United Nations Educational, Scientific and Cultural Organization

UNESCO Institute for Information Technologies in Education

KLID 한국지역정보개발원
Korea Local Information Research & Development Institute

4th Industrial Revolution Impact Toward Training and Education Future: ICT Paradigm Change Leveraging the Power of AI, IoT, Cloud, Big Data, 5G, etc.

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Agenda

I. 4th Industrial Revolution and Technology

1. Change in ICT Technology Environment
2. Emerging Technologies as of 2018
3. AI (Artificial Intelligence)
4. IoT (Internet of Things)
5. AR and VR
6. 5G (5th Generation Mobile)
7. Big Data
8. Block Chain

II. Discussions

1. Robot Teacher (Robolution)
2. Wrap-up and Future Endeavor

I. 4th Industrial Revolution and Technology

1. Change in ICT Technology Environment

Era	PC	Internet	Mobile
Economy Paradigm	Industrial Economy	Digital Economy	
IT Paradigm	Computerization	On-line, Informatization	Social, Mobile
IT Issue	PC, Database PC communication,	High-speed Internet www, web-server	Mobile Internet Smart Phone
Major field (Service)	PC, OS	Portal, search engine, Web 2.0	App service, SNS
Major resources	Physical assets, Labor, Capital	Knowledge, Information	
IT Vision	1Person 1PC	Connected Homes	PC in my hands, communication

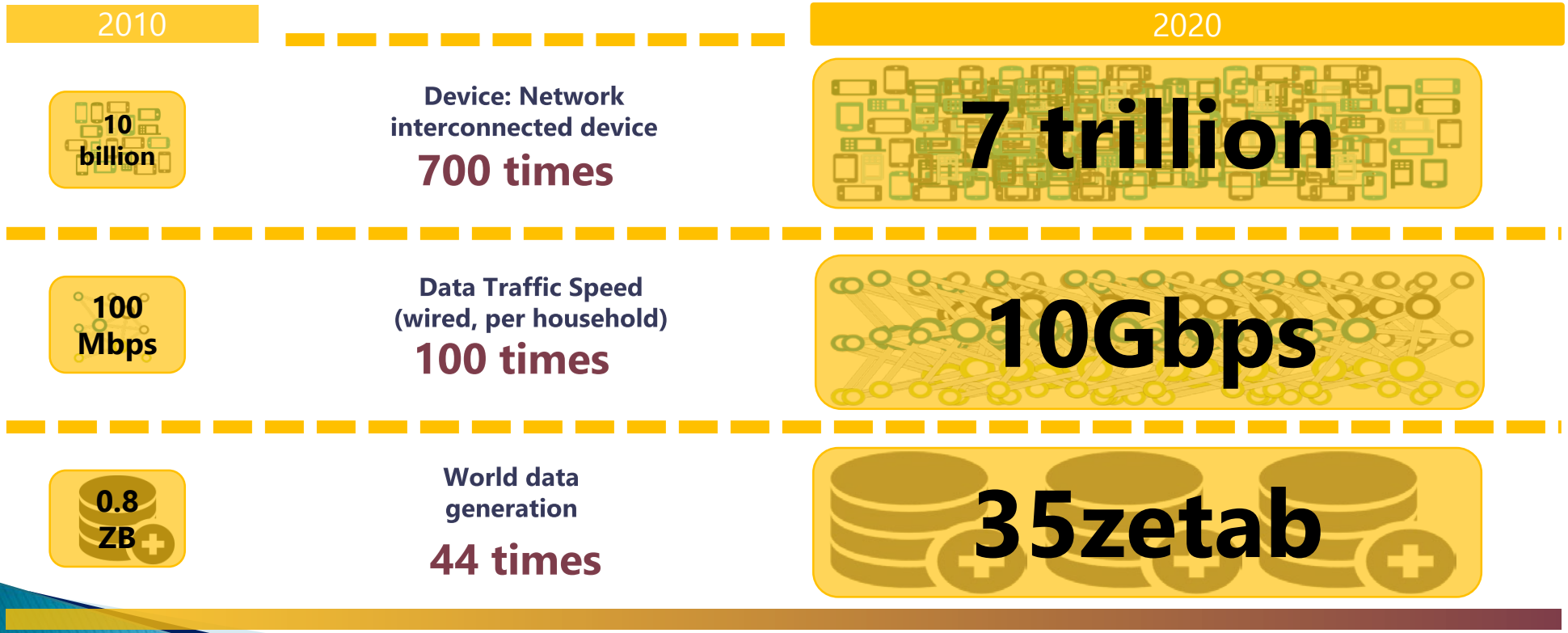
What is the next big thing

?

