉬운, 정형화된 일을 하는 노동자가 일반적으로 매우 많은데, 이런 일상정인 일자리는 쉽게 사라질 것으로 예견되고 있다. 또한 그 범위는 의료, 법률, 교육, 유통, 공장 등 거의 모든 영역을 포함하고 있으며, 이런 현상은 이미 진행 되고 있는 것을 볼 수 있다. 물론, 혁신 기술의 출현으로, 새로운 서비스 및 제품을 만드는 새로운 일자리도 생겨날 것이다. 그러나 이런 새로운 일자리는 컴퓨터와 해당 기술을 매우 잘 알고 창의적으로 활용할 줄 아는, 고도로 훈련되고 복잡한 비 정형성 일을 하는 특별한 사람들의 차지가 될 가능성이 높다. 문제는, 이런 일자리는 다년간의 훈련과 경험을 필요로 하므로, 일자리를 잃은 보통 사람을 훈련을 통해 재배치하는 것도 용이하지 않을 것으로 판단된다는 것이다. 대한민국은 특히, 인구절벽 시대, 소득 양극화 심화, 인구고령화를 맞이하고 있고, 이로 인해 이미 많은 갈등 요소가 사회에 축적되어 왔기 때문에, 위와 같은 미래 전망은 매우 큰 우려를 낳고 있는 것이 사실이다. 이러한 때에, 본 강의를 통해, 대한민국이 어떻게 하면 지속가능한 성장을 할 수 있는지, 산, 학, 연, 관 측면에서 검토하고 논의해 보는 시간을 갖고자 한다.

Brain and Human Evolution

Earth ~4.5 Million Years Old

Homo Sapiens ~ 200K
Civilization ~ BC 3,000
Population of 1st century ~ 100 million
Life expectancy ~ 20 years

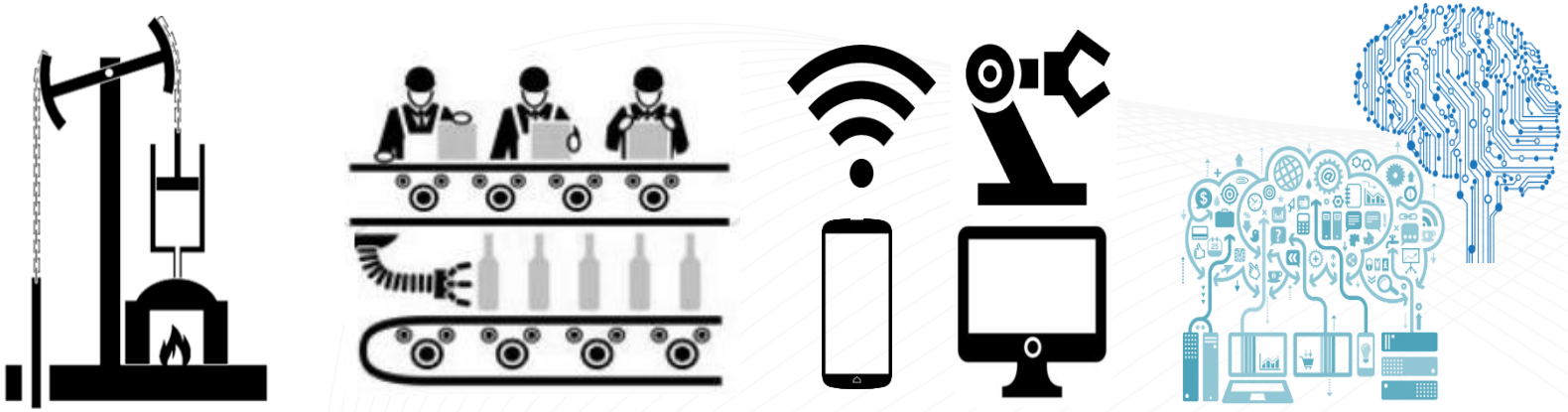
Humanity today?
A miracle, enabled by brain and cooperation!



The 4th Industrial Revolution

The advent of intelligence society

~~Advances in technology lead the transformation of society to the next level!~~
Why 4th IR story made a big hit in Korea?
AlphaGo or a fear of losing jobs?



technology

1st	2nd	3rd	4th
Steam engine	Electricity	Computer and automation	Artificial Intelligence

Social Transformation

Mechanization	Mass Production	Information	Intelligence

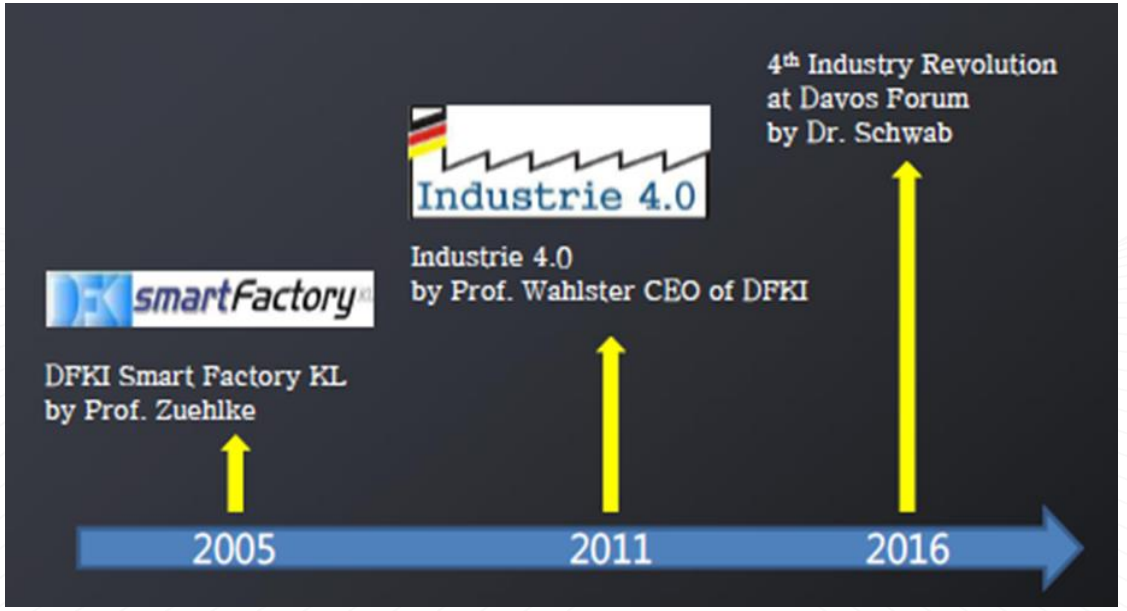
Visit to Hannover Messe 2017

Völklingen Ironworks
UNESCO World Cultural Heritage Site
Once largest steel prod. site, closed at 1986

"Change or Disappear"

Industry 4.0 of Germany

- 2005, DFKI Smart Factory" by Prof. Zuehlke
- 2011, Industry 4.0 termed at Hannover Fair
- 2012, in Gov. 10 Strategic High Techs
- 2013, 200M E Funding on CPS & IoT R&D
- 2015, Platform Industry 4.0

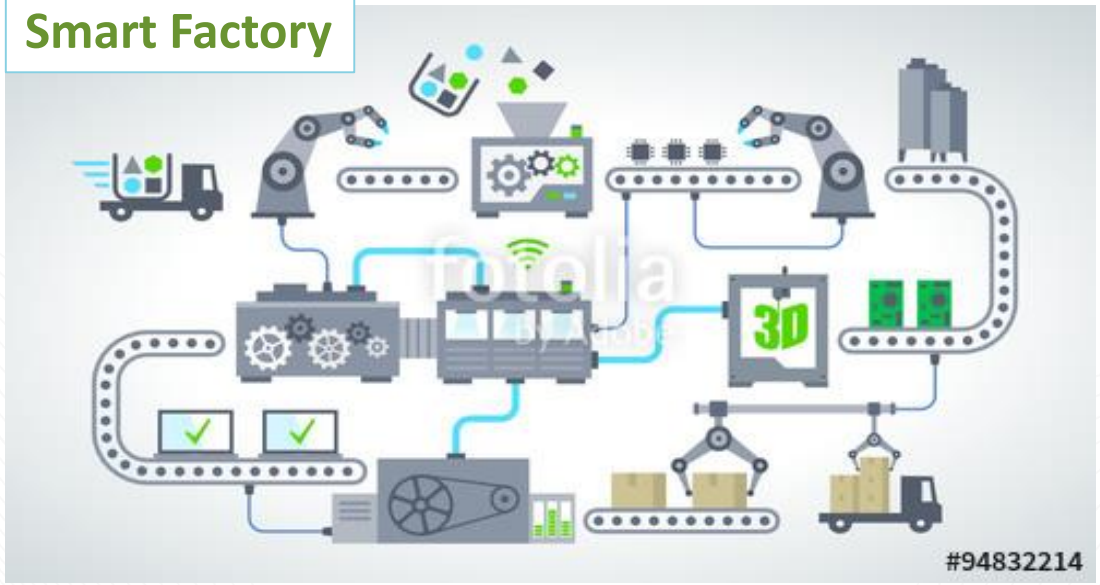


- Germany ~ the world leader in manufacturing industry
- GFG, aims to upgrade manuf. ind. with ICT, cloud computing, Robots & AI
- Able to keep manufacturing sites in Germany, revolutionizing the manufacturing ind.

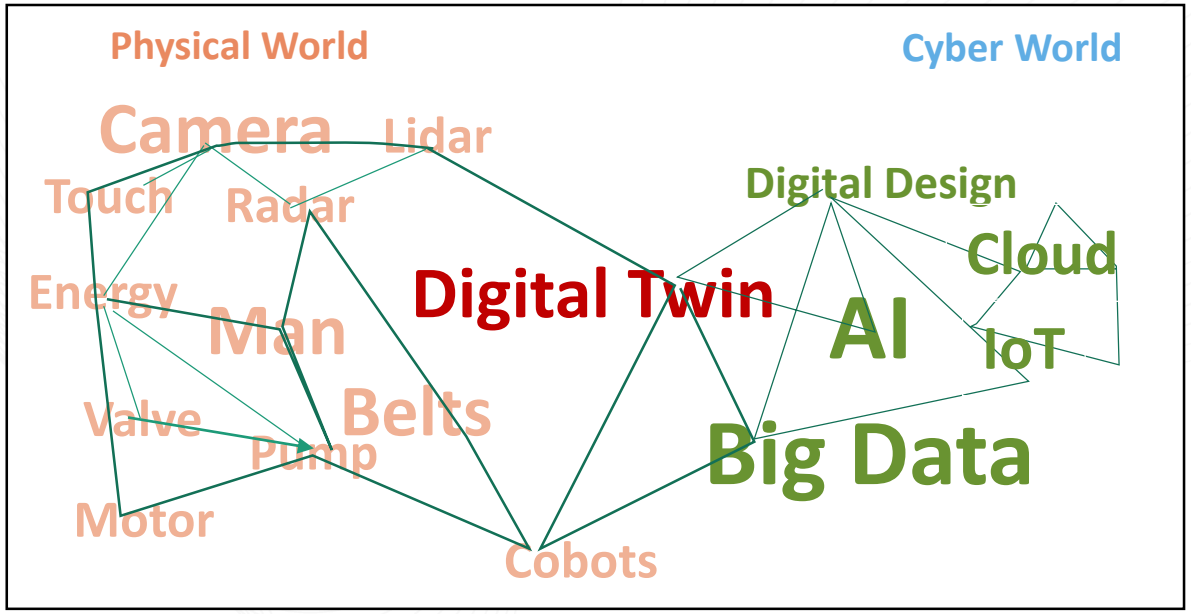
DFKI: German Research Center for AI

Hannover Messe 2017

Smart Factory

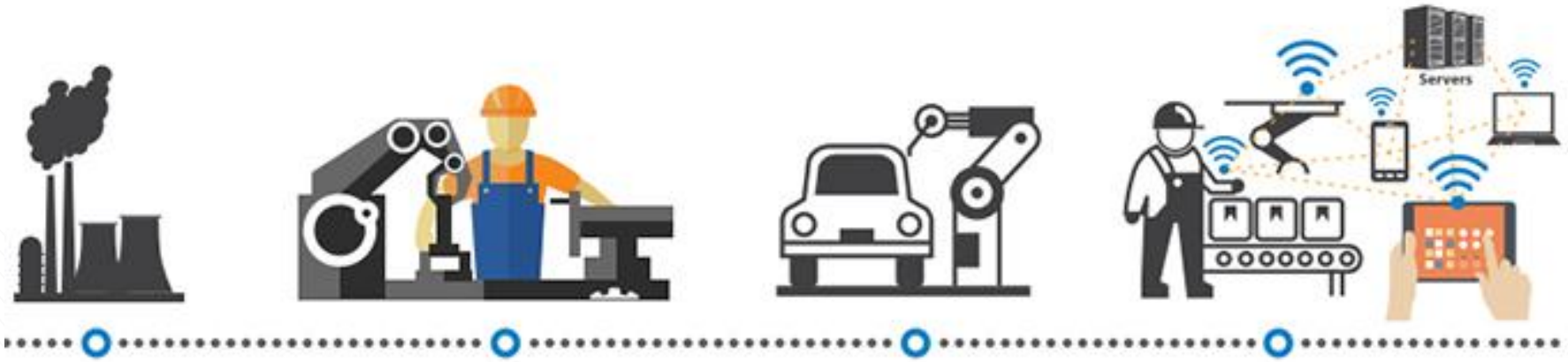


Production on Demand



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

Industry 4.0



18th Century

Industry 1.0

Mechanical production. Equipment powered by steam and water

19th Century

Industry 2.0

Mass production assembly lines requiring labor and electrical energy

20th Century

Industry 3.0

Automated production using electronics and IT

Today

Industry 4.0

Intelligent production incorporated with IoT, cloud technology and big data

Cloud Technology + Internet of Things (IoT) + Intelligent Machines + Big Data = Industry 4.0 Factory

Industry 4.0 and 4th Industrial 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.

Definition: Making Modern System Intelligent. I will explain in the following several sentences:

- In a factory, motors, valves, belts, controllers, energy sources, mechanical robots, and etc.
- (IoT) These things can be digitalized by attaching a digital sensor to each of them.
- (Digital twin) A digital twin is created for each thing.
- (Optimization) A factory with digital twin can be optimized in a computer design.
- (Big Data) Digital data can be gathered, stored, and used to monitor the status of factory.
- (Prediction) Data stored up to present can be used to figure out a trend or 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 school*, *smart city*, *smart energy*, *smart farm*, *smart hospital*, and etc.

Korea's Impressive Catching Up!!!!

1st IR

2nd IR

3rd IR

Now, preparing for the 4th IR

Korean War

Textile Industry

Ship/Auto Industry

Information/Comm. Industry

1950

1960

1970

1980

1990

2000

2010

2020

Farming/Fishing

Heavy/Chemical Industry

Electronics/Computer Industry

Future Industry

Korea's Impressive Catching Up

1st IR | 2nd IR | 3rd IR | Preparing the 4th IR

Korean War

1950

1960 Fa

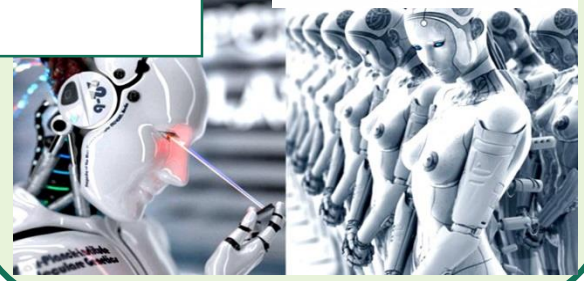
Fast Follower Strategy Worked in the Past?

- Government led Sci/Tech and economic plans
- Aim to solve problems whose answers are well known
- Elites dominated society
- Diligence & hard work mattered
- Unique goal society –compete, compete, compete

What strategy should we adapt in the future?

