2018 IT Trends
with Digital Transformation

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iSchool Chair (2018-2019)

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ETRI

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VIDEO CLIP for 4th Industry Revolutions

https://www.youtube.com/watch?v=khjY5LWF3tg

Technology Trends with Digital Transformation

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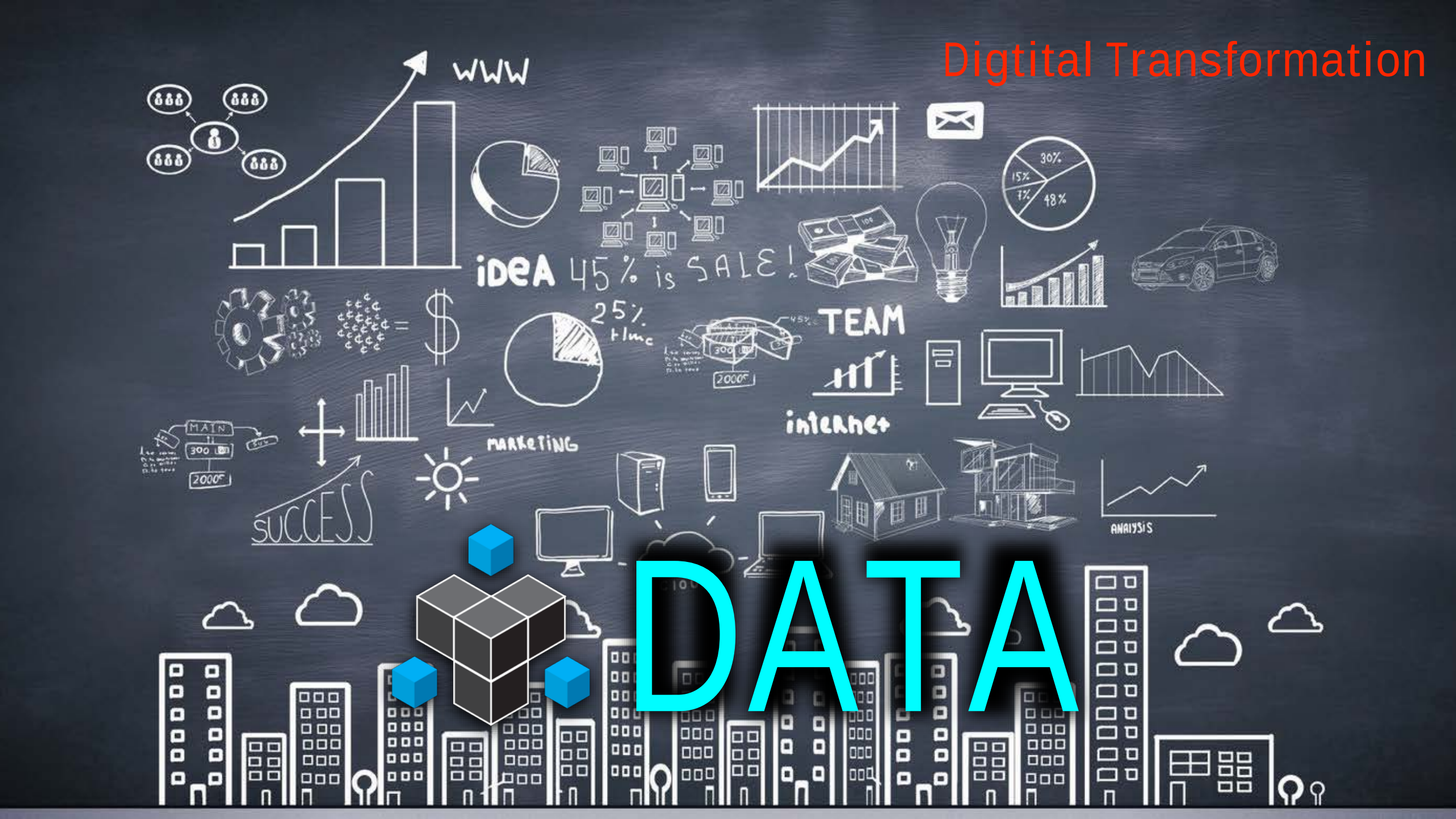
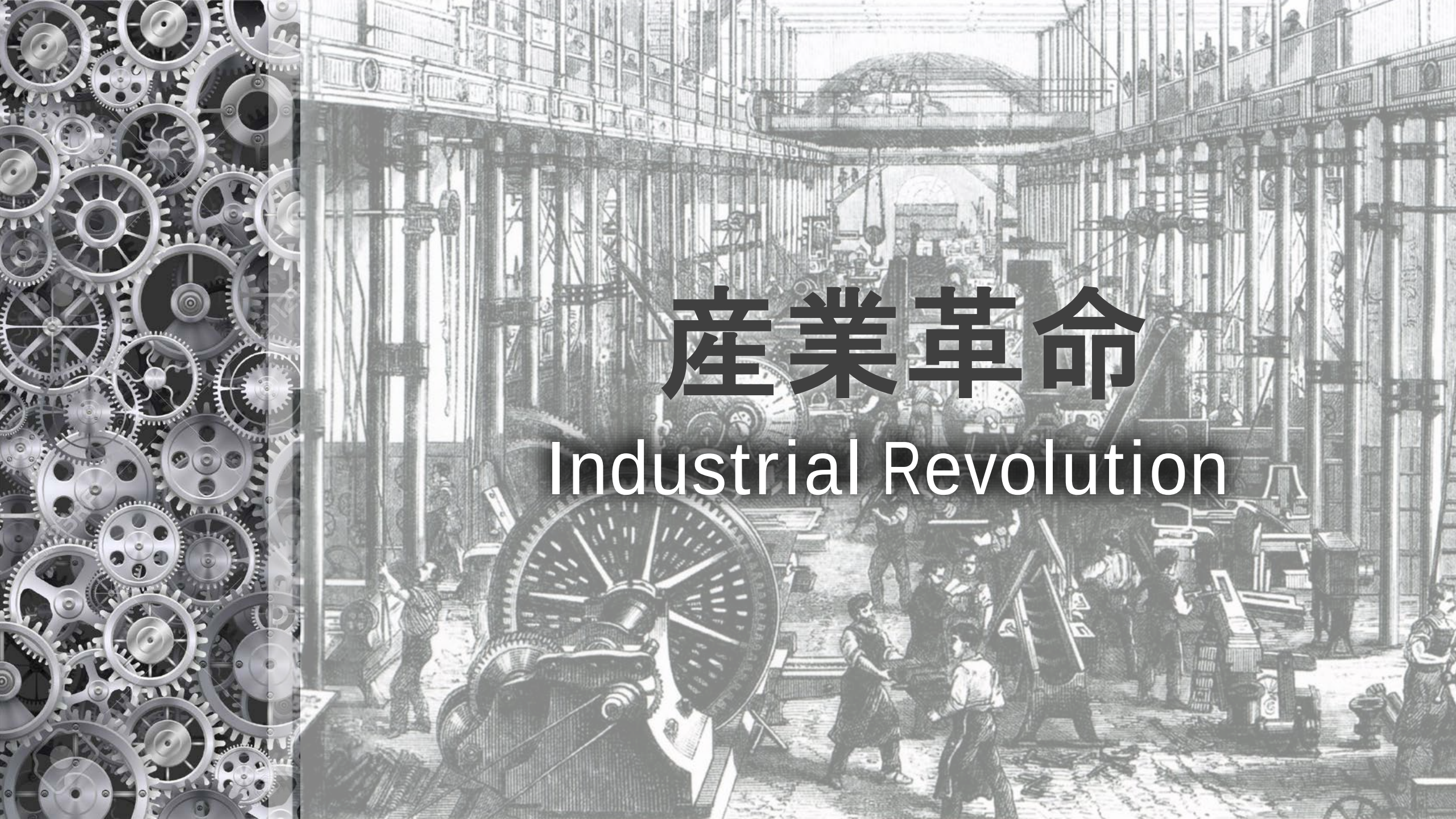
Technology Trends with Digital Transformation