1. Change in ICT Technology Environment

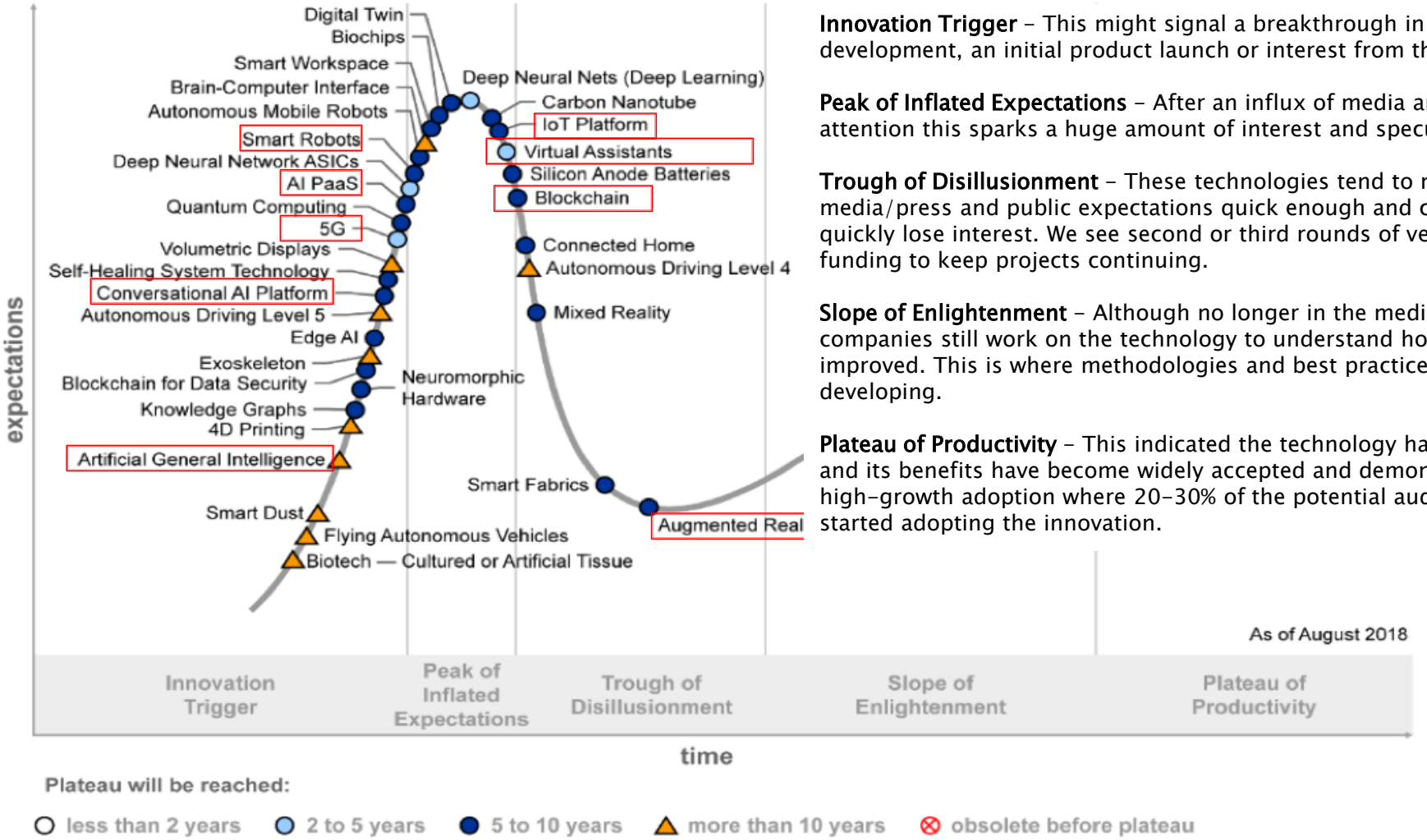
▪ Data-driven World!

- Super computer performance has been improved **1,000 times** for the last **10 years** (`07 ⇨ `16)
- Among the world data from 1900 to 2016, **90%** has been produced **for the past 2 years** (`15 ~`16)



2. Emerging Technologies as of 2018

Hype Cycle for Technologies by Gartner



Innovation Trigger – This might signal a breakthrough in the technology development, an initial product launch or interest from the press.

Peak of Inflated Expectations – After an influx of media and press attention this sparks a huge amount of interest and speculation.

Trough of Disillusionment – These technologies tend to not meet media/press and public expectations quick enough and consumers quickly lose interest. We see second or third rounds of venture capital funding to keep projects continuing.

Slope of Enlightenment – Although no longer in the media headlines, companies still work on the technology to understand how it can be improved. This is where methodologies and best practices start developing.

Plateau of Productivity – This indicated the technology had become stable and its benefits have become widely accepted and demonstrated. There is high-growth adoption where 20-30% of the potential audience has started adopting the innovation.