2020

ustry



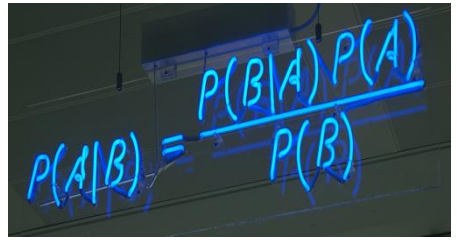
Two Pillars of Intelligence

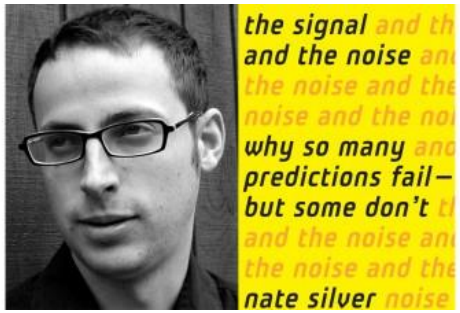
Big Data, AI

Bayes Theorem

Convergence(Experience, Big Data) => **Future Prediction**

- Thomas Bayes(1701~1761)
  - Presbyterian minister
  - *Divine Benevolence* (1731)
  - *Later got interested in Probability*



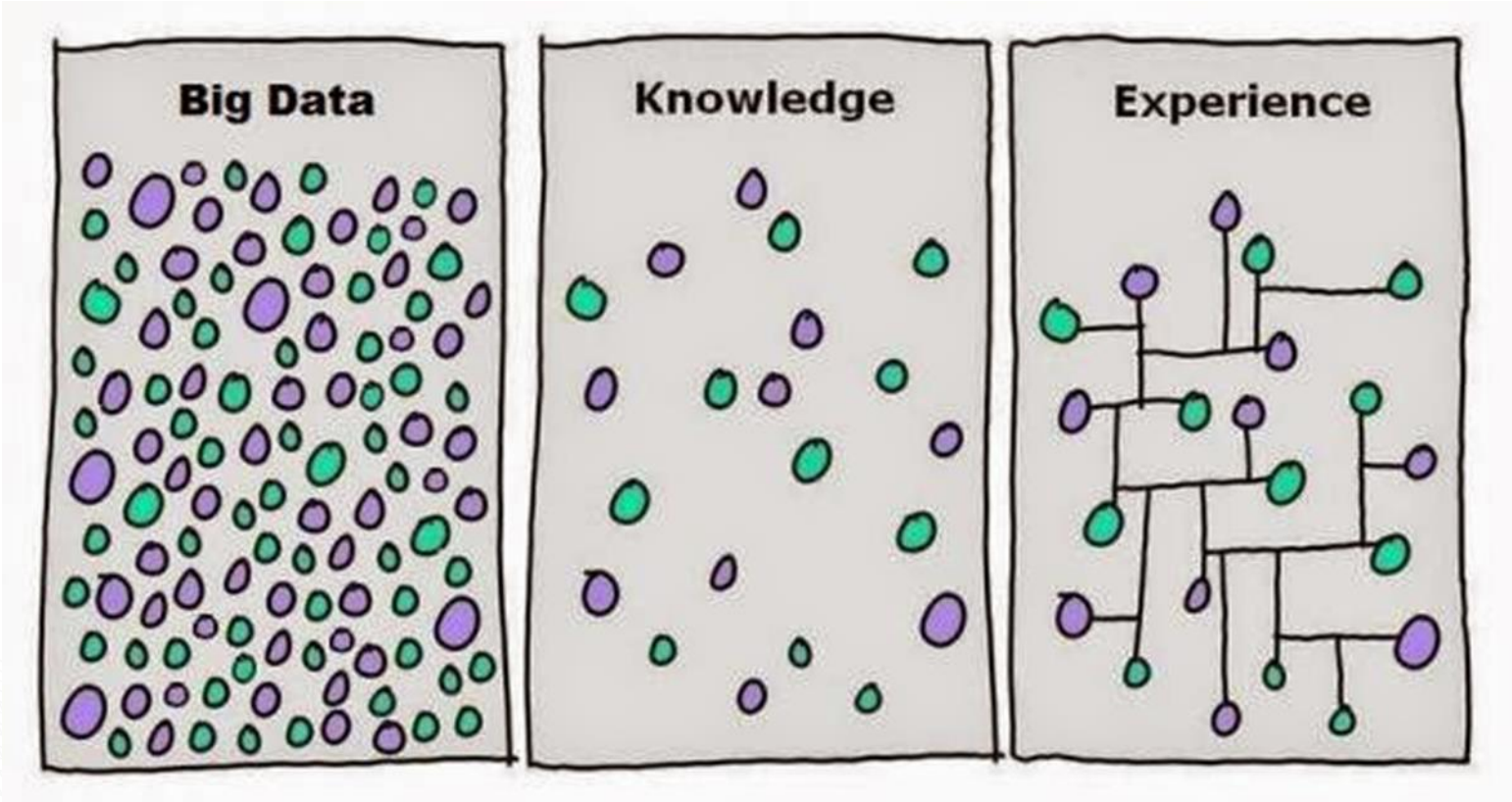


Nate Silver (1978 ~)

- New York Times Best Seller
- Poll Aggregation Blogger
- Prediction Expert
- Big Data = True + Noise, Predict Future?

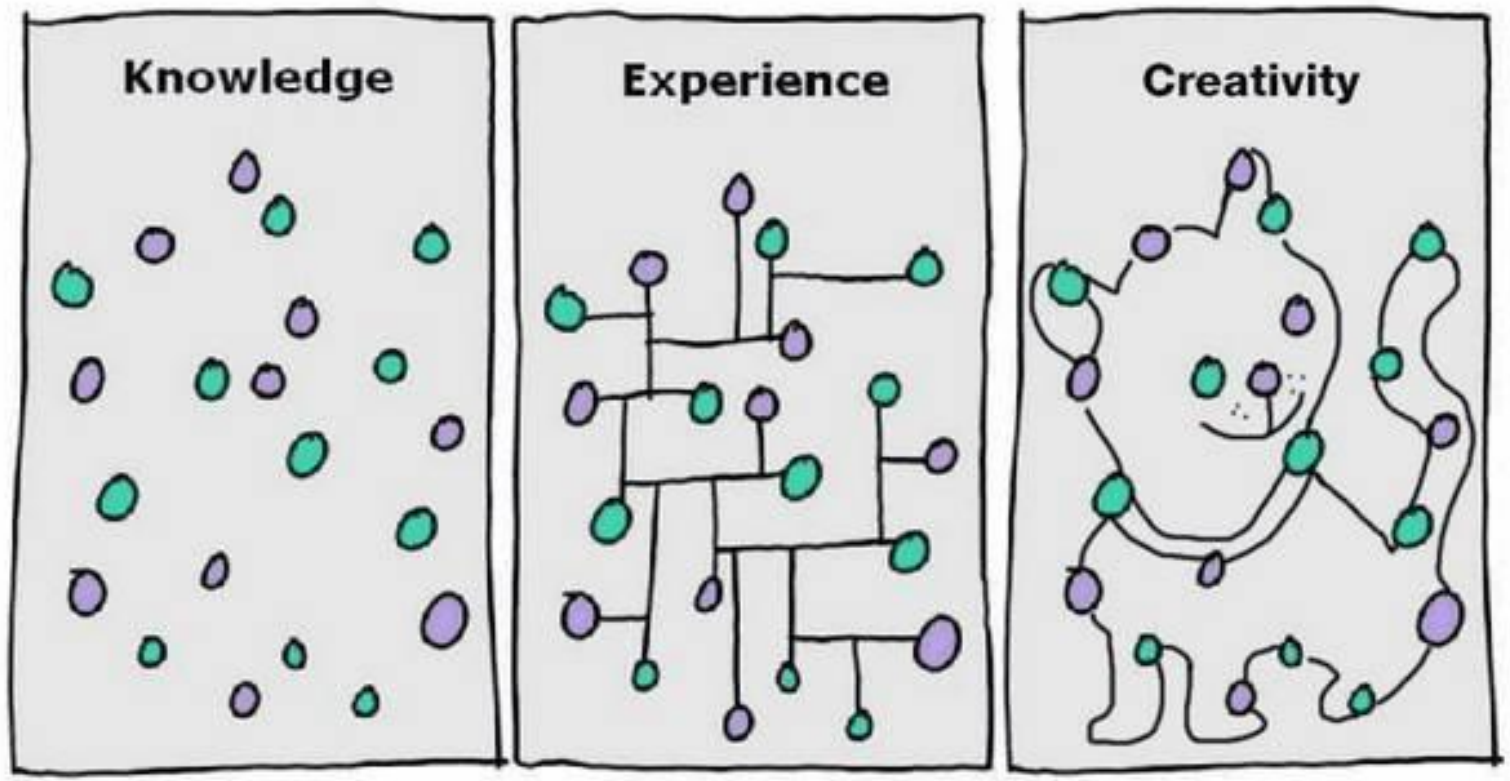
[Nate Silver's Very Very Wrong Predictions About Donald Trump Are Terrifying](#) **(2016)**

Big data is god?



Big data is god?

To create is to use Bayes Theorem, combining data and experience!



Big Data

from Internet of Everything

Now, AI is the New Electricity!

QUIZ

What is the name of this computer?

Developed by IBM

A chess-playing computer capable of calculating one billion ways in a second

Wins against Garry Kasparov
1997 World Championships

Artificial intelligence

The four big figures

Artificial Intelligence Machine Learning Method 'Deep Learning' Research Nerd

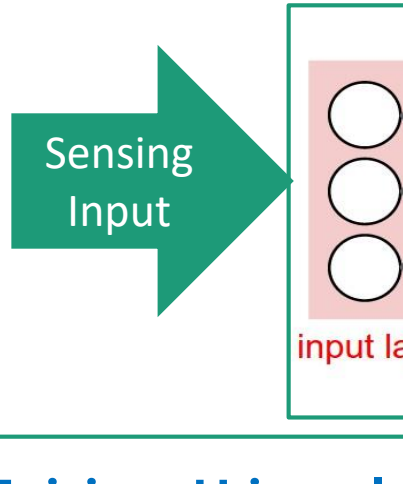
Yan Rekoon
- Professor, New York University
- Facebook Artificial Intelligence Research Director

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

Deep Artificial Neural Network

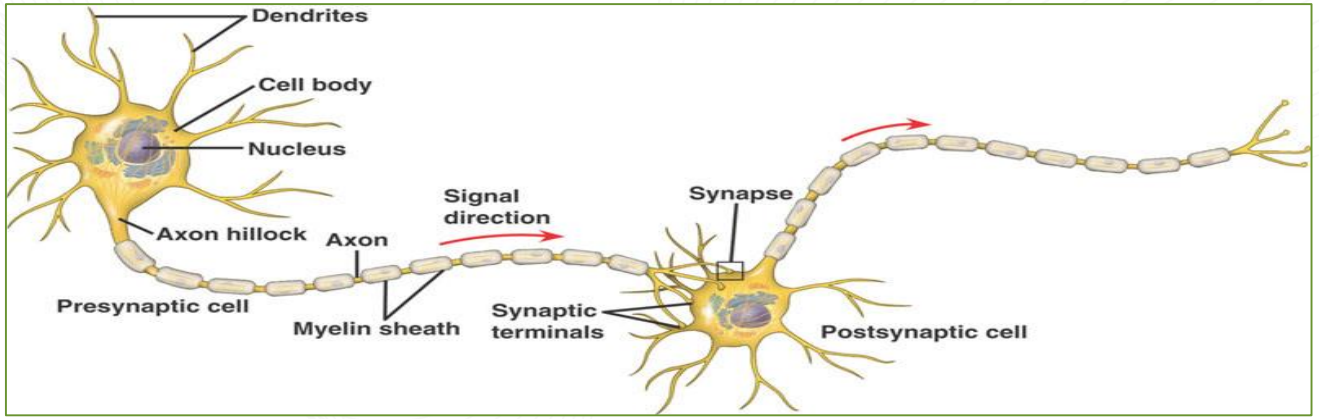


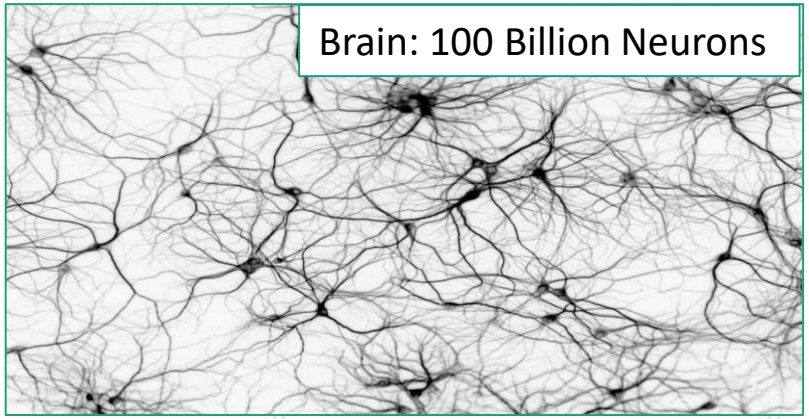
Dog vs. Cat

Training : Using a large number of sensing inputs, determine network connections

Classification : Sensing Input, judgment of situation , Result Out

Network grows and reconfigures itself via self-learning procedures.





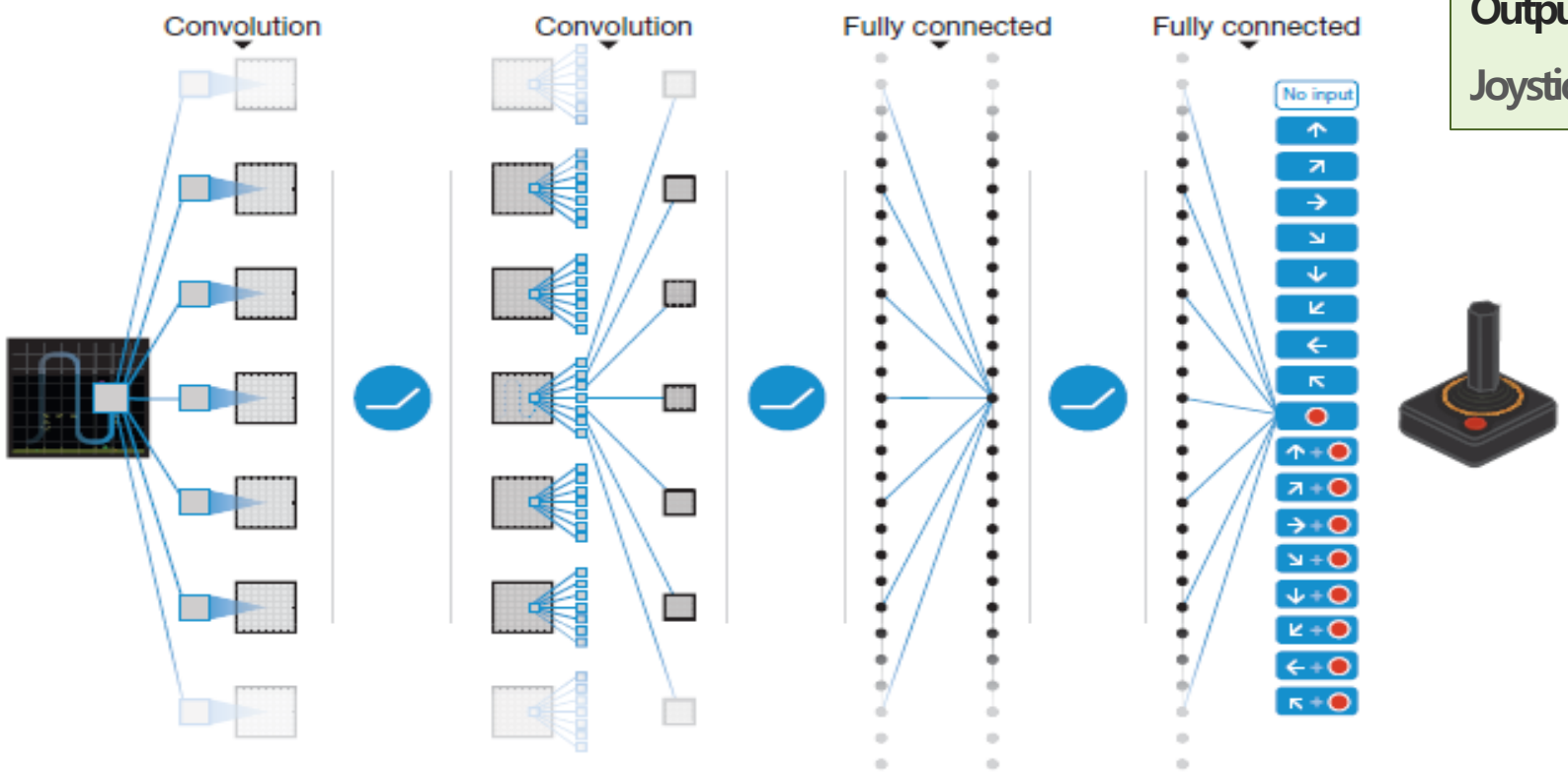
Deep Neural Network of AlphaGo

Sensing

Situation Aware

Action

Input : Screen



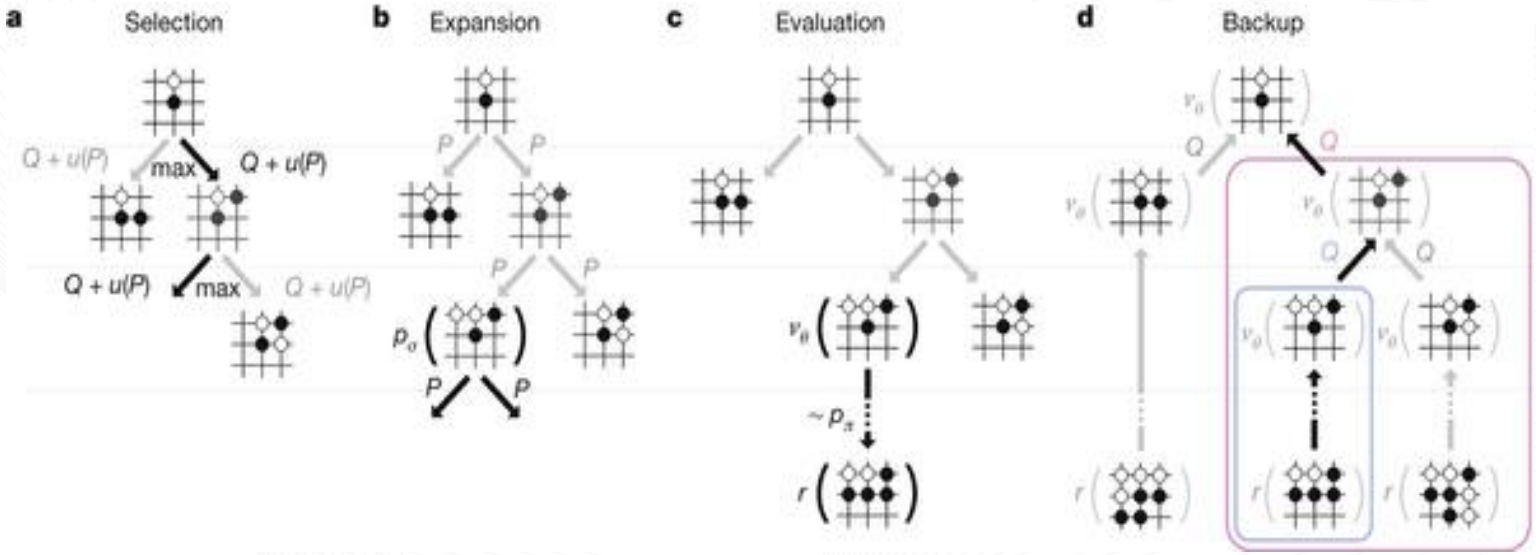
Output :