- **PART 1. ICT Trends with 4th Industrial Revolution**
- PART 2. Key Technology for 4th Industrial Revolution
- PART 3. Artificial Intelligence (AI) Trends
- Annex. New Technology Issue on Standards

https://www.societegenerale.com/en/digital-transformation

Digital transformation is the **change** associated with the application of **digital technology** in all aspects of **human society**.


Digtital Transformation
WWW
iDeA 45% is SALE!
25%
TEAM
internet
MARKETING
SUCCESS
ANALYSIS
DATA



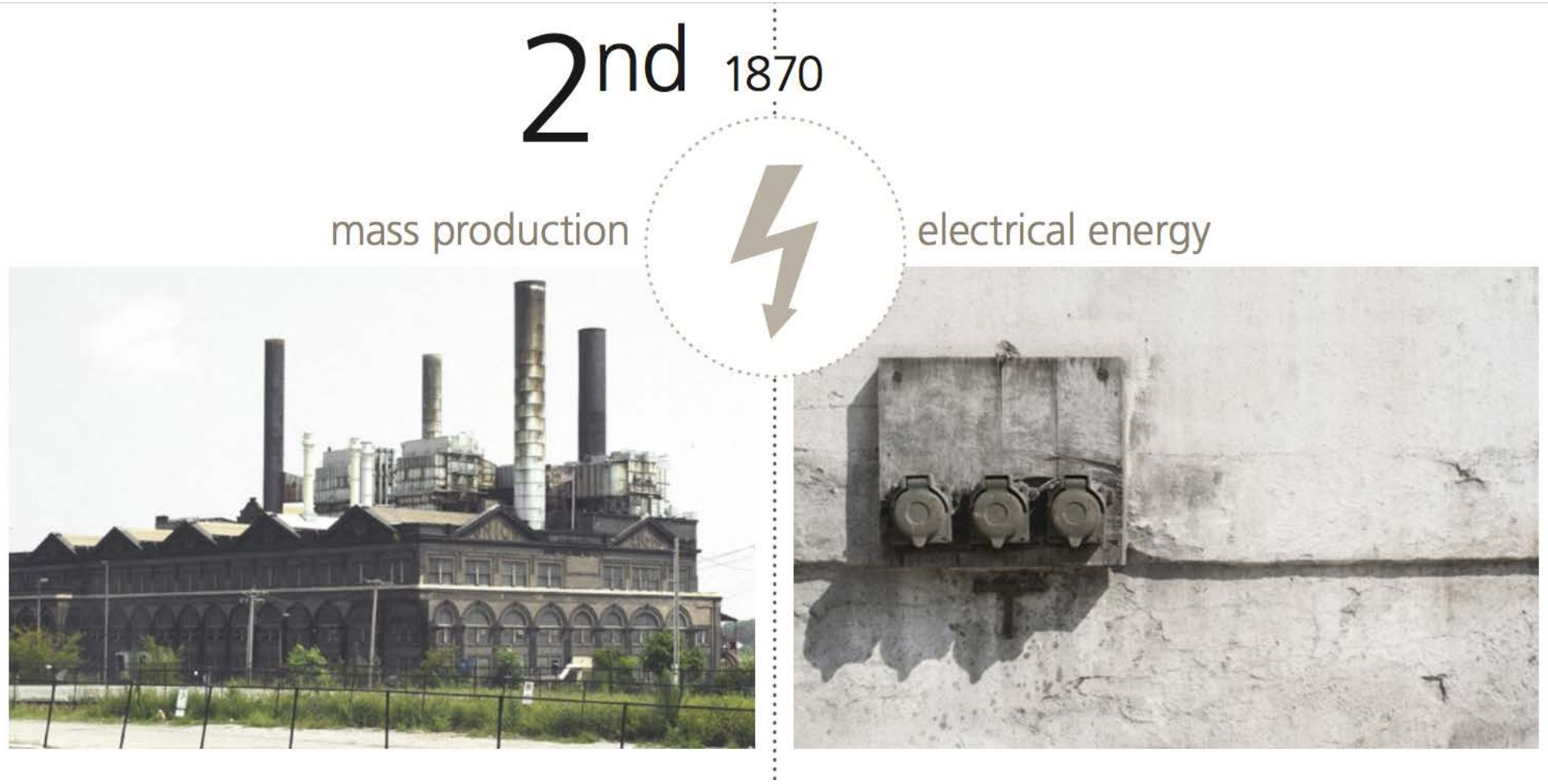
産業革命

Industrial Revolution

1st 1784

mechanical production

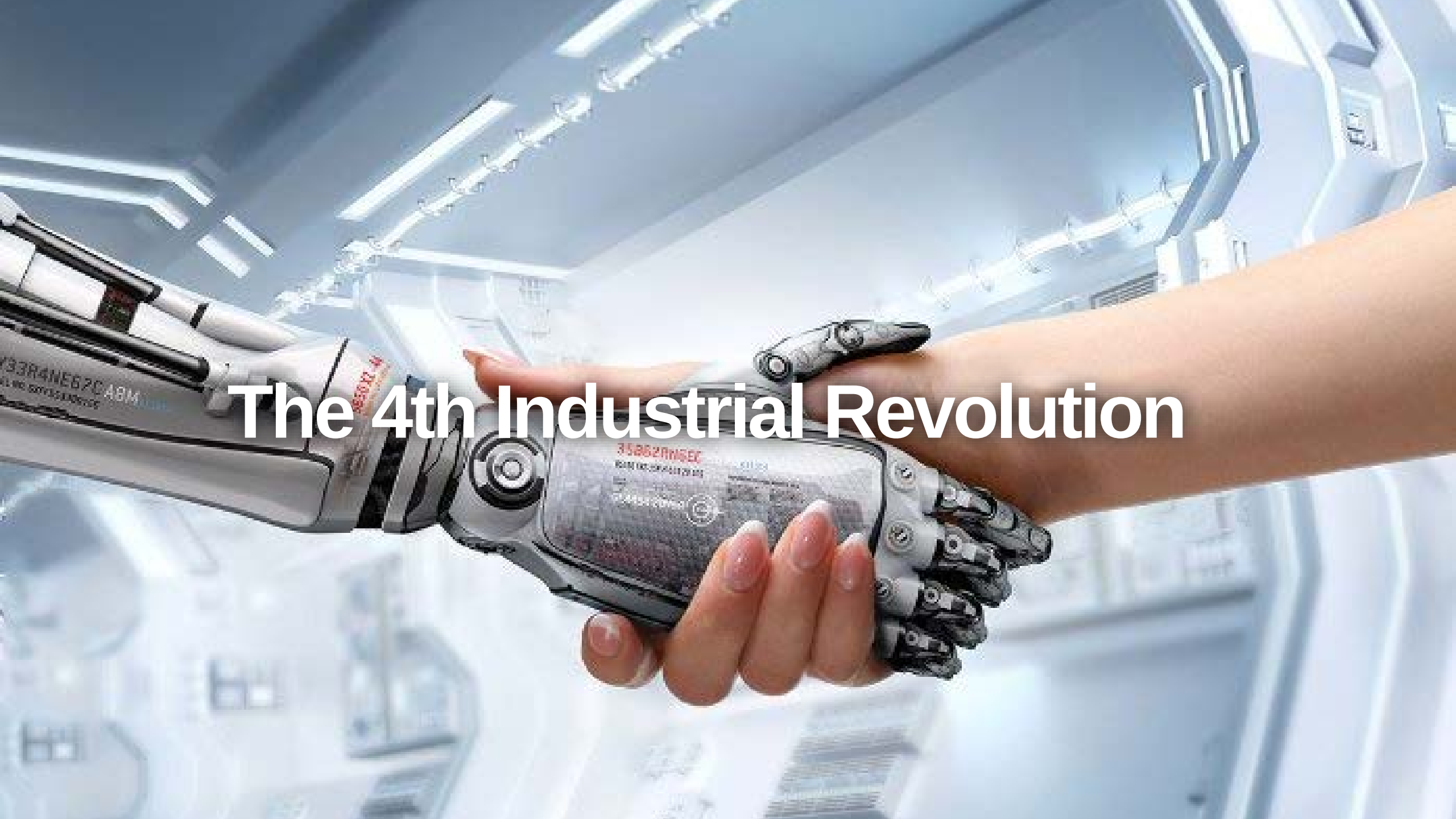
steam power energy


2nd 1870
mass production
electrical energy


3rd 1969
electronics
IT
STOP
FF
PLAY

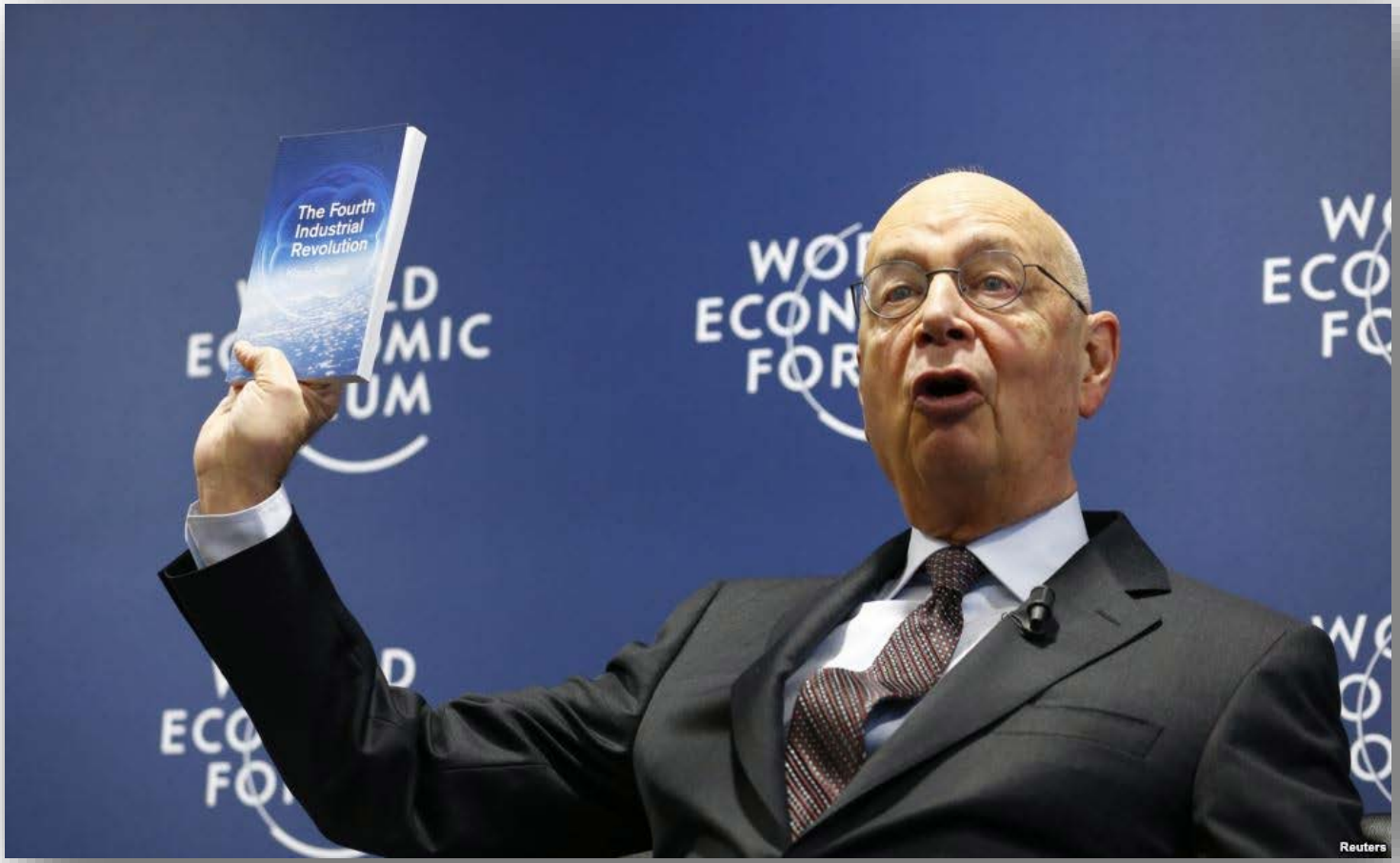
UBS

UBS white paper on the Fourth Industrial Revolution