Image Source: Gartner 2018

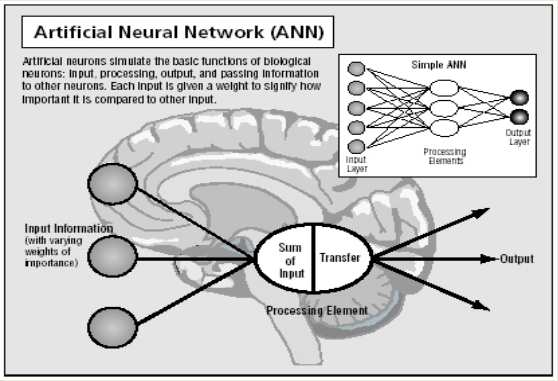
3. AI (Artificial Intelligence) – 1

Deep Learning, Machine Learning, and AI

AI

Machine Learning

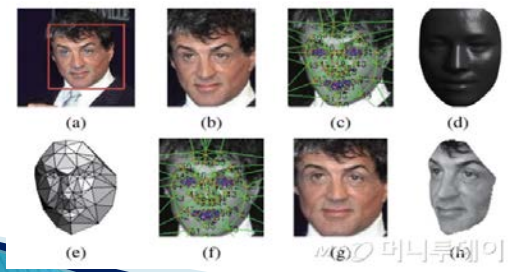
Deep Learning

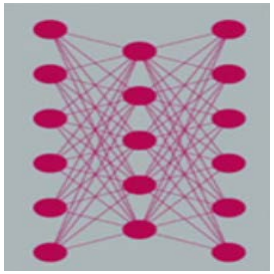


+ **Big Data**

Machines take Data and begins to learn for itself. Algorithms are programmed to learn and improve without the need for human data input

The science of making machines smarter, which in turn augments human knowledge and capabilities, Artificial intelligence is any computer program that does something smart





Sylvester Stallone

3. AI (Artificial Intelligence) - 2

Let's Have Quizzes for AI and Human!

1

News story excerpt:

"A shallow magnitude 3.3 earthquake was reported Friday evening four miles from Burney, Calif., according to the U.S. Geological Survey. The temblor occurred at 11:00 p.m. Pacific time at a depth of 6.8 miles."

Human

Robot(AI)

This excerpt of a news report about an earthquake on June 30, 2017 was written by the Los Angeles Times' algorithm called Quakebot.

Hamza Shaban, Washington Post, July 17, 2017

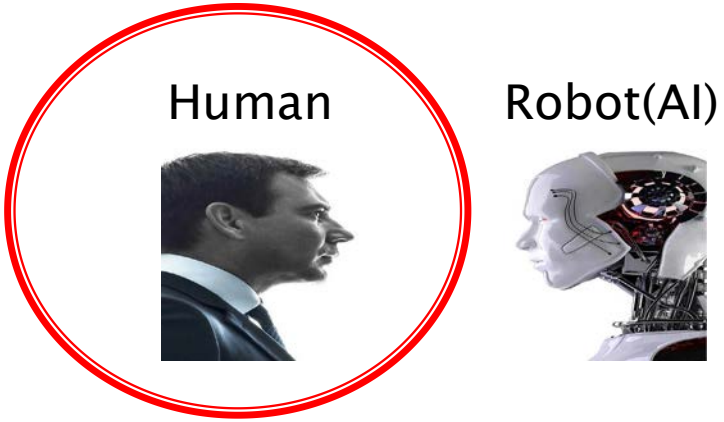
3. AI (Artificial Intelligence) - 2

Let's Have Quizzes for AI and Human!

2

News story excerpt:

"Stocks have sailed along for a year and a half without a significant correction, but analysts see increasing signs of trouble ahead



This is an excerpt from an article written by a CNBC markets editor.

Hamza Shaban, Washington Post, July 17, 2017

3. AI (Artificial Intelligence) - 2

Let's Have Quizzes for AI and Human!

3

Human

Robot(AI)

Designed from extensive data analysis of Rembrandt's body of work, this is a computer-generated 3D printing made in the style of the 17th century Dutch painter. Over the course of 18 months, engineers used computers to 3D scan and analyze 346 Rembrandt paintings. They then used facial recognition software to identify recurring geometric patterns in Rembrandt's portraits.

Hamza Shaban, Washington Post, July 17, 2017

3. AI (Artificial Intelligence) - 2

Let’s Have Quizzes for AI and Human!

4

Human

Robot(AI)

Rembrandt's "Christ in the Storm on the Sea of Galilee."

Hamza Shaban, Washington Post, July 17, 2017

3. AI (Artificial Intelligence) - 2

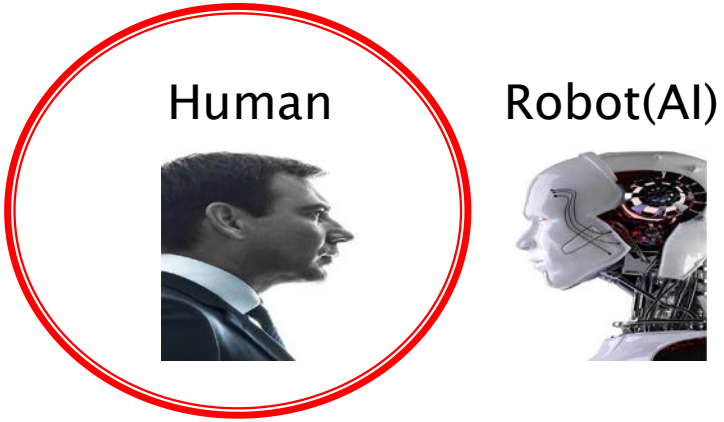
Let's Have Quizzes for AI and Human!