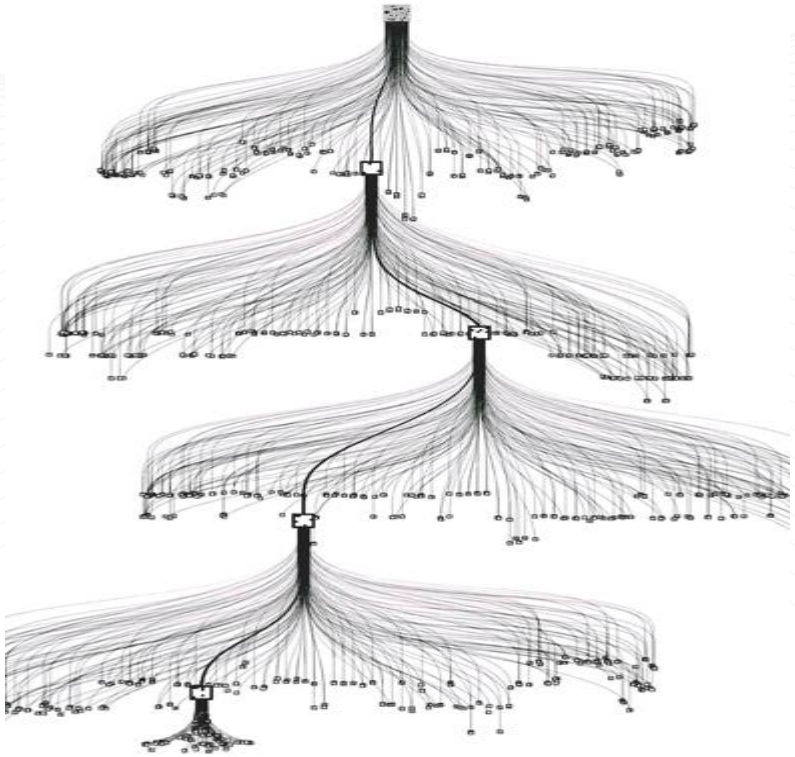
Joystick Action

Artificial Intelligence

AlphaGo, a tree search algorithm,

finds a winning play via wide and deep search, instantaneously using a cloud of computers





QUIZ

What is the name of this computer?

Developed by IBM

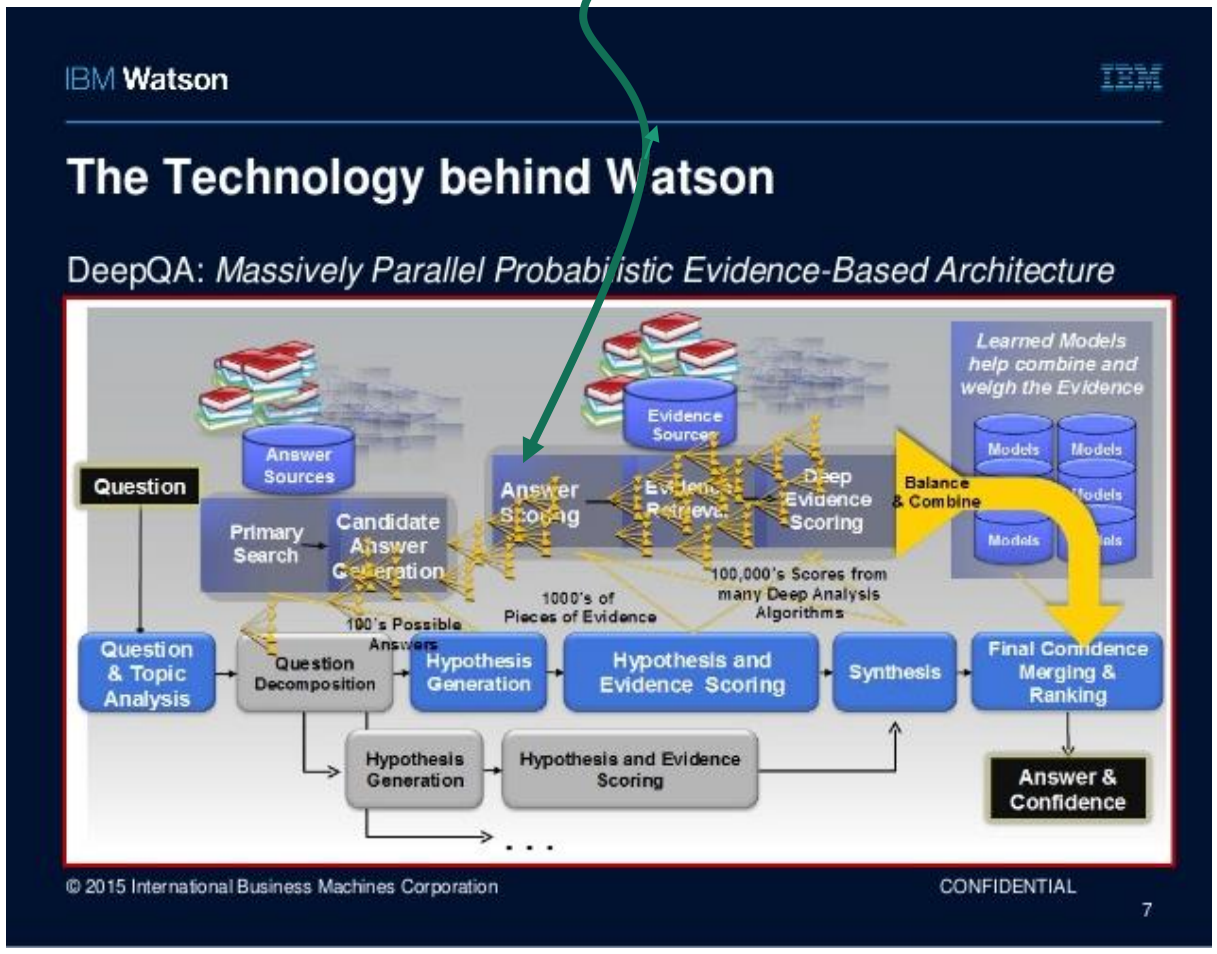
Can answer questions in natural language format

Artificial Intelligence Computer System

2011 Won the Jeopardy Game

Technology and Capabilities of Watson

Watson is also a tree-search algorithm, exploring a tree of deep QAs with high likelihoods and priors!



SPEECH TO TEXT	Employs low latency speech recognition capabilities to convert English speech to text
TEXT TO SPEECH	Synthesizes natural-sounding speech from text in English and Spanish
VISUAL RECOGNITION	Analyzes the visual content of images and videos to understand their content
CONCEPT INSIGHTS	Explores the concepts behind your input, identifying associations beyond traditional text matching
TRADEOFF ANALYTICS	Helps users make better choices by weighing multiple and often conflicting goals

Artificial Intelligence and Robots

Today, artificial intelligence can

Compute, (1997)

Hear, (2010)

See, (2013)

Make complex judgement (2016)

Understand Context, (2011)

Robot can Speak,

Walk,

Run,

Ride,

Fly.

without human intervention,

gain experience via seeing, reading & hearing,

accumulate knowledge, and

make comprehensive judgments.

Appearance of Super AI soon?

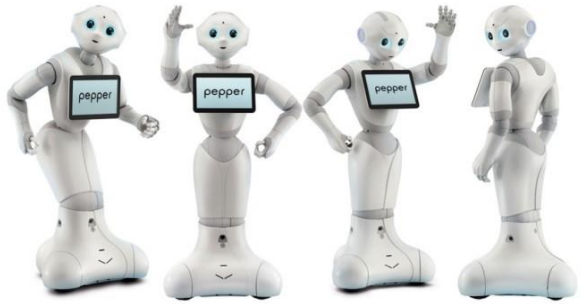
The end of humanity, or

an unlimited opportunity?

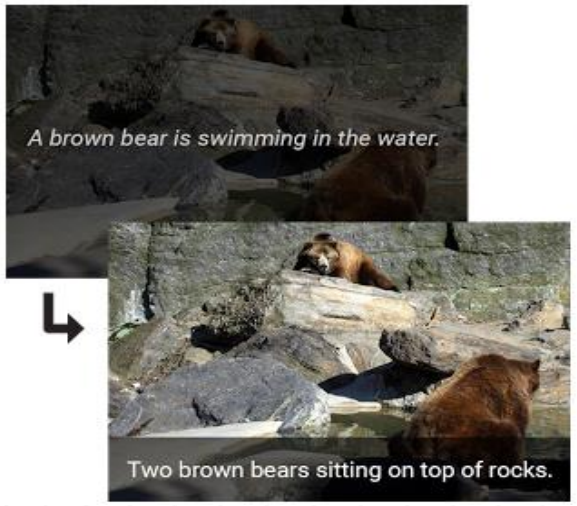
A.I.

The current of A.I., Robot : Listen · See · Speak · Cognitively Think · Understand Context

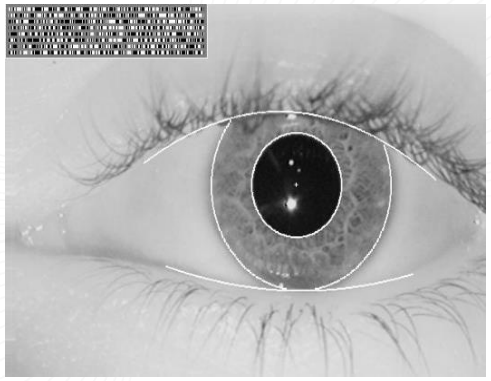
Interaction

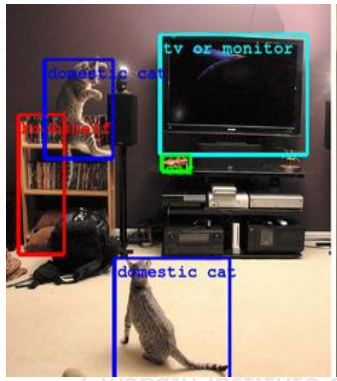


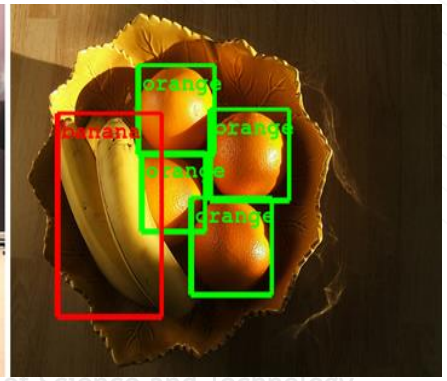
Understand Context (Google Captioning AI)



Recognition







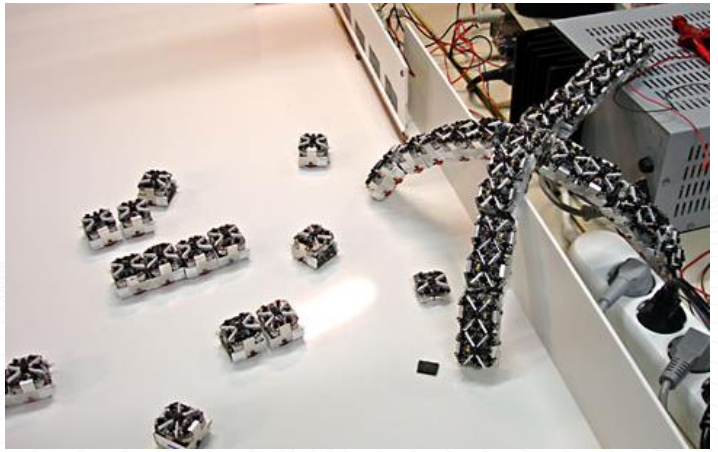
A.I.

The current of A.I. and Robot : Walk · Run · Ride · Fly

Handle Robot

(Boston Dynamics)

Swarm Robotics

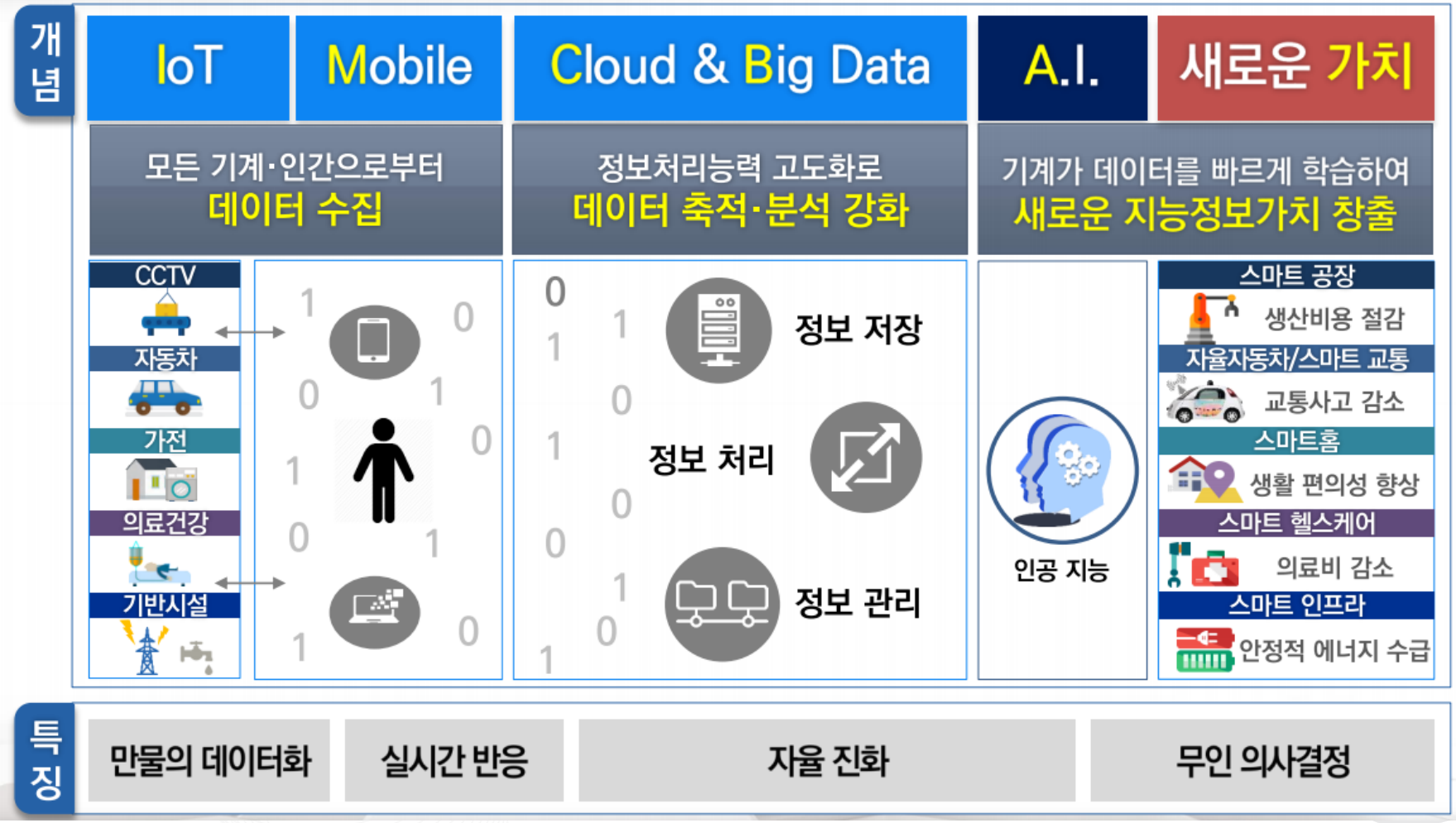


Driverless Car

Drones

Big Data is New Oil! AI is New Electricity!