The 4th Industrial Revolution

WORLD ECONOMIC FORUM

2016



2016 Klaus Schwab, President of WEF

4th Industrial Revolution

The Fourth Industrial Revolution **builds on the Digital Revolution**, representing new ways in which technology becomes embedded within societies and even the human body. The Fourth Industrial Revolution is **marked by emerging technology** breakthroughs in a number of fields, including **robotics**, **artificial intelligence**, **nanotechnology**, **quantum computing**, **biotechnology**, **The Internet of Things**, **3D printing** and **autonomous vehicles**.

WIKIPEDIA
The Free Encyclopedia


INDUSTRY
4.0
IEC
61499
IEC
61131
nxt
2012
Industrie 4.0

Industrie 4.0

Merkel, Germany

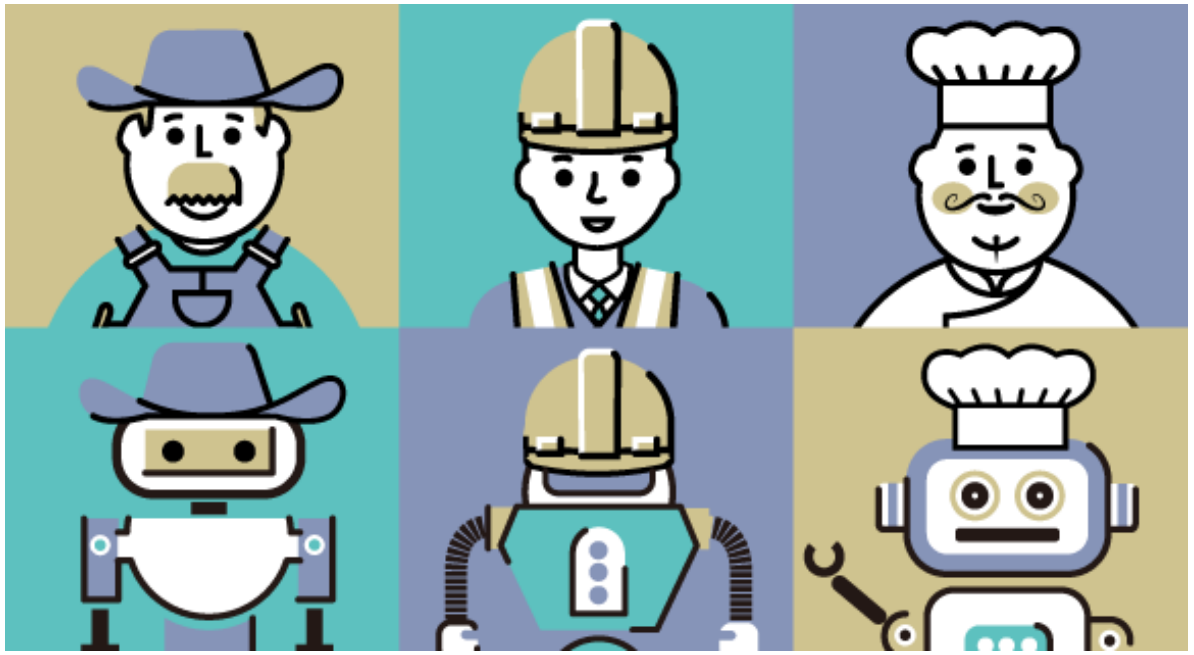
"**HITECH** STRATEGY 2020" (2010)