5

Poem:

Invisible fish swim this ghost ocean now described by waves of sand, by water-worn rock.

Soon the fish will learn to walk. Then humans will come ashore and paint dreams on the dying stone.



This is an excerpt of a poem titled Invisible Fish by Joy Harjo

Hamza Shaban, Washington Post, July 17, 2017

3. AI (Artificial Intelligence) - 2

Let's Have Quizzes for AI and Human!

6

An excerpt from an untitled poem:

"When I in dreams behold
thy fairest shade
Whose shade in dreams
doth wake the sleeping
morn
The daytime shadow of my
love betray'd
Lends hideous night to
dreaming's faded form"

Human

Robot(AI)

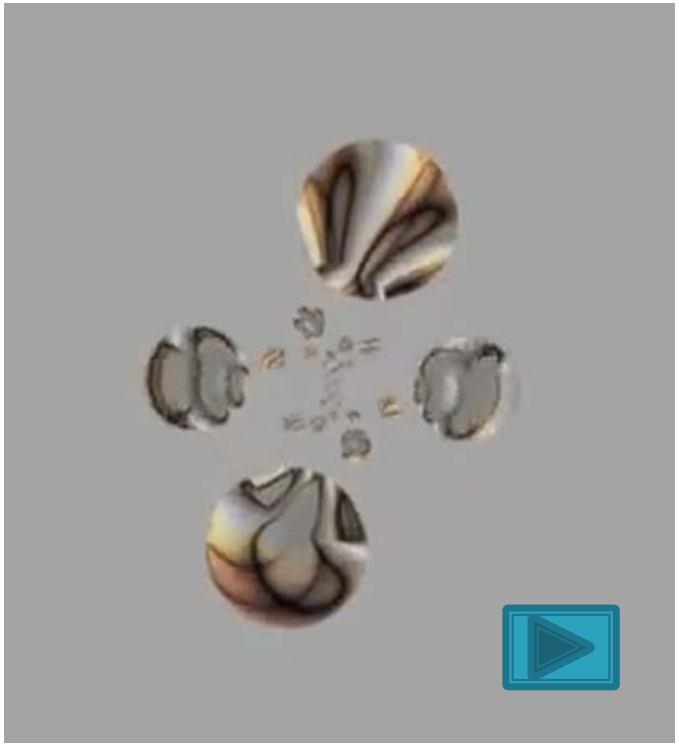
This is an excerpt of a computer-generated poem written in the style of William Shakespeare.

Hamza Shaban, Washington Post, July 17, 2017

3. AI (Artificial Intelligence) - 2

Let's Have Quizzes for AI and Human!

7 A song titled "Taurus"



Human

Robot(AI)

This song, Taurus, was composed by a computer program called Experiments in Musical Intelligence, written by David Cope.

Hamza Shaban, Washington Post, July 17, 2017

3. AI (Artificial Intelligence) - 2

Let's Have Quizzes for AI and Human!

8

Excerpt from a news story:

"FedEx shares have climbed 9 percent since the beginning of the year, while the Standard & Poor's 500 index has increased nearly 5 percent. In the final minutes of trading on Tuesday, shares hit $162.65, a climb of 11 percent in the last 12 months."

Human

Robot(AI)

This is an excerpt from an article published by Business Insider generated by platform called Automated insight

Hamza Shaban, Washington Post, July 17, 2017

3. AI (Artificial Intelligence) - 2

Let's Have Quizzes for AI and Human!

9

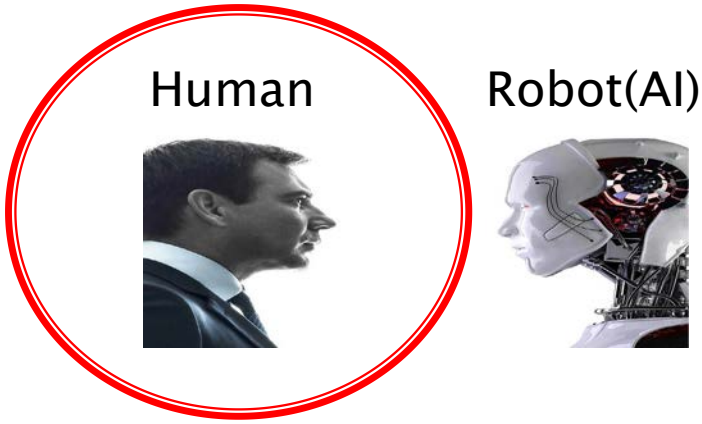
Sonnet (Poem) :

"O! how I faint when I of you do write,

Knowing a better spirit doth use your name,

And in the praise thereof spends all his might,

To make me tongue-tied speaking of your fame."