Creating new value through intelligent IT



* 자료: 지능정보사회 중장기 종합대책 추진방향 - 미래창조과학부

New technologies that intelligent IT brings forth.

Smart logistics - Robotics, automation, self-driving technology

Service, health care, education, logistics, factory automation

Amazon's Warehouse

Driverless Truck Platoon

* 자료: "시속 1,000Km 하이퍼튜브(HTX) – 한국철도기술연구원

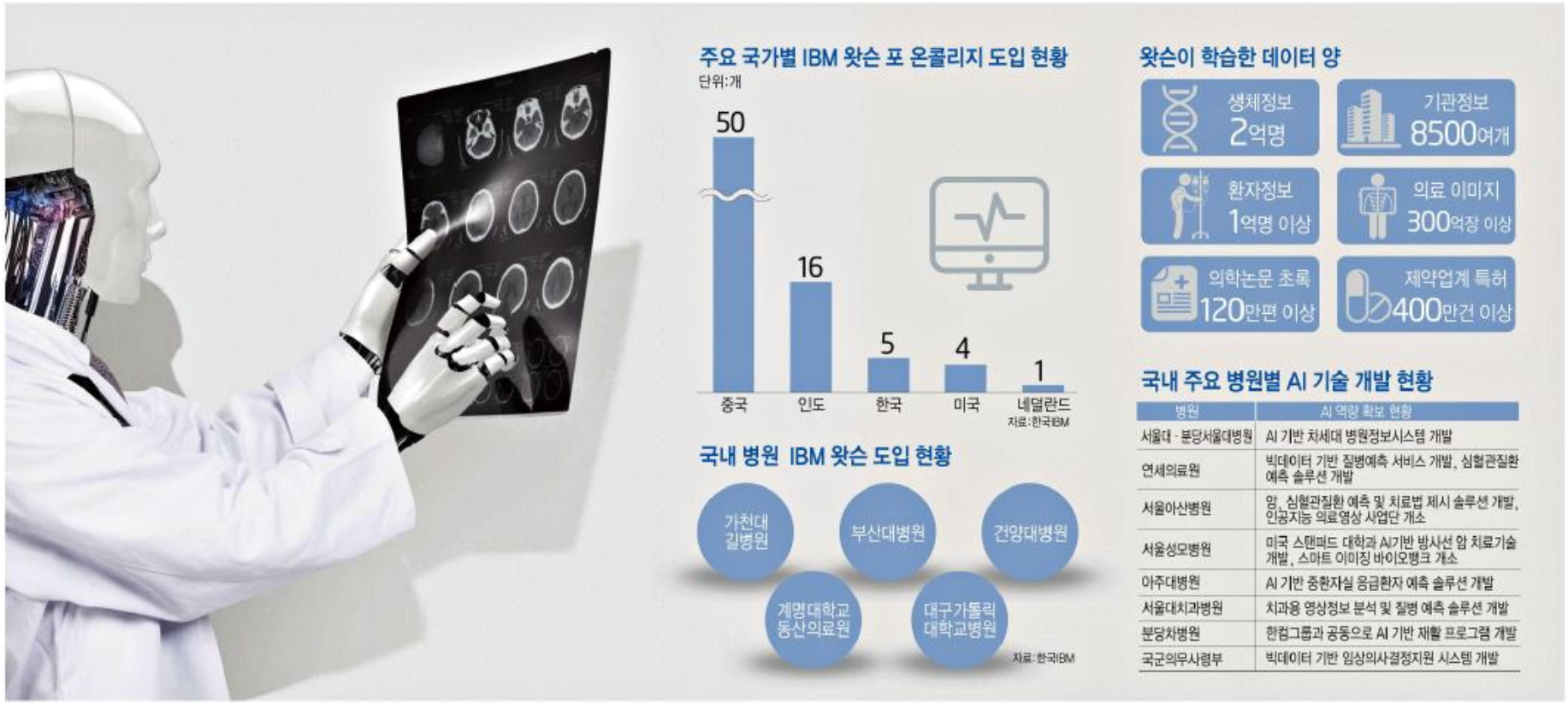
Watson for Oncology

Bios of 200M People, 3 Trillion Medical Images, 1.2M journals papers

Electronic Journal, April 11, 2017

전자신문

2017년 04월 11일 화요일 004면 종합



주요 국가별 IBM 왓슨 포 온콜리지 도입 현황

단위:개

자료:한국IBM

국내 병원 IBM 왓슨 도입 현황

자료:한국IBM

왓슨이 학습한 데이터 양

국내 주요 병원별 AI 기술 개발 현황

병원	AI 역량 확보 현황
서울대 · 분당서울대병원	AI 기반 차세대 병원정보시스템 개발
연세의료원	빅데이터 기반 질병예측 서비스 개발, 심혈관질환 예측 솔루션 개발
서울아산병원	암, 심혈관질환 예측 및 치료법 제시 솔루션 개발, 인공지능 의료영상 사업단 개소
서울성모병원	미국 스탠퍼드 대학과 AI기반 방사선 암 치료기술 개발, 스마트 이미징 바이오뱅크 개소
아주대병원	AI 기반 중환자실 응급환자 예측 솔루션 개발
서울대치과병원	치과용 영상정보 분석 및 질병 예측 솔루션 개발
분당차병원	한컴그룹과 공동으로 AI 기반 재활 프로그램 개발
국군의무사령부	빅데이터 기반 임상의사결정지원 시스템 개발

◇세계 톱3 'AI 도입국', 의료 혁신 시작됐다

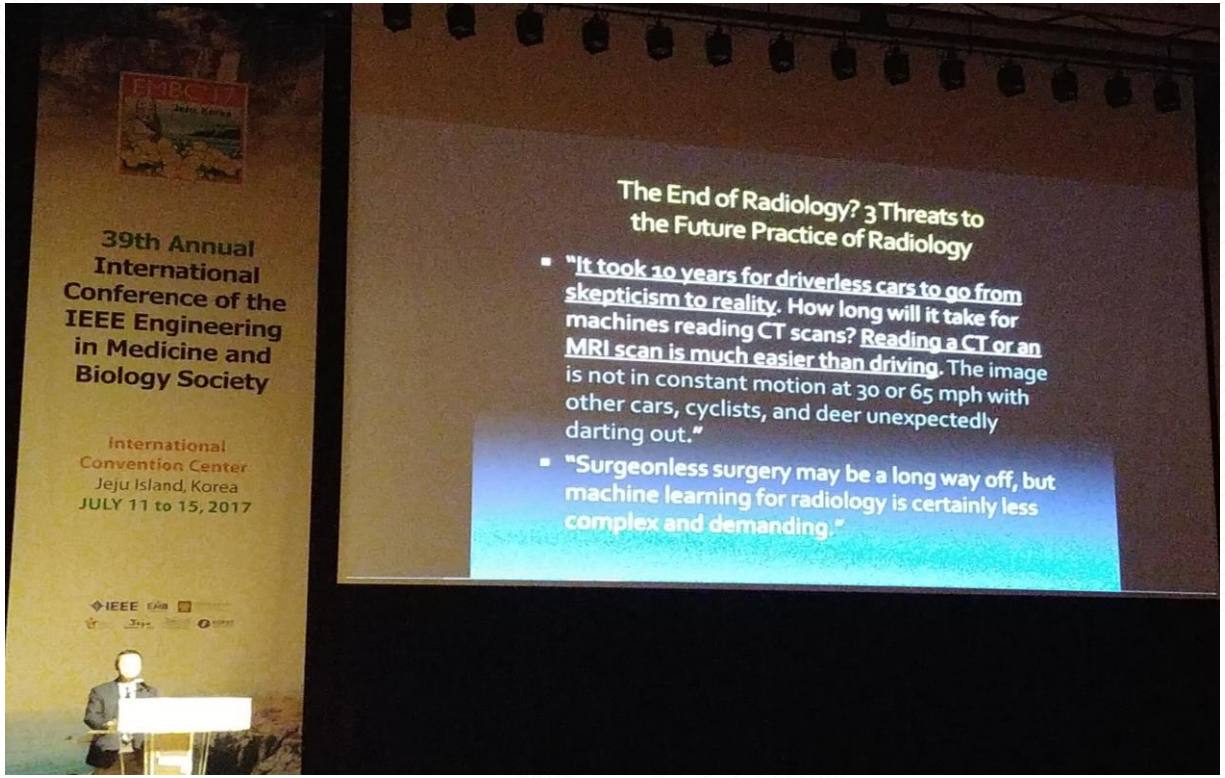
알파고가 불러온 AI 신드롬은 병원에서 IBM '왓슨'이 바통을 이어 받았다. 코그니티브(인지) 컴퓨팅 솔루션 왓슨은 빅데이터를 분석해서 자연어로 된 질문을 이해하고 답을 제시한다. 매일 쏟아지는 300여종의 의학저널, 200여종의 의학 교과서, 1500만쪽에 달하는 의료 정보를 학습해서 최적의 치료법을 제시한다. 암 진단·치료에 도움을 주는 '온콜로지' △유전자 분석에 초점을 맞춘 '지노믹스' △임상 시험을 돕는 '클리니컬 트라이얼 매칭' △연구개발(R&D)용 '라이프 사이언스' 등이 대표 솔루션이다.

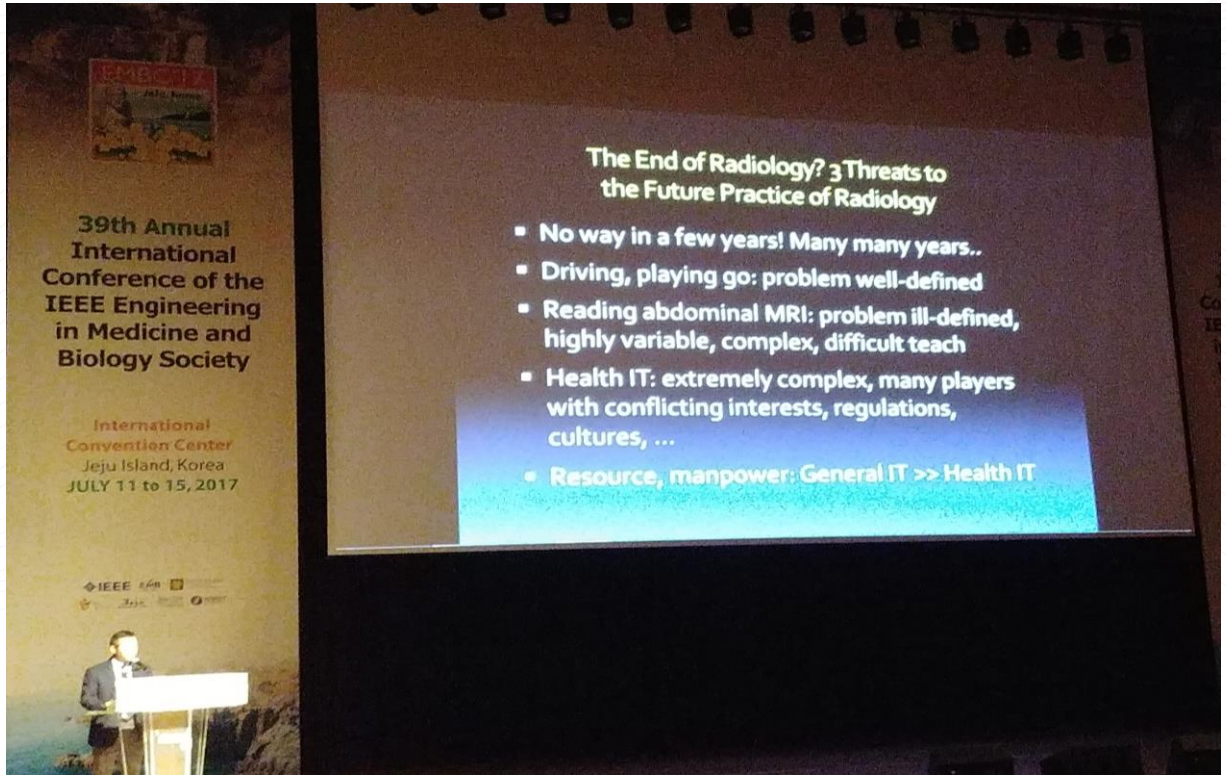
2015년 국내에 첫선을 보인 왓슨 포 온콜로지는 지난해 9월 가천대 길병원을 시작으로 부산대병원, 건양대병원, 계명대 동산의료원, 대구 가톨릭대학병원, 중앙보훈병원 등 6개 병원이 도입했거나 도입할 예정이다. 세계 각국과 비교해서 도입 비율이 높다. 왓슨 포 온콜리지를 도입한 병원은 중국이 50곳으로 가장 많다. 인도가 마니팔 병원 그룹 내 16곳이 도입해 뒤를 이었다. 우리나라(5곳)는 3위다. 미국이 4개 병원, 태국·네팔·네덜란드가 각 1곳이다.

AI 주치의 등장…의료혁신 脈 제대로 짚을까

A Radiologist I met at IEEE EMBS 2017

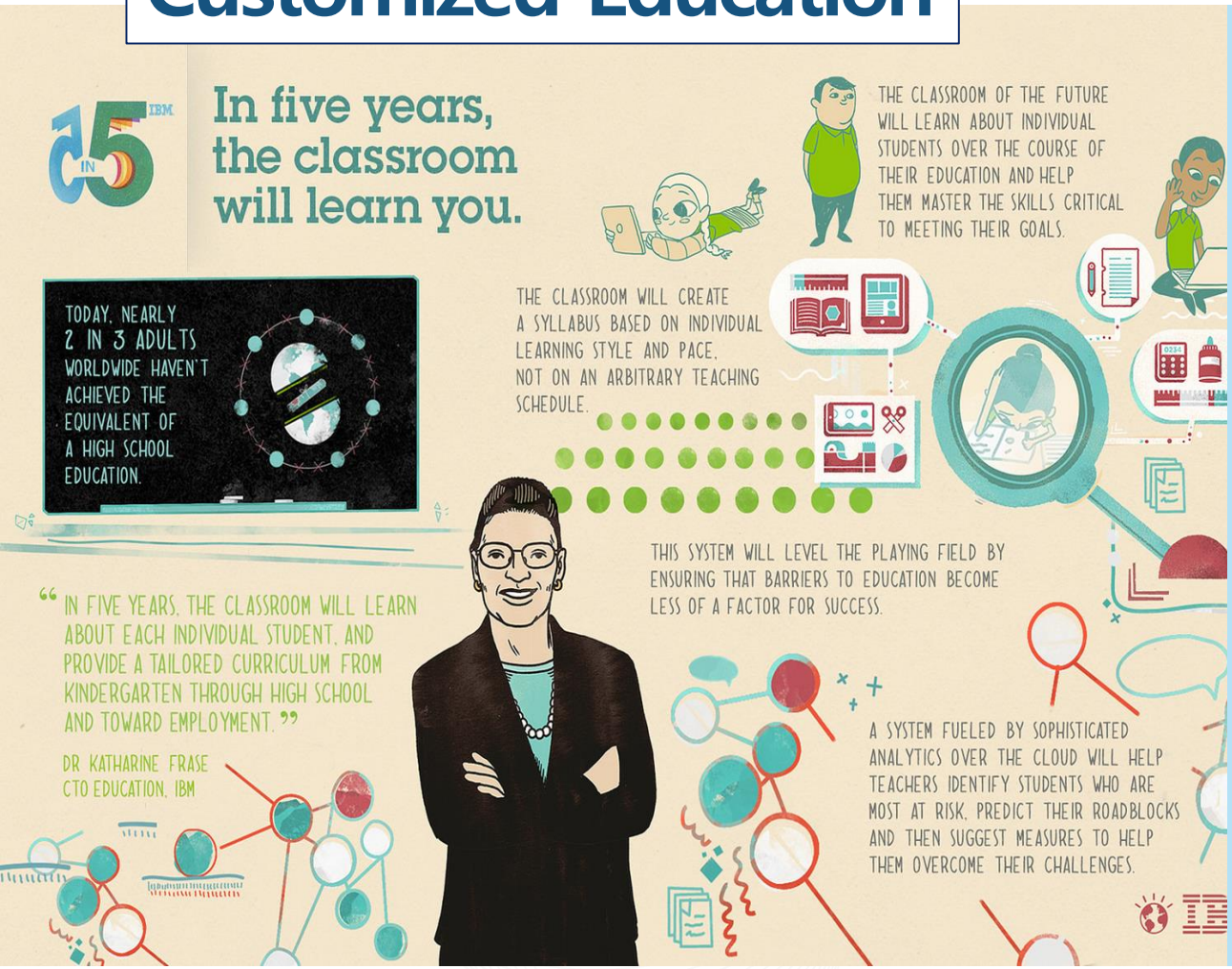
The end of Radiology?
He says No!
Why?
Because the job is very complex for AI to take over.
He says there are lots of hypes about AI.