Koreans are the people most familiar with the Fourth Industrial Revolution in the world.

What does the fourth industrial revolution mean for us?

anticipation

Workplace



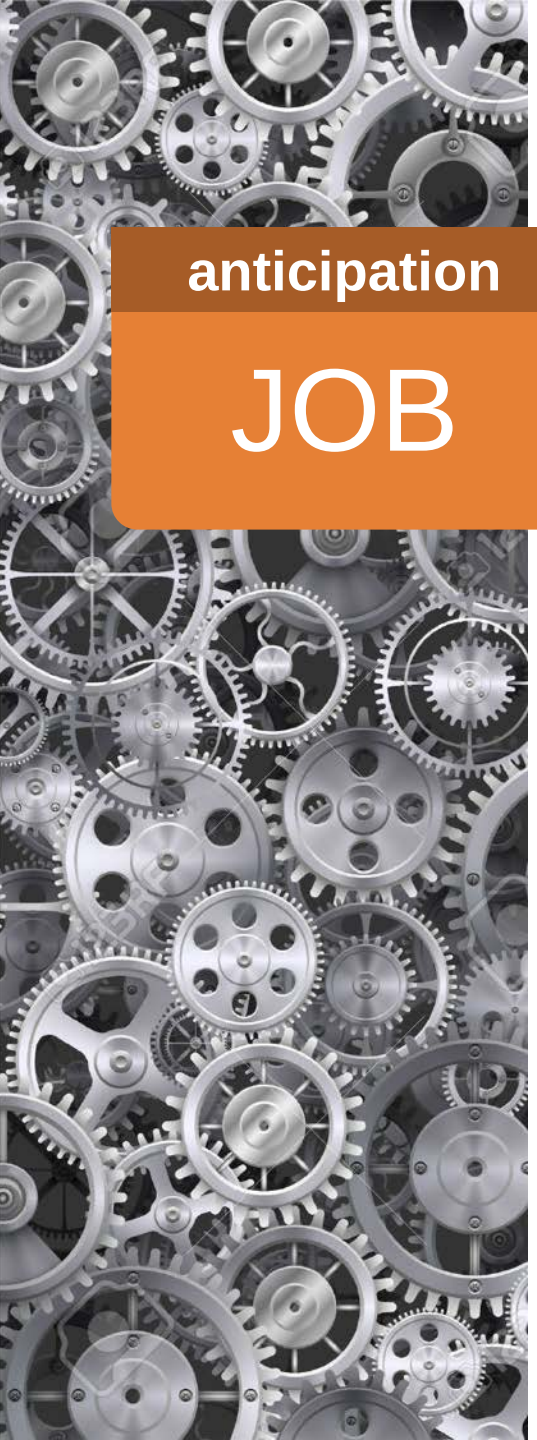
34%

NIKKEI ASIAN REVIEW

FT FINANCIAL TIMES

Amid the global proliferation of artificial intelligence, research compiled by The Nikkei and the Financial Times has found that **Machines are capable of handling about one-third of some 2,000 workplace tasks hitherto performed by humans**

http://asia.nikkei.com/Features/AI-now-and-tomorrow/Robots-can-handle-a-third-of-our-workplace-tasks-study-