This is an excerpt from William Shakespeare's Sonnet 80

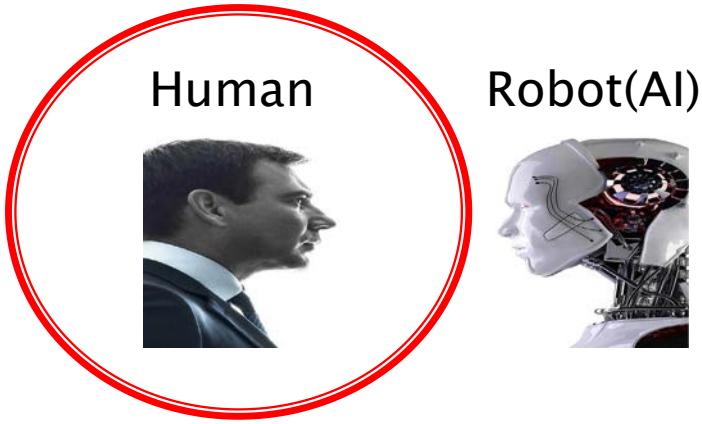
Hamza Shaban, Washington Post, July 17, 2017

3. AI (Artificial Intelligence) - 2

Let's Have Quizzes for AI and Human!

10 News Article :

"So the Yankees' visit to second place lasted only one day. After all that losing — out in California and their first night back home — the Yankees welcomed summer on Wednesday with a victory to regain the lead in the American League East."



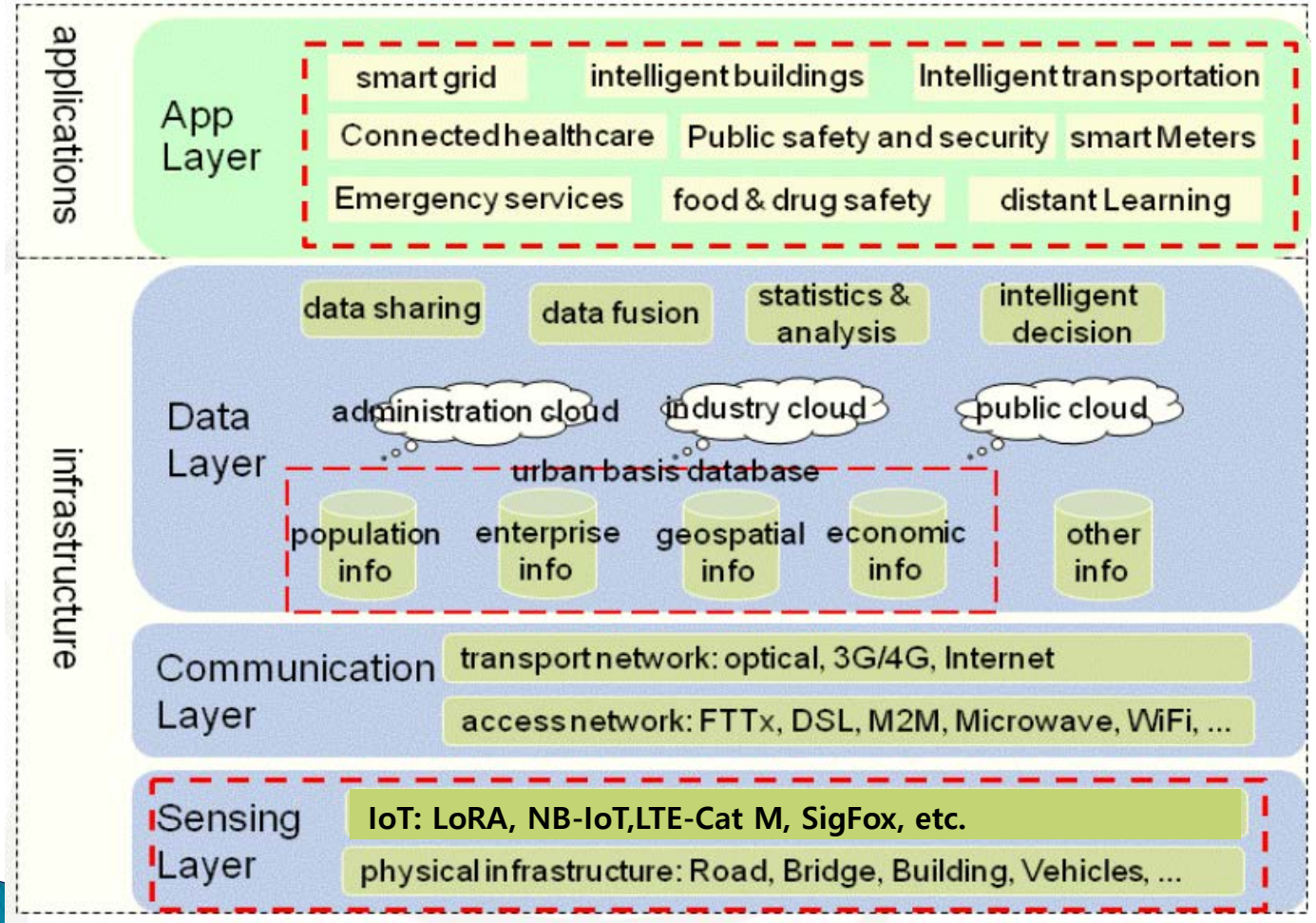
This is an excerpt from an article in the New York Times.