IBM Watson Capabilities

Customized Education



Customized Medicine

Prospects of 4th Industrial Revolution

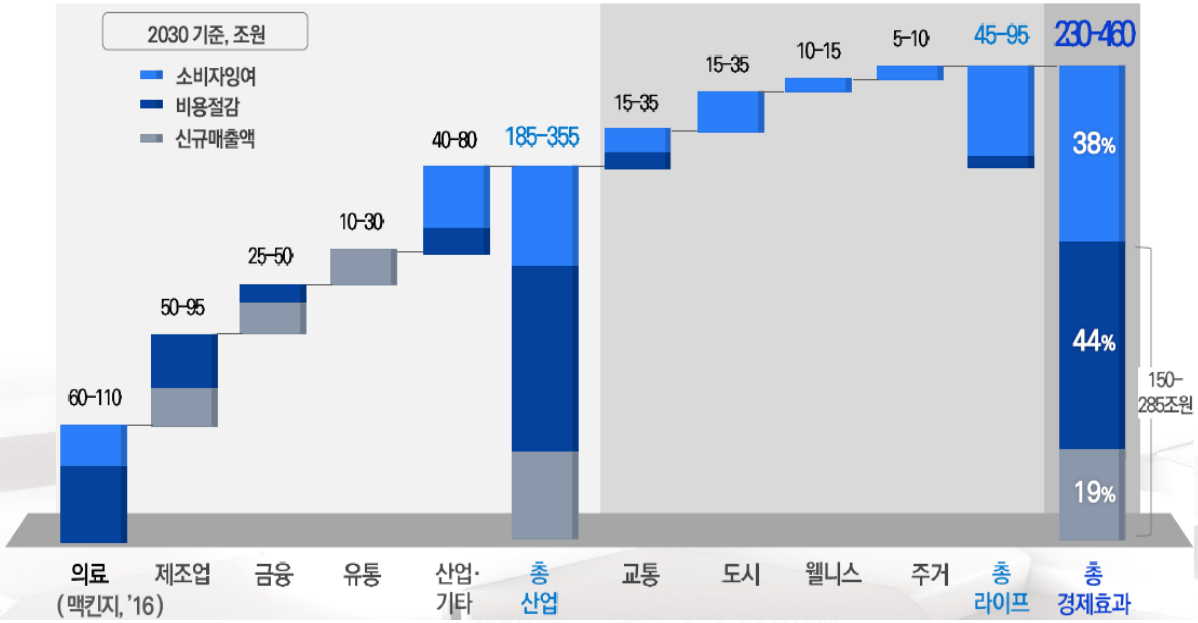
Prospects for Changes in Domestic Economy and Employment Effectiveness

경제효과

» 2030년 기준, 최대 460조원의 총 경제효과 발생

» 신규매출 85조원, 비용절감 199조원, 소비자후생 175조원 (최대치 기준)

경제적 영향분석



고용효과

기존 일자리 변화

» 총 노동시간 중 최대 49.7% 자동화 예상

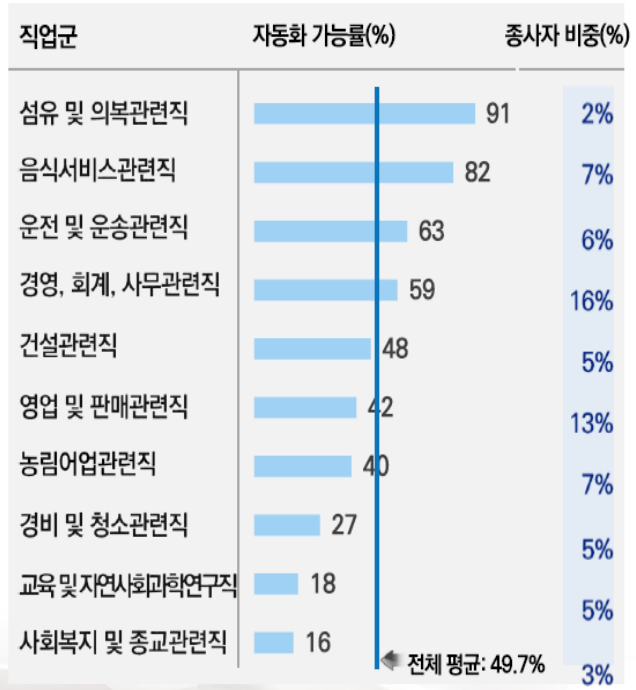
» 100% 대체되는 직업은 0.3%,
20% 이상 자동화 가능한 직업은 86%

신규 일자리 창출

» 2030년까지 SW엔지니어 등 지능정보기술 분야에서 약 80만명 일자리 창출

구 분	고용창출 효과
해외 AI 관련산업 종사자 예측 기반	10-45만명
외부기관 예측자료	60-80만명

일자리 영향 분석



※ 국내 총 2,500만명 일자리 (414개 직종) 분석(맥킨지, '16)

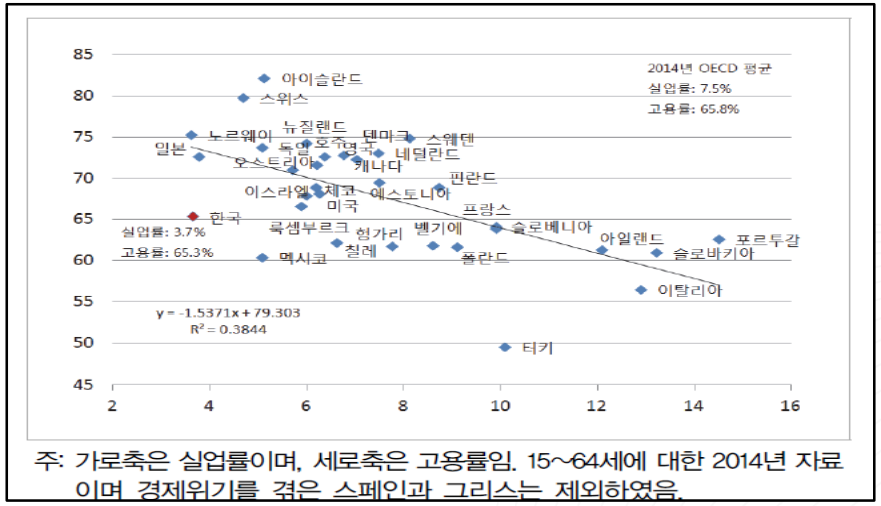
*자료: McKinsey(2016), 지능정보사회 중장기 종합대책 추진방향 - 미래창조과학부

Future society, future issues

Global Trends in Korea Future Issue

Low Growth Era

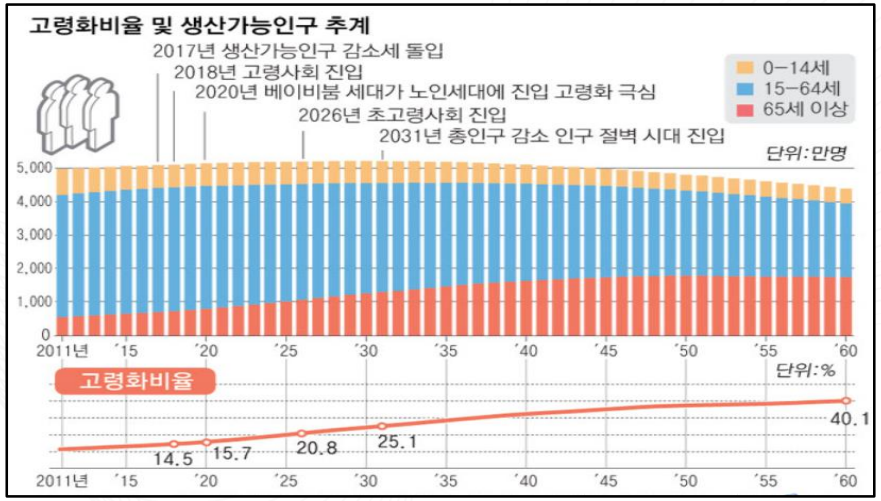
Fixed employment rate (60%)



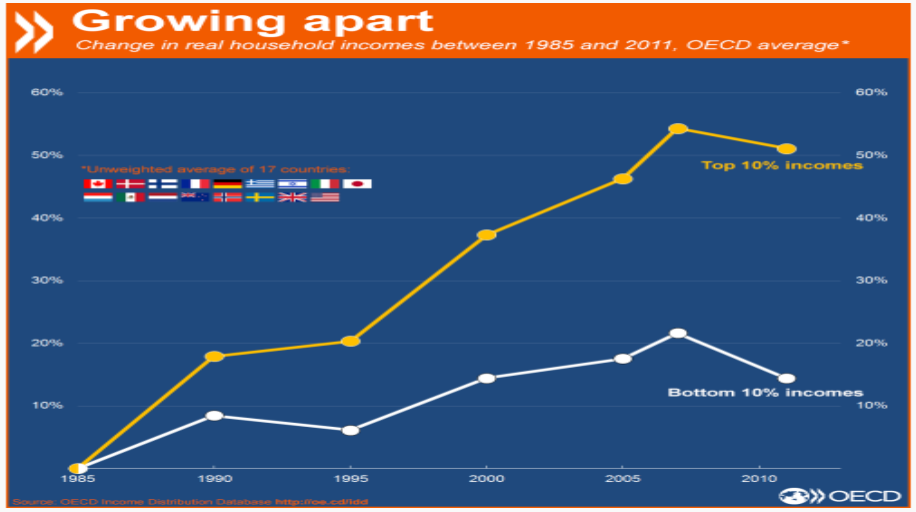
주: 가로축은 실업률이며, 세로축은 고용률임. 15~64세에 대한 2014년 자료이며 경제위기를 겪은 스페인과 그리스는 제외하였음.

Low fertility & Population Cliffs

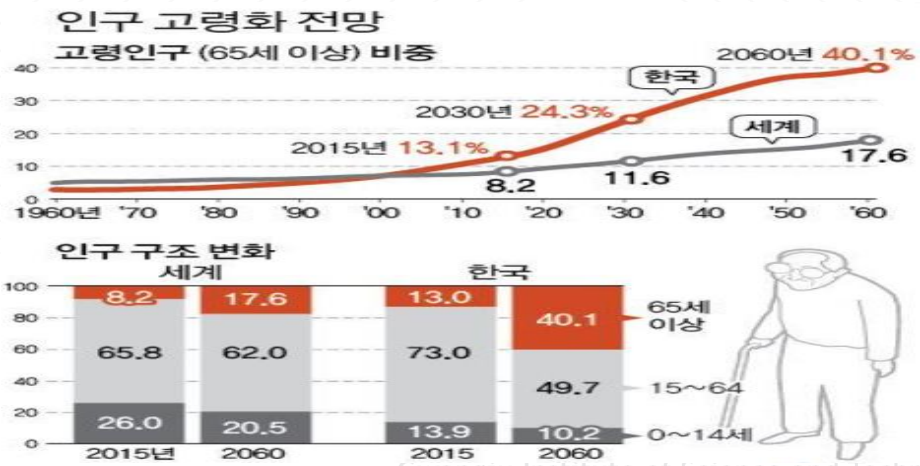
Decrease in total population (2031년)



Income Polarization



Ageing Population



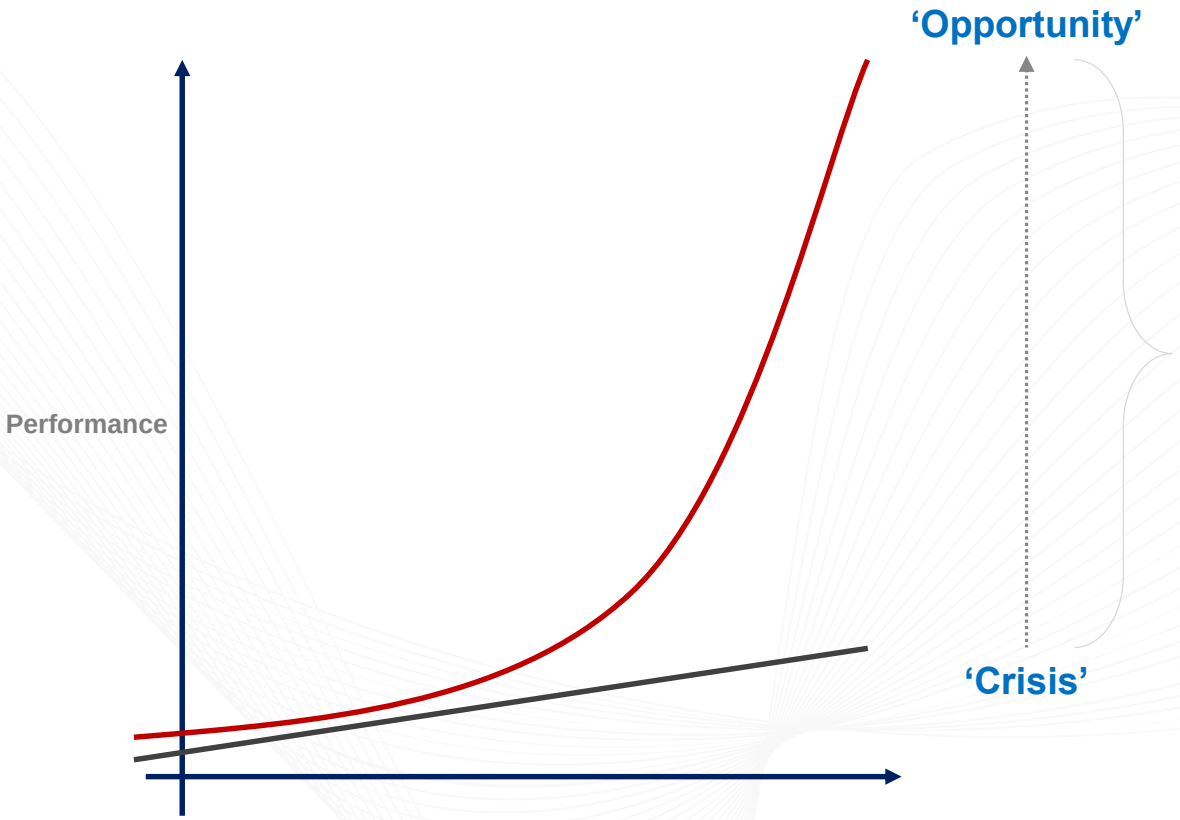
"저성장 시대의 고용확대정책: 유럽 주요국 사례 및 실증 분석을 중심으로" - 대외경제정책연구원

"OECD Forum 2015: Income Inequality in Figures"

Great turn brought by 4th IR

The era of 4th Industrial Revolution coming, crisis or opportunity?

"Crisis" to "Opportunity"



How?