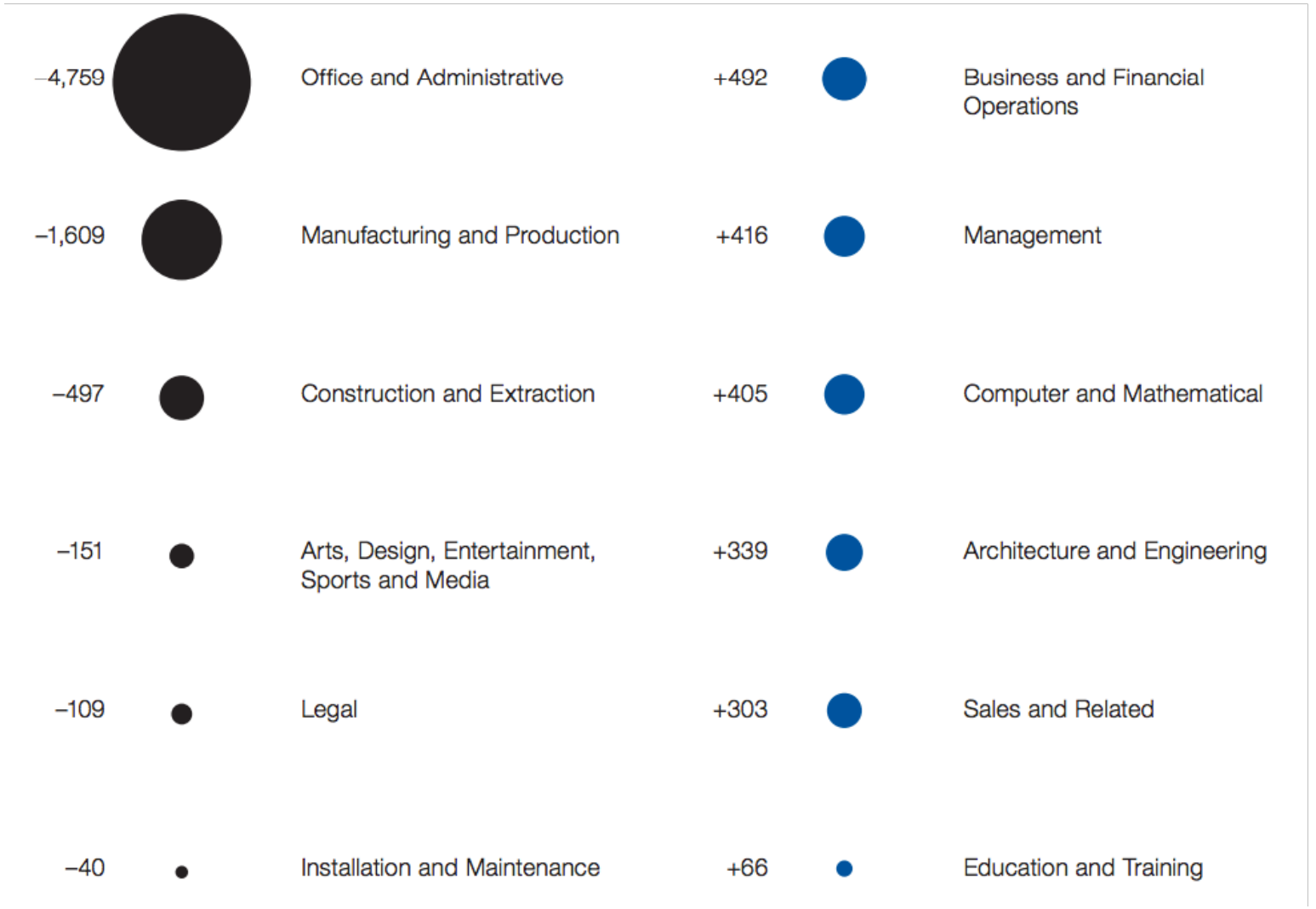


anticipation

JOB