Hamza Shaban, Washington Post, July 17, 2017

IoT Definition and Coverage

- IoT (Internet of Things) is, by using low-powered wide area covered wireless sensors and actuators among intelligent and easy-to-deploy application platforms, making a fully micro connected world of objects – including humans.
- The growth potential of IoT is significant (by 2020).
  - IDC: **$7.1 trillion revenue** in IoT related business
  - Gartner: **26 billion IoT units**
  - Cisco: IoT **$19 trillion** market

IoT Architecture



- IoT infrastructure can be divided into Data layer, Communications layer, and Sensing layer
- IoT equation:

Physical Object
+
Controller, Sensor, and Actuators
+
Internet
=
Internet of Things

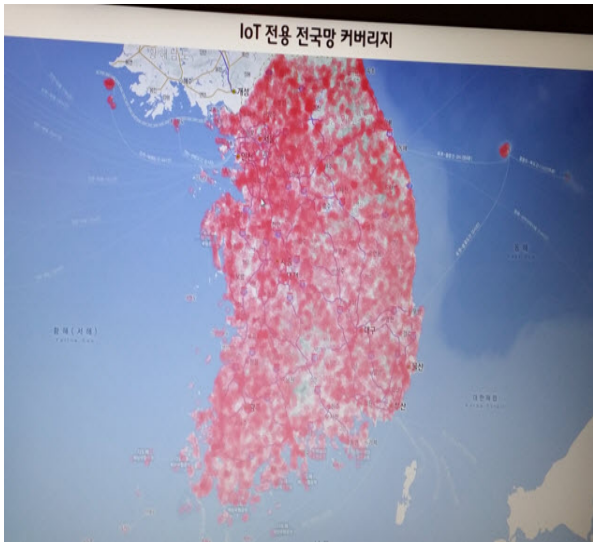
An equation for the Internet of Things

Sources: FG-SSC "Technical Report on Smart Sustainable Cities Infrastructure" Page 12 and document FG-SSC-0112, proposed by Fiber Home Technologies Group and Telecom Italia

4. IoT (Internet of Things) – 3 (examples)

LoRa Base Stations

LoRa network coverage



IoT Meteorological Sensor

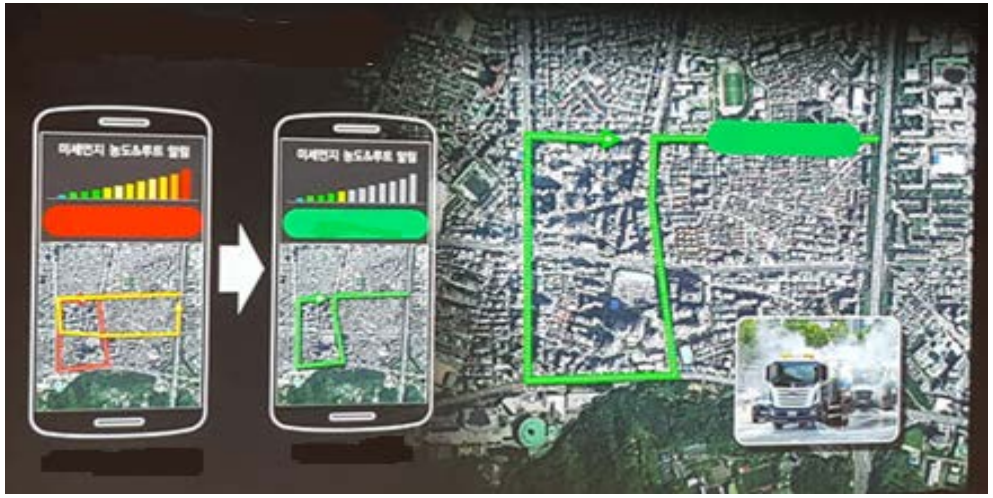
Data	Monthly Fee	Services	Etc.
100KB (1time per 1 hour)	35 cents	Gas/Water AMI and Monitoring	• Discount 2 year contract (5%), 5 year contract (20%), • Multi-lines (500, 2%) • Additional data rate 0.05cents/0.5KB
500KB (1 time per 10 minutes)	50 cents	Monitoring of facilities	
3 MB (1 time per 1 Minute)	70 cents	Asset management (public bicycles, etc.)	
10 MB	1 dollar	Safe watch for humans	
50 MB	1.5 dollars	Movable assets	
100 MB	2 dollars	Construction security mgm't, Electricity AMI, etc.	