Great turn brought by 4th IR

Ability we need, in the era of the 4th IR

Mathematics

수학

Creativity

창의력

Soft Power

소프트파워

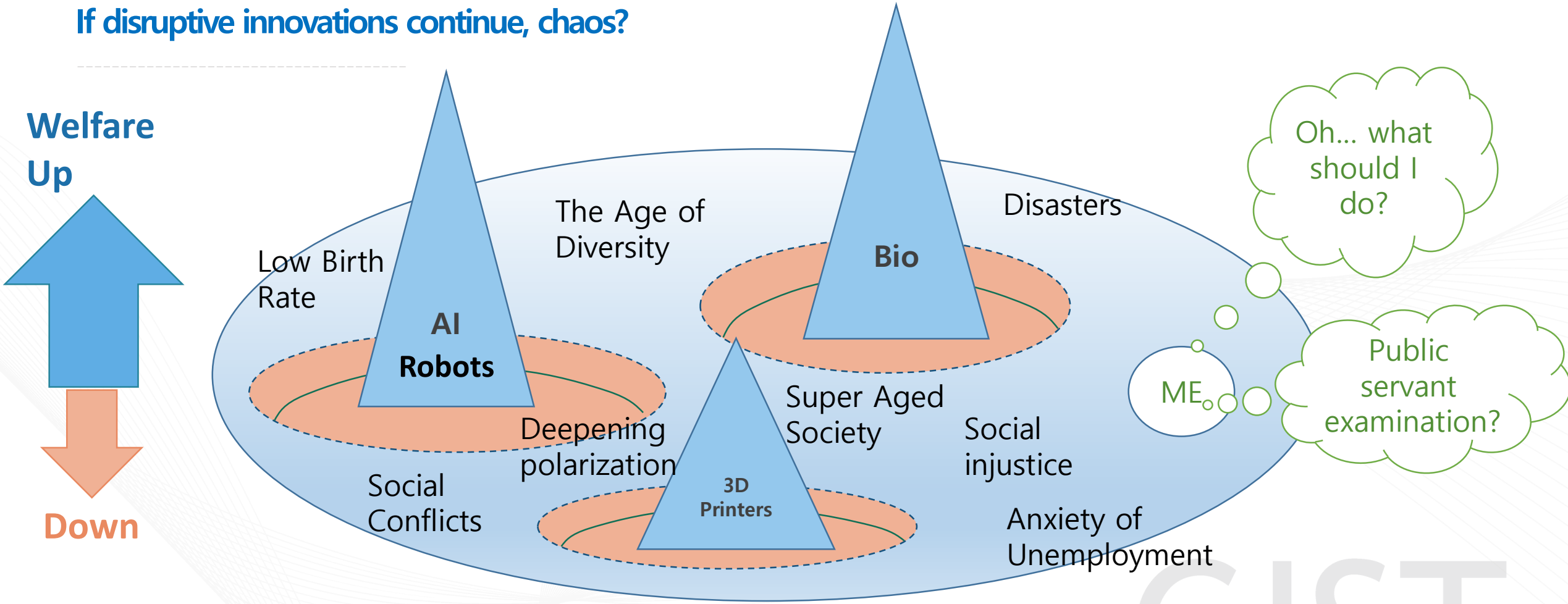
"Low-level language or mathematical abilities
can be replaced by artificial intelligence"

"With our more creative thinking,
Find the direction
Hidden in the ocean of data.
We must focus on developing higher human intelligence "

- KAIST Jung JS

4th Industrial Revolution and Future Society

If disruptive innovations continue, chaos?



A very few elite groups gain a huge success, while majority lose!

4th Industrial Revolution and Future Society

With positive mind, make plans and grab opportunities

Technology advances make the world a better place to live!

Find desirable future values, solve problems by advancing technologies.

Bolster human dignity & pursuit of happiness!

Again, it's not tech adv. that's bad.

1950

2010

4th Industrial Revolution and Future Society

Belief and Right mindset We should keep!!

Belief. Sustainable growth through technological innovation

- However, the environment such as earth, space, nature should be protected!

- Fair distribution of wealth
  - Beware of marginalized class, dislocated class
- Need for balanced development
  - Single Cell vs. Multiple Cells
- Sharing Economy → No ownership society
  - Socar, AirBnB, Uber

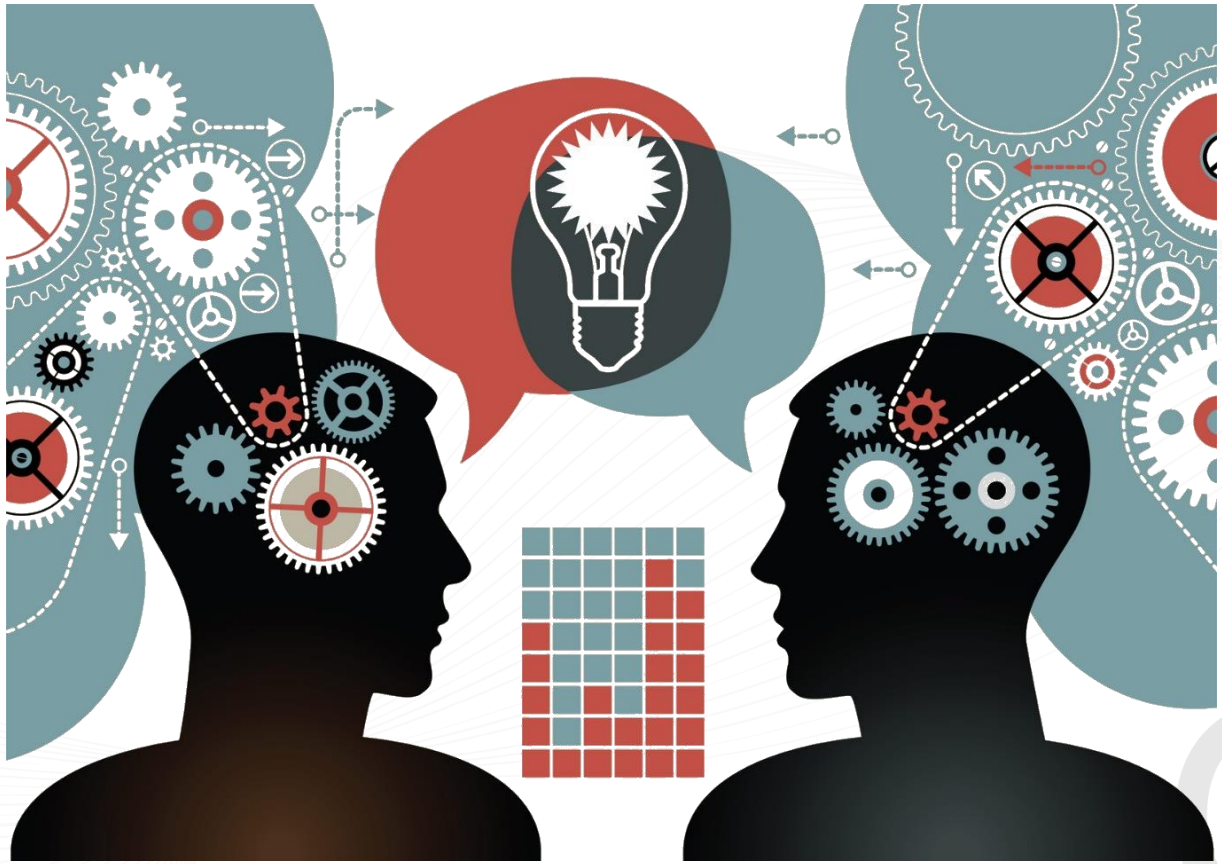
4th Industrial Revolution and Future Society

- **Harmony among generations**
  - Digital native young vs. old living in the age of 100
  - Harmony of old and young
- **Responsive & Responsible**
  - Hyper connected & collective intelligence age
  - Small Elites vs. Every Party Involved
  - Multi-stakeholders shall work together!!!!
- **Progress to play-like working society!**
  - Self actualization

4th Industrial Revolution and Future Society

Talents in the Fourth Industrial Revolution

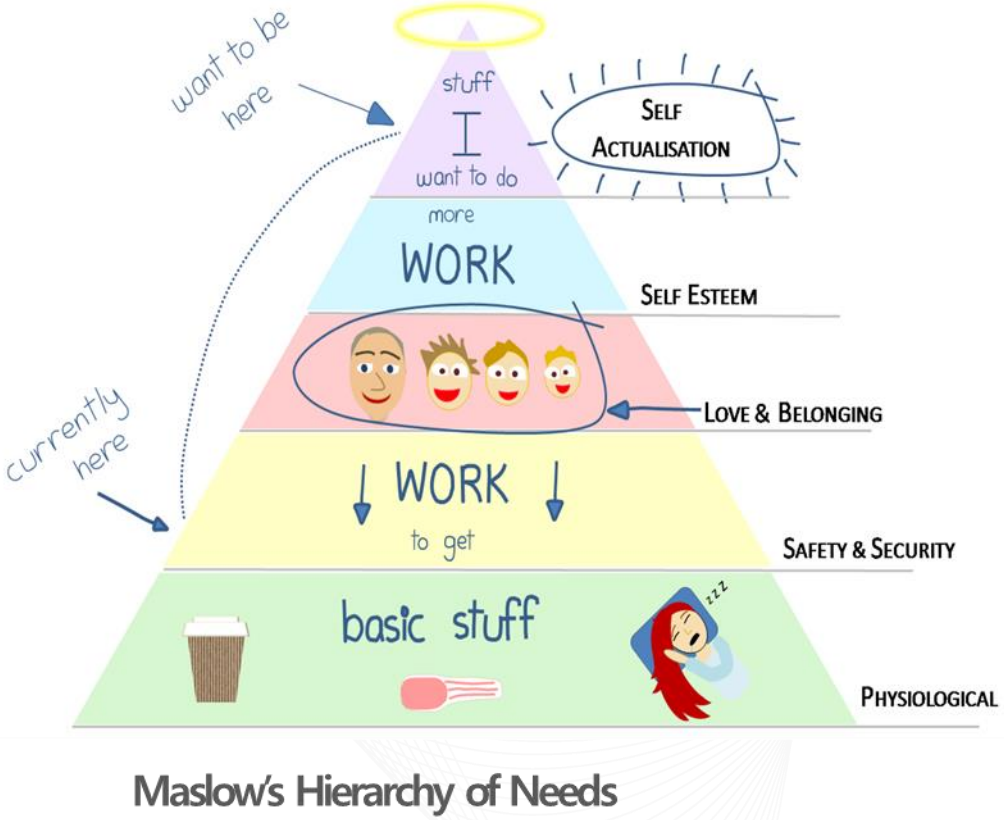
Communication, Convergence, Collective Intelligence, Sharing, Collaboration, and Empathy



A Sustainable Society

Future driven by technological innovations is the Age of Opportunity!

Human desire, Source of Job Creation (KAIST Lee MH)



Maslow's Hierarchy of Needs

4th Industrial Revolution and Future Society

Promotion Strategies

- Philosophical beliefs
- Set key values
- Problem analysis
- Preparing execution plans

  (Governments, University, Citizen)

A Sustainable Society

Realization of " happiness " through technology

4th IR toward Happier Korea

Continued growth via technology innovations

+

Realization of Human Actualization,

including human dignity and pursuit of happiness

↓

Continued development of world and happier world

The socioeconomic development strategy based on S&T

Belief

(long-term) Innovation improves human life
(short-term) Income polarization, career disappearance

strategy

Establishing a sharing, cooperating, trusting culture
Solving the polarization, job disappearance problems
Building a virtuous cycle of growth and distribution

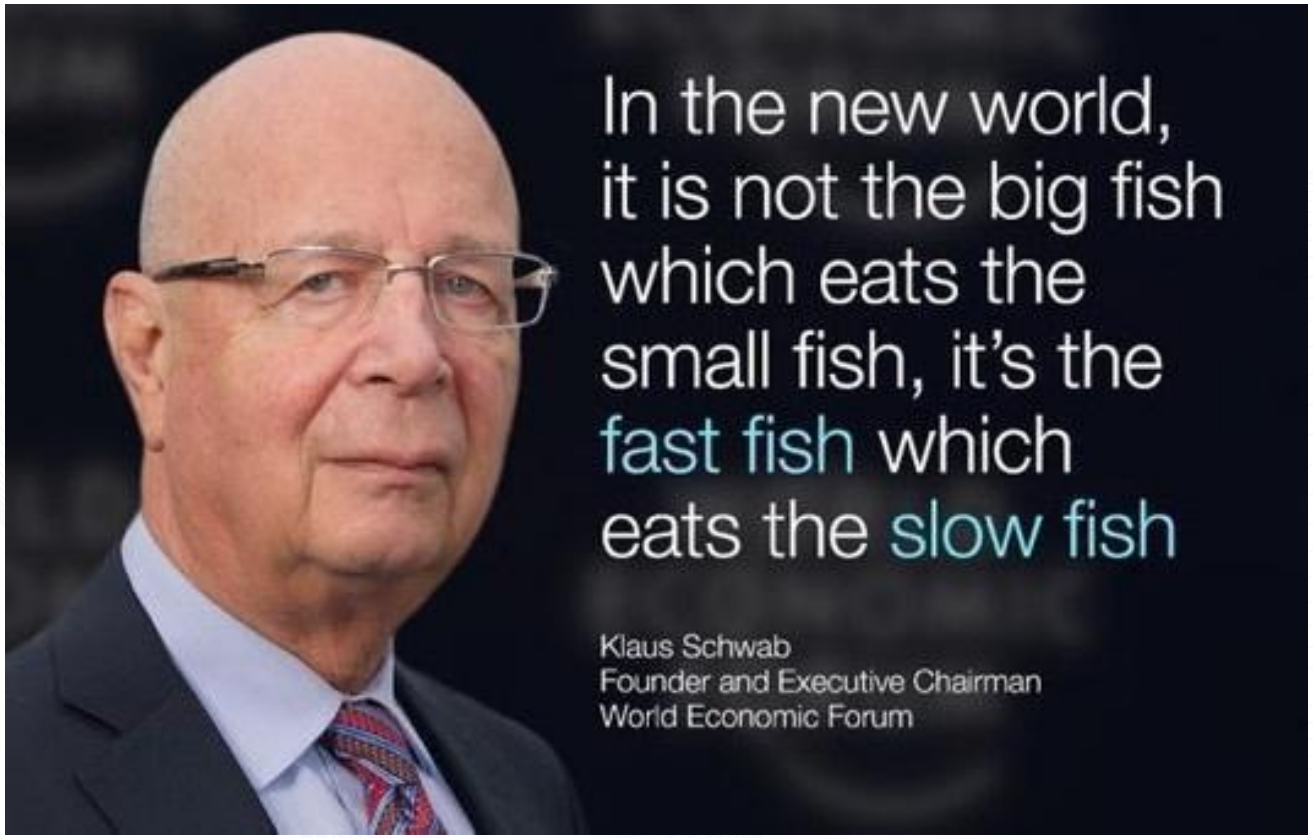
Respect diversity, Horizontal communication

- Increased productivity of innovative technology makes people's life better
- Establishing a strategy for continuous development of technology innovation
- **Responsive and Responsible Leadership**

(The main topic of 2017 Davos Forum)

Small fish has chances in the 4th IR era!