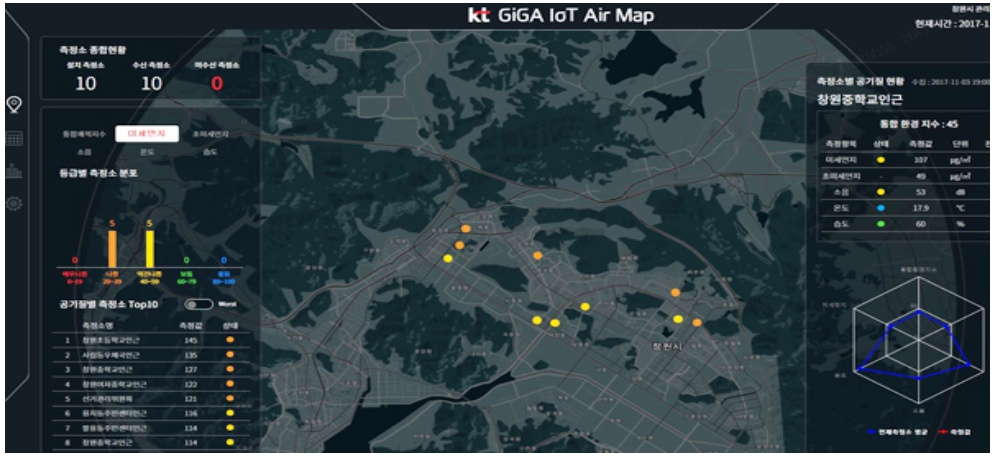
4. IoT (Internet of Things) – 4 (examples)

IoT based Air Quality Sensor

- Open API and platform support
- Air Quality is monitored by 1 minute
- 512 sensors in Seoul (605 Km^2)
- Dynamic water cleaning routes recommendation by big data analysis
- Smart phone supports

Optimized routes for water cleaning





Big Data Analysis based on updating air quality by 1 minute

□ Digital Textbook in Korea (Pilot)

Video Presentation: Pitch Bird Case

- Augmented Reality and Virtual Reality can have a potential for EduTech innovation
- However, **sustainable proper contents** and **student acceptability** can be an issue

AR can outpace the growth of VR!

6. 5G (5th Generation Mobile)

Image Source: Qualcomm 2018

7. Big Data

Big Data has important potential that can be used for education practices

Improve Student Performance and Coaching

During his or her student life however, every student generates a unique data trail. This data can be analyzed for providing optimized learning and better understanding of students.(1)

Create Mass-customized Programs

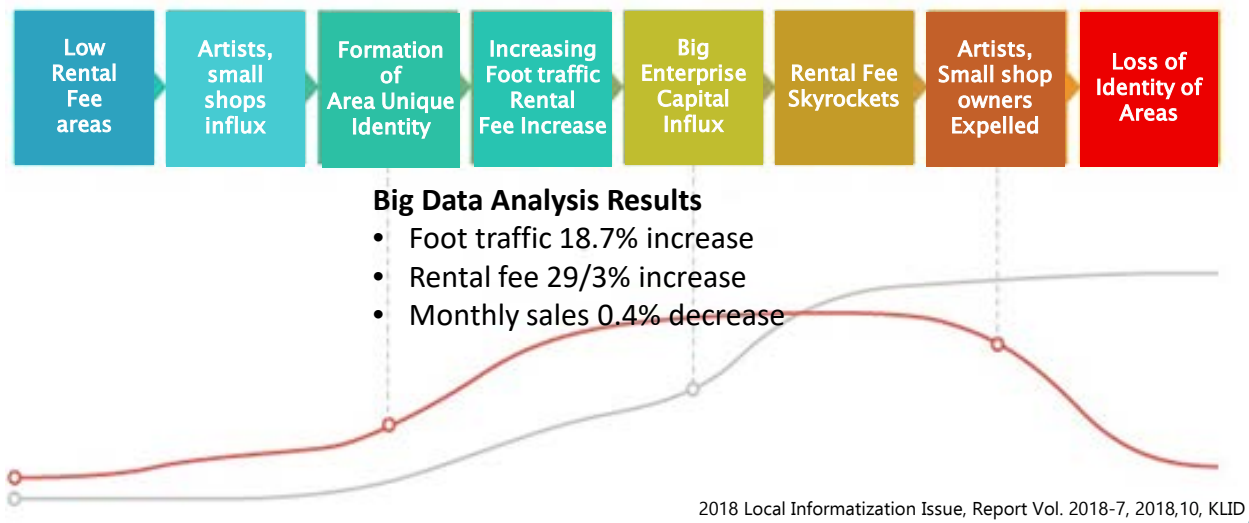
Providing mass customization in education is a challenge, but thanks to algorithms it becomes possible to track and assess each individual student.

ex) When Andrew Ng taught the Machine Learning class at Stanford University, generally 400 students participated. When it was developed as a MOOC at Coursera in 2011, it attracted 100,000 students.(1)