Fast fish & Slow fish



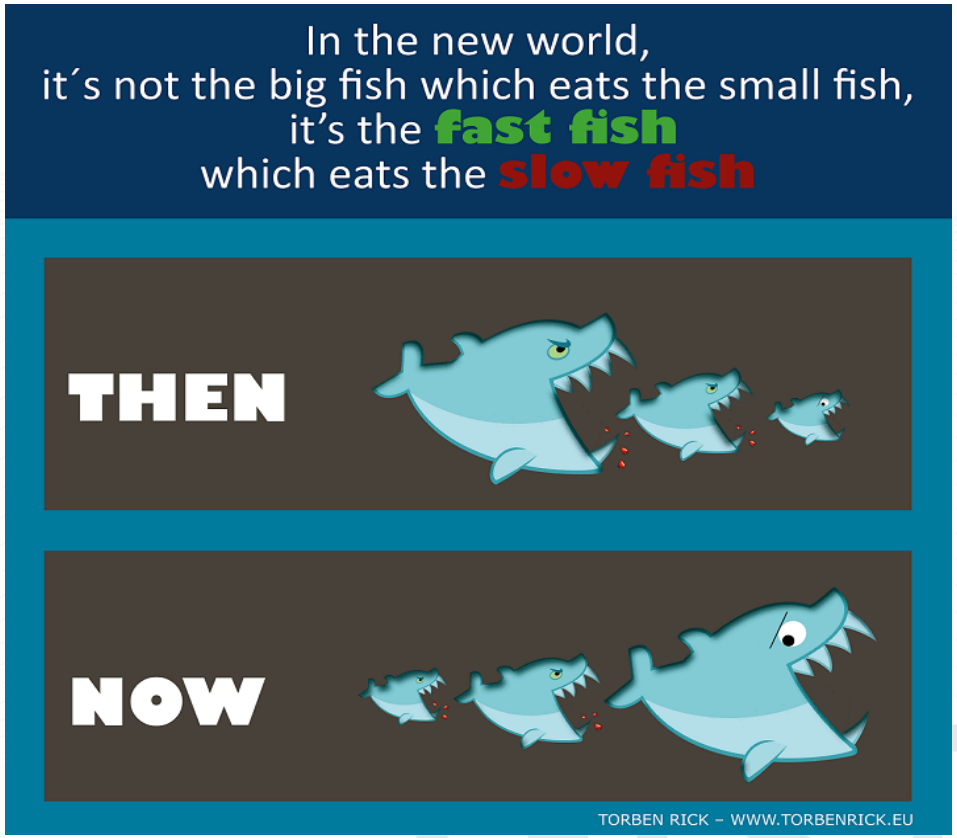
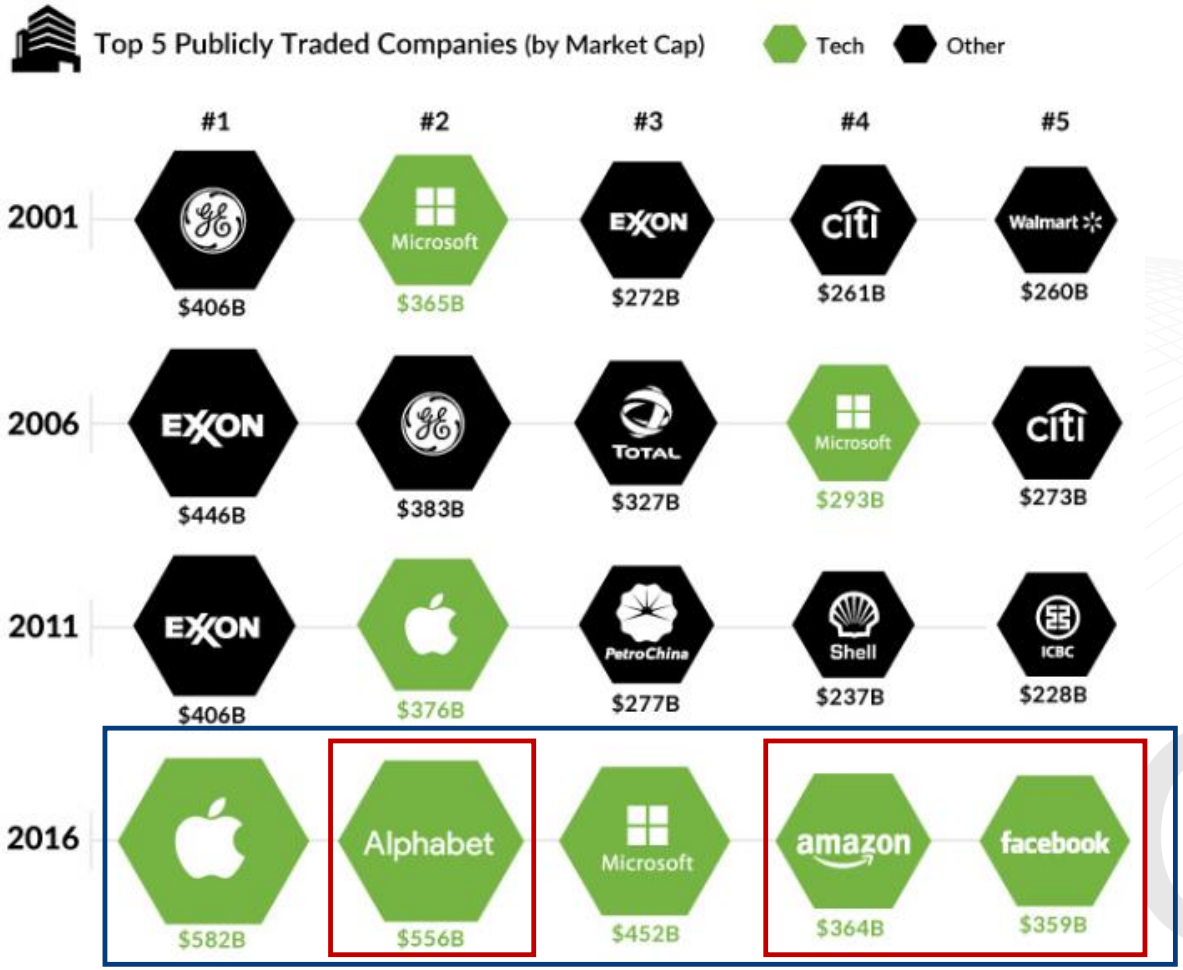


Table turns frequently, in the 4th IR era

Characteristics of the 4th Industrial Revolution

the Game Changer, But very flexible because of the short term technology cycle!



Silicon Valley based Tech. firms

< 20 years old

Crisis or Chance?

Preparation is important!

4th industrial revolution, coexistence of crisis and opportunity!

- Crisis: Maximized profits of few technological superiors,

  Despairs to many who cannot follow the change(unemployment)

- Opportunity: Frequent shifts of paradigm

  Faster spread of technology

  Easier to cooperate

  Easier to make ideas into reality

Korea's strategies for future

- Government declares future values, build innovative platforms.
- University opens up research outcomes/equipment/facilities.
- Professors shall do original research and educate young.
- Citizens be ready for lifelong study, use open platforms, challenge entrepreneurs.
- Companies should participate in a win-win ecosystem,
  spread innovative outcomes into the world.
- Korea takes a huge leap into a happy, active and innovative nation with a $40,000 per capita income.

Current Status of S&T in Constitution (Written in Korean)

제 1장 총강

제1조 ①대한민국은 민주공화국이다. ②대한민국의 주권은 국민에게 있고, 모든 권력은 국민으로부터 나온다.

제5조 ②국군은 국가의 안전보장과 국토방위의 신성한 의무를 수행함을 사명으로 하며, 그 정치적 중립성은 준수된다.

제 2장 국민의 권리와 의무

제10조 모든 국민은 인간으로서의 존엄과 가치를 가지며, 행복을 추구할 권리를 가진다. 국가는 개인이 가지는 불가침의 기본적 인권을 확인하고 이를 보장할 의무를 진다.

제23조 ①모든 국민의 재산권은 보장된다.

제34조 ⑥국가는 재해를 예방하고 그 위험으로부터 국민을 보호하기 위하여 노력하여야 한다.

제36조 ③모든 국민은 보건에 관하여 국가의 보호를 받는다.

제 9장 경제

제119조 ②국가는 균형있는 국민경제의 성장 및 안정과 적정한 소득의 분배를 유지하고, 시장의 지배와 경제력의 남용을 방지하며, 경제주체간의 조화를 통한 경제의 민주화를 위하여 경제에 관한 규제와 조정을 할 수 있다.

제123조 ①국가는 농업 및 어업을 보호·육성하기 위하여 농·어촌종합개발과 그 지원등 필요한 계획을 수립·시행하여야 한다.

②국가는 지역간의 균형있는 발전을 위하여 지역경제를 육성할 의무를 진다.

제127조 ①국가는 과학기술의 혁신과 정보 및 인력의 개발을 통하여 국민경제의 발전에 노력하여야 한다.

Current Constitution

- The people of Korea made a nation to defend their homeland and live peacefully. (Act 1)

- The state protects the people from wars, disasters, and crisis, and guarantees the basic rights of the people, such as the pursuit of happiness, freedom, and education (Act 2)

- The state shall endeavor to develop national economy through innovation of science and technology and development of information and manpower. (Act 127)

Leap to a Nation of Welfare via ST Development

Amendment of the Constitution

- The South Korean people built a national defense to defend the nation and live peacefully.
- The nation protects the people from war, disaster and shouting, and guarantees the basic rights of people, such as dignity, pursuit, freedom, freedom, and education.

- **The state supports the pursuit of scientific discovery and technology development aiming to foster the basic rights of all people.**
- **The state timely and evenly distribute the outcome of economic growth via science and technology advances throughout the nation.**

- **Better, in Act 1 or the manifesto of amendment.**

Making New Jobs and Digital Governance, Korea National Assembly, Feb. 13th, 2017.

Korean strategy in 2017 for seizing the opportunity?

What should be the job creation strategy for Korea?

We need to continue the creation of *innovative* outcomes??

- Why is there no visible technological innovations in Korea such as AI, IoT, Big Data, Bio?
- How can we foster people like Bill Gates, Steve Jobs, Sergey Brine and Jeffrey Hinton???

Beware of what we have, we need to position ourselves well, globally and historically!

- Realize good's and bad's in us (Concentration of population, traffic networks)
- Utilize the opportunities leading nations provide. via cooperation and open innovation
- Share the value of the 4th Industrial Revolution
- Instill lifelong learning, promote science and technology education.

Strategy for seizing opportunity in Korea

Each local government should establish platforms and implement strategies by analyzing local issues.

For example, Jeonnam-do and Gwangju have open fields, rivers, and oceans.

So it's easy to make a quick change.

Focus on family

Strategies for Seizing Opportunities in Korea

Strategy to prepare for the fourth industrial revolution

Human resource training/ 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

The strategy for seizing the opportunity in Korea

Makers Movement

Garage Culture

Start-up support, production of prototype 21 days, Seeed Studio(中)

Maker Faire

Spread maker space (Korea)

전자신문 | etnews

[人사이트]이홍노 GIST 연구원장 "4차 산업 창업캠퍼스 조성 최선"

발행일 : 2017.06.19

<이홍노 GIST연구원장>

<이홍노 GIST연구원장>

"4차 산업혁명을 주도하는 독창적인 미래기술을 연구개발(R&D)하고, 시장 중심기술의 창업대학으로 발전할 있도록 최선을 다하겠습니다."

광주과학기술원(GIST·총장 문승현)이 인공지능(AI)과 빅데이터 등 첨단기술을 활용해 연구와 교육, 사업화가 시에 가능한 (가칭) '글로벌 이노베이티브 캠퍼스(GI 캠퍼스)' 조성을 추진하고 있다. 오는 2022년까지 5년간 사업비 1430억원을 투입해 광주첨단과학산업단지 3지구 33만㎡(약 10만 평) 부지에 GI 캠퍼스를 조성하기로 했다.

GI 캠퍼스 조성 프로젝트를 주도하고 있는 이홍노 GIST 연구원장(전기전자컴퓨터공학부 교수)은 "GI 캠퍼스는

A 5 year project
2 Billion USD

1인당 학생 10명·의무 강의 2개 제한… GIST 교수는 AI 연구하기 좋겠네

자율주행·헬스케어 로봇 '우리 손으로'

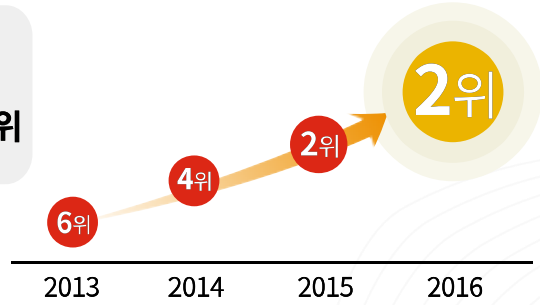
"국내외 기관 교류·협력 활발 R&D 활성화로 창업단지 기여"

The role of the university

University of Science and Technology GIST

2016 QS 세계대학평가 (피인용수 부문)

교원1인당 논문 피인용수 부문
2년 연속 세계 2위/9년 연속 국내 1위



1	King Abdullah University of Science and Technology	
2	Gwangju Institute of Science and Technology (GIST)	
3	Princeton University	
4	California Institute of Technology (Caltech)	
5	University of California, Santa Barbara(UCSB)	
6	Ecole normale superieure, Paris	
7	Weizmann Institute of Science	
8	Harvard University	
9	Pohang University of Science And Technology(POSTECH)	
10	Massachusetts Institute of Technology(MIT)	

2016 THE 세계대학평가 (종합부문)

종합 부문
세계 301-350위
국내 7위

※ ( ) 안은 세계순위

1위	서울대(72위)
2위	KAIST(89위)
3위	POSTECH(104위)
4위	성균관대(137위)
5위	고려대(201-250위)
6위	연세대(251-300위)
7위	**GIST(301-350위)**
8~10위	한양대, 경희대, 중앙대

기타 2015-16 세계대학평가 결과

미국 특허 등록 Top 100
(미국 특허국, 특허부문)
세계 57위 / 국내 5위

Rank Pro 세계대학평가
(ICS, 종합부문)
세계 116위 / 국내 3위
※ KAIST 35위, POSTECH 60위, 서울대 166위, 연세대 200위

세계에서 가장 혁신적인 대학
(톰슨로이터, 특허 등 성과확산 부문)
세계 86위 / 국내 8위

설립 50년 미만 세계대학평가
(THE, 종합부문)
세계 33위 / 국내 3위
※ POSTECH 5위, KAIST 6위

The role of the university

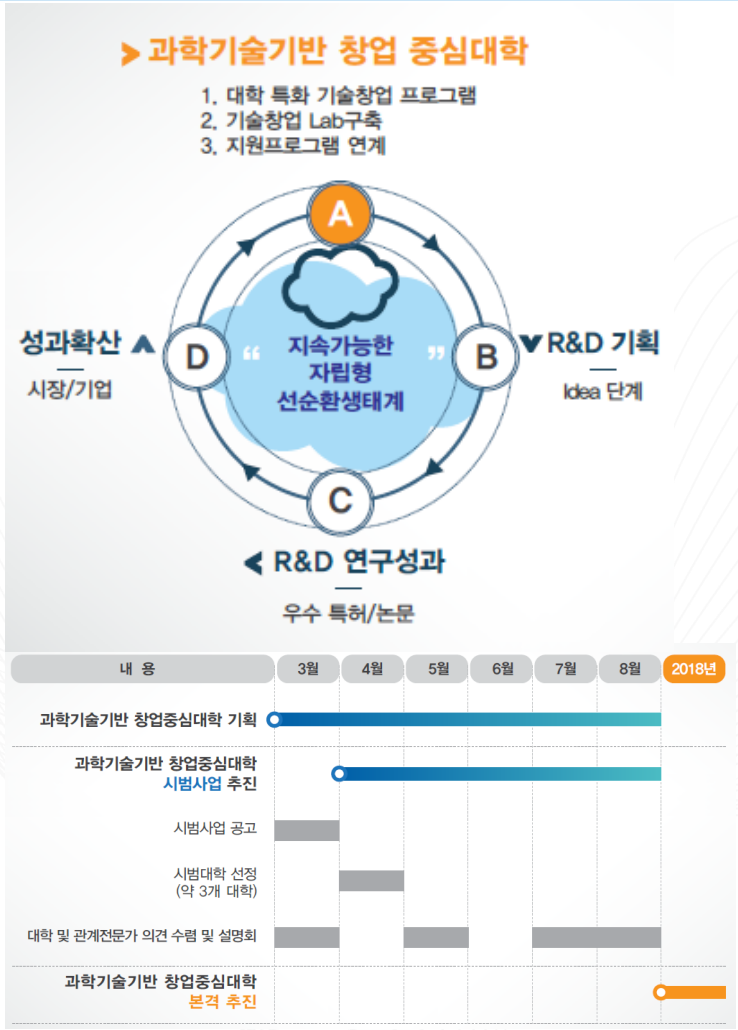
Selected as a science and technology-based entrepreneurial center university project

Ministry of Science, ICT and Future planning-GIST Research policy center

2017.2.28. DDP

The acting president's greetings

Director's Announcement



The role of the university

Knowledge innovation of specialization science and technology university

As a world-renowned university of innovation, Quantum Jump

Build an open research platform

수요자중심 · 시장주도형 기초 및 융합 연구트랙 신설

- 대학의 연구성과 · 기술 · 장비 개방을 통한 R&D 오픈이노베이션
- 지능정보기술기반 기초 및 융합 연구혁신 선도

가치 창출·Business Model 발굴 형 교육혁신

트랜스휴먼 엔지니어링(Trans-Human Engineering) 실증공학 프로그램 신설

- '과정'을 중시하는 인간중심적 교육(공감-문제발견-수요자/시장중심 문제해결-가치창출)
- 개방형(MOOC, Flipped Learning) 교육혁신 및 융합 형(STEAM) 인재양성

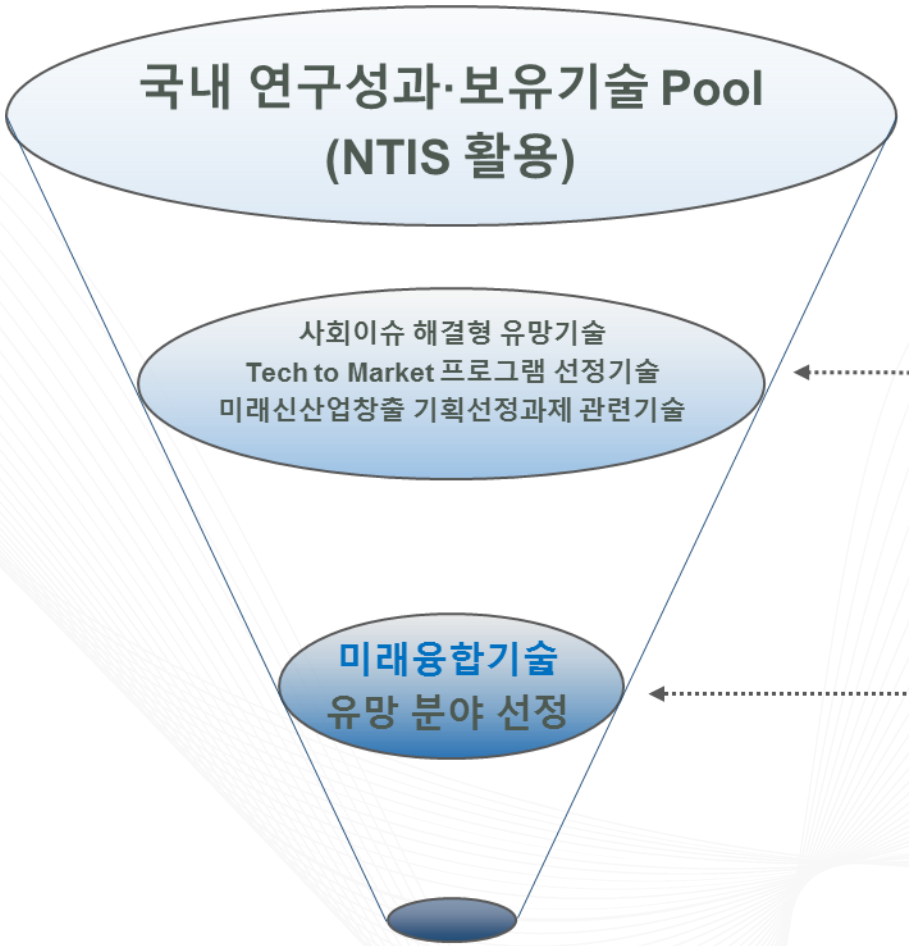
Creating a performance-based ecosystem

창의혁신생산 플랫폼 구축을 통한 성과→사업화→재투자 선순환구조 확립

- 하이테크 기술기반 창업 · Lab-to-Market 촉진
- Activate the business establishment through the commercialization model of the civic group.

Platform of the 4IR

Platform where the public derives technology entrepreneurial items



미래 예측을 통한 산업화 가능 고려

4차 산업혁명 관련기술 · 미래 이슈 연관성 고려

| 물리 | 디지털 | 바이오 |

| 성장하는 사회 |스마트한 사회 | 건강한 사회 | 지속 가능한 사회 | 안전한 사회 |

국내 R&D 정책 · 현황 파악 및 접점 분석

My own start-up item

Platform of the 4IR

Citizen

Be responsive to the problem of world!
Lifelong Learning Using Open Platform!

- Use On-line SW
- Use hundreds of free On courses
- Using public technology

  (Goverment 3.0, Goverment 4.0)

Challenge yourself!

Strategies for Future Society

The ability to grow individuals to prepare for the future.

Creativity ~ Positive mind, empathy, and passion

Bright Future

Belief

Create New from Brushing up Old

Research

Read, Think & Write

The only way

" Artificial intelligence is a man-made SW.
The prepared can take advantage of AI technology."

“The future is for us to make.”

“Creativity comes from reading, thinking and writing“

"Innovation via research shall provide solutions in many areas of human needs, such as politics, economics, society, law, medicine, and response to climate change.

Heung-No Lee

Strategies for Future Society

Solve a difficult problem which is known to have an answer!

vs.

Find problems and solve, in your own ways!

Heathy, Happy Korea with sustainable development

The Image of Healthy organization · Local Society · Nation · Human Kind

Few Elite

Closed

Polarization

Separation

Miscommunication

Vicious Circle

Ownership

Distrust

Equality, Collective Intelligence

Open

Fair Distribution

Fusion

Communication

Virtuous Circle

Sharing

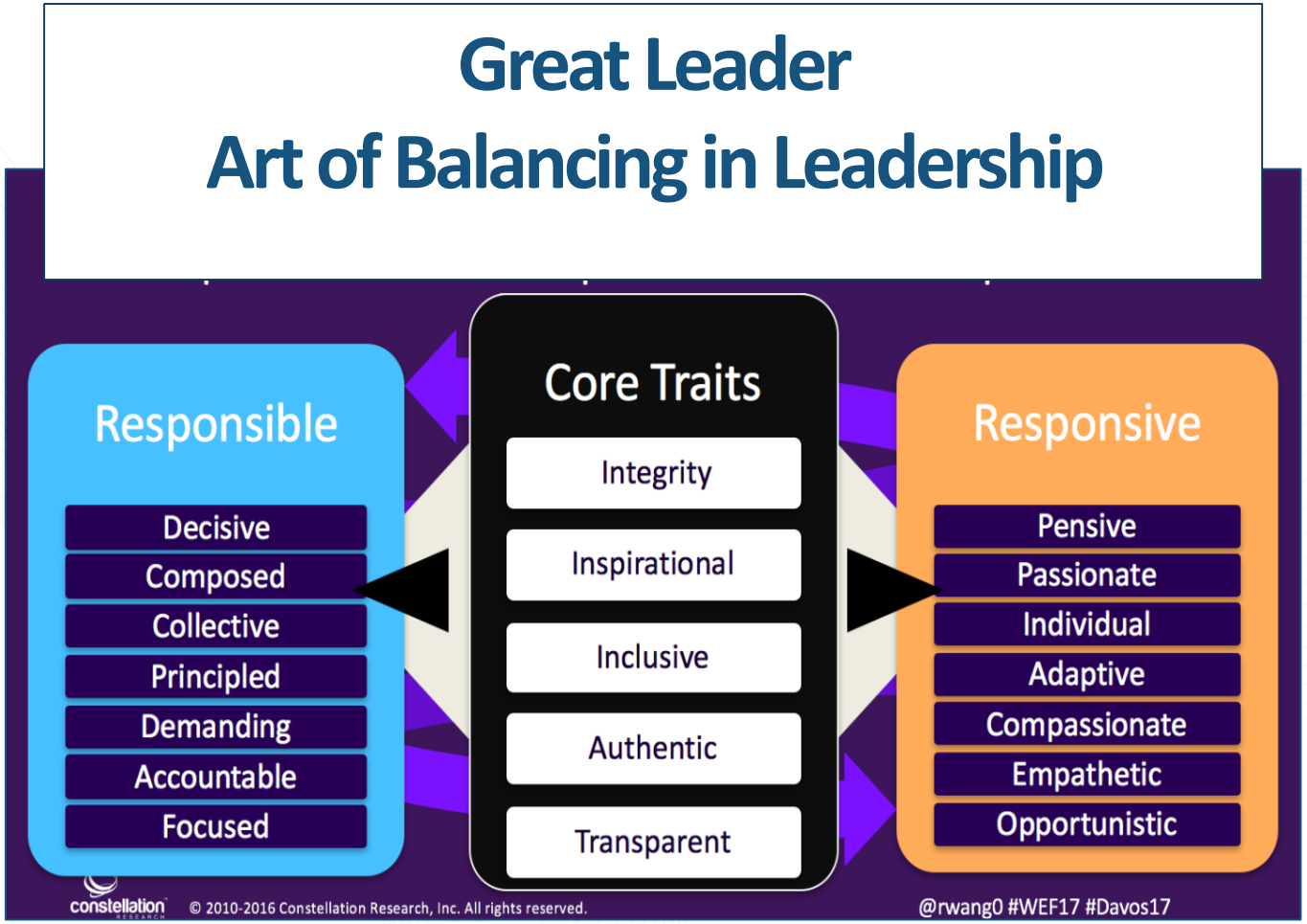
Cooperation

Trust

Responsive and Responsible Leadership

Agenda for 2017 DAVOS

Electing Great Leader for Promising Future!



Governmental policy in Korea

President Moon's Key Economic Pledges

Job Creation

- Create 514,000 jobs in Public Sector
- Change 300,000 contract workers to direct hires

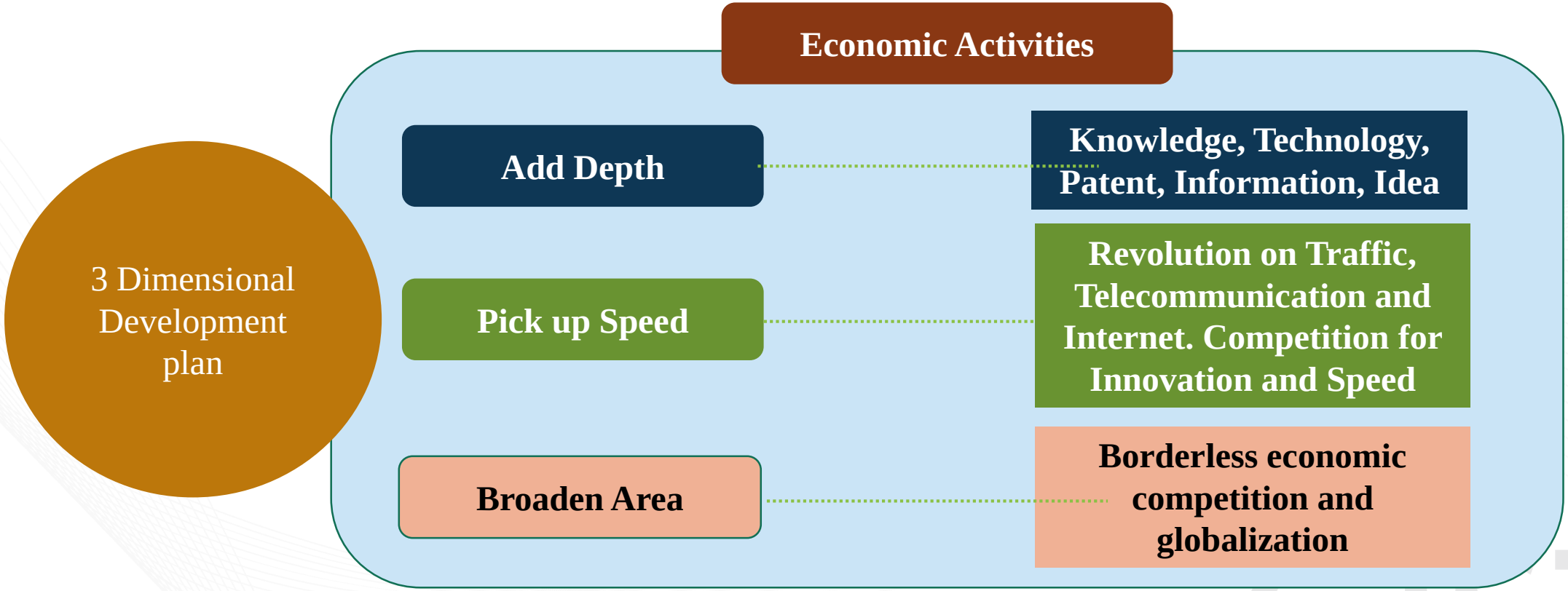
Creation of New Industries

Encourage public, private sectors to work together for 4th IR using advanced technology such as electric cars, autonomous driving, renewable energy, artificial intelligence

<Source> Nikkei Asian Review (2017.05.10.)
http://asia.nikkei.com/Politics-Economy/Policy-Politics/South-Korea-elects-Moon-on-promises-of-jobs-chaebol-reform

Key Strategy for Job creation in Korea

- **To acquire a Sustainable National Competitiveness**



<Source> Park Chul Woo(2017), Job Creation Strategy and Tasks (2017.05.10.)
http://pulsenews.co.kr/view.php?year=2017&no=312984

Policy Direction for Job Creation in Korea

- **Establishment of new industries**
  - Most effective way for job creation
- **Collective start-ups based on scenario for Business Ecosystem**
  - (As-is) Single Start-up with a core technology for commercialization
  - (To-be) Collective start-ups cultivated as a mutually linked package.
- **Government as a facilitator for Business Ecosystem**
  - Design of business structure
  - Define participants and their roles

<Source> Park Chul Woo(2017), Job Creation Strategy and Tasks (2017.05.10.)
http://pulsenews.co.kr/view.php?year=2017&no=312984

S. Korea's Key Policy Measures for 4th IR

- **Launch Presidential Committee on 4th Industrial Revolution in 2018**
- **Introduce negative-type regulation for new industries**
- **Install public big data center**
- **Build world's first high-speed IoT network and commerciazeid 5G Communication**

<Source> Pulse News (2017.05.10.) http://pulsenews.co.kr/view.php?year=2017&no=312984

Discussion Items

- What is the growth strategy for Inst. of Sci &Tech schools?
- Education strategy for future?
- How to create new jobs?
- How to promote cooperation among ventures and big companies?
- Big data gathering vs. privacy law.
- AI, is it really a revolutionary technology?
- How to go to the society of trust?
- Sustainable growth, how to achieve it?

Comments

- **Purpose of a nation is to develop Science and Technology? Does it make any sense? You cannot change the identity of a nation.**
- **You promotes a rosy future; but it must have a limit. Science and Tech has drawbacks. Direction and speed must be controlled. Talking only about rosy future makes the proposition rather unstable and incomplete.**
- **It seems that opportunity for innovation is left only to the big companies such as Google, Facebook, Samsung, etc. Would it be possible for smalls to make significant contribution? Should we tax the big companies for innovation taxes?**
- **There has been many troubles and drawbacks caused by science and technology projects which have left uncontrolled.**

Strategy of Korea leading 4th Industrial Era

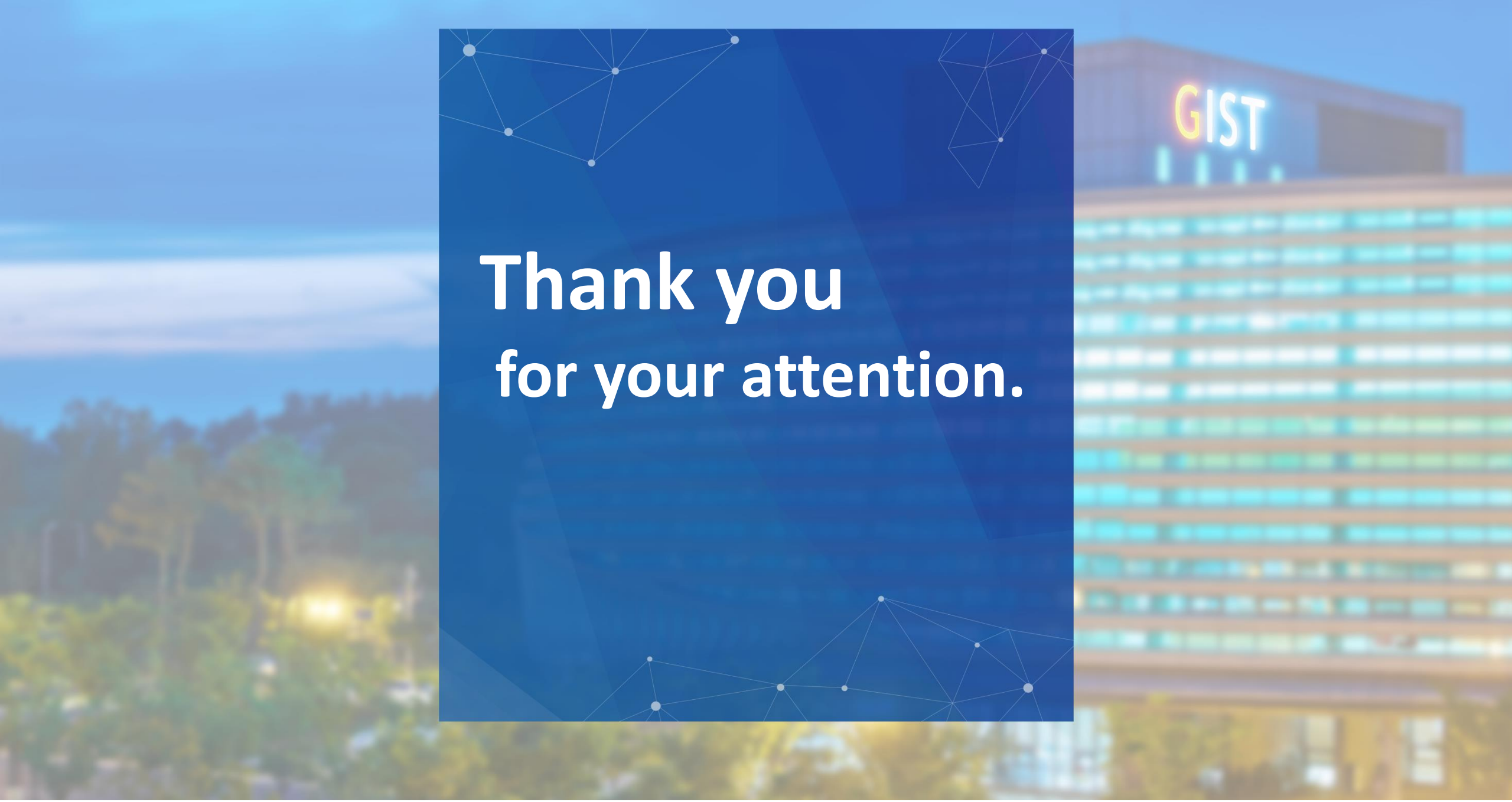
Future : Table turns frequently, Technology spreads fast, Easier to cooperate & to realize an idea, and creative idea can improve human ability!

Strategy: Build new ecosystem for ventures, creative Korea!

- New constitution for continuing innovative S&T and fast distribution of wealth
- New platforms for promoting innovation for each part

There is no pre-designed or destined way for future!

We determine the desirable future and usher in it via cooperation!



Thank you
for your attention.