(1) Source: Four Ways Big Data Will Revolutionize Education, Datafloq

7. Big Data – 2 (Real Life example)

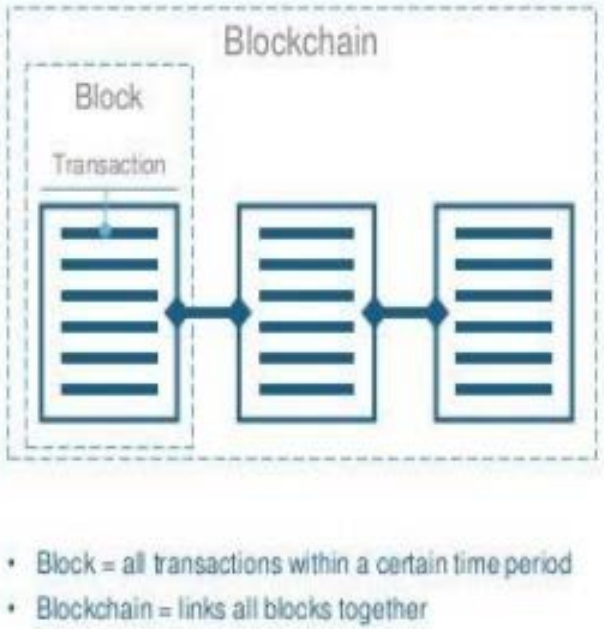
Changwon's Big Data Analysis in Public Policy

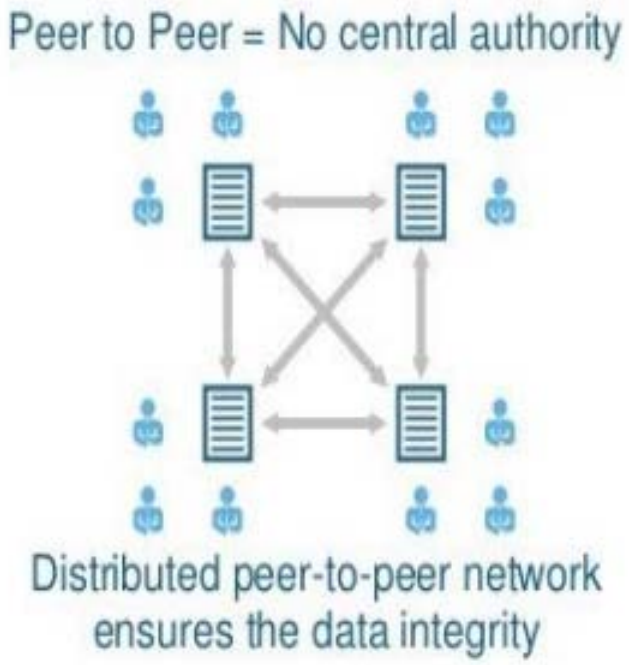


2018 Local Informatization Issue, Report Vol. 2018-7, 2018,10, KLID

- 2011, Changdong at Changwon City showed a sudden increase in rental fees and gentrification glimpse was shown.
- Government closely monitored by big data analysis (with number of foot traffic, sales, rents, etc.) and it seemed the city was at the starting state of gentrification.
- Before a fatal stage, government had public hearings/meetings for consensus and constituted an agreement for mutual benefits
- Local ordinances were set by the government before severe gentrification, big data had important roles for good governance.

Blockchain Technology





- Blockchain is a distributed ledger technology (DLT) and it can affect many verification, validation, brokerage businesses eco systems.

8. Blockchain - 2

Blockchain Technology for Education?

20 Areas for Blockchain (Forbes, by Tom Vander Ark)	
1. Transcripts	11. Learning Marketplace
2. Badges	12. Record Management
3. Student Records	13. Retail
4. Identity	14. Charity
5. Infrastructure Safety	15. Human Resources
6. Ridesharing	16. Governance
7. Cloud Storage	17. Libraries
8. Energy Management	18. Publishing
9. Prepaid cards	19. Public Assistance
10. Smart Contracts	20. Bonds

- Blockchain can be widely used in industry but in education field, it may not show a strong alternatives against current core practices.
- *Wolf University* case can be experimental and needs to see how it goes.

II. Discussions

1. Robot Teacher (Robolution)

- Robot can have a great potential to be a good teacher

1. Robot Announcer in the new program can work 365 day 24hours a day.
2. Very human like that even students cannot have some uncomfortableness.
3. AI with robotic can expedite Robot teacher in the class room or virtual class room.
4. Any language can be used here

2. Wrap-up and Future Endeavor

- EduTech and beyond

1. It is not just LMS and MOOC thing, rather, recent technology advancement can affect many aspects of traditional education.
2. However, at the same time, still there are many huddles to get over for using proper EduTech maximizing education performances.
3. AI, 5G, Big Data and AR will be mostly have big impacts on education practices, IoT and Blockchain would find more sustainable values replacing current education practices.
4. AI with human-like interface (robot) can be substituting a teacher's role in the nearest future.
5. Contents, Contents, and Contents. – The importance of educational contents cannot be underestimated even in ICT advancement era.
6. Teacher/Educators role can be redefined. They are eventually being not the knowledge giver but being knowledge co-finder with students.

Future Classroom by HP

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Thank You!
Questions and Comments

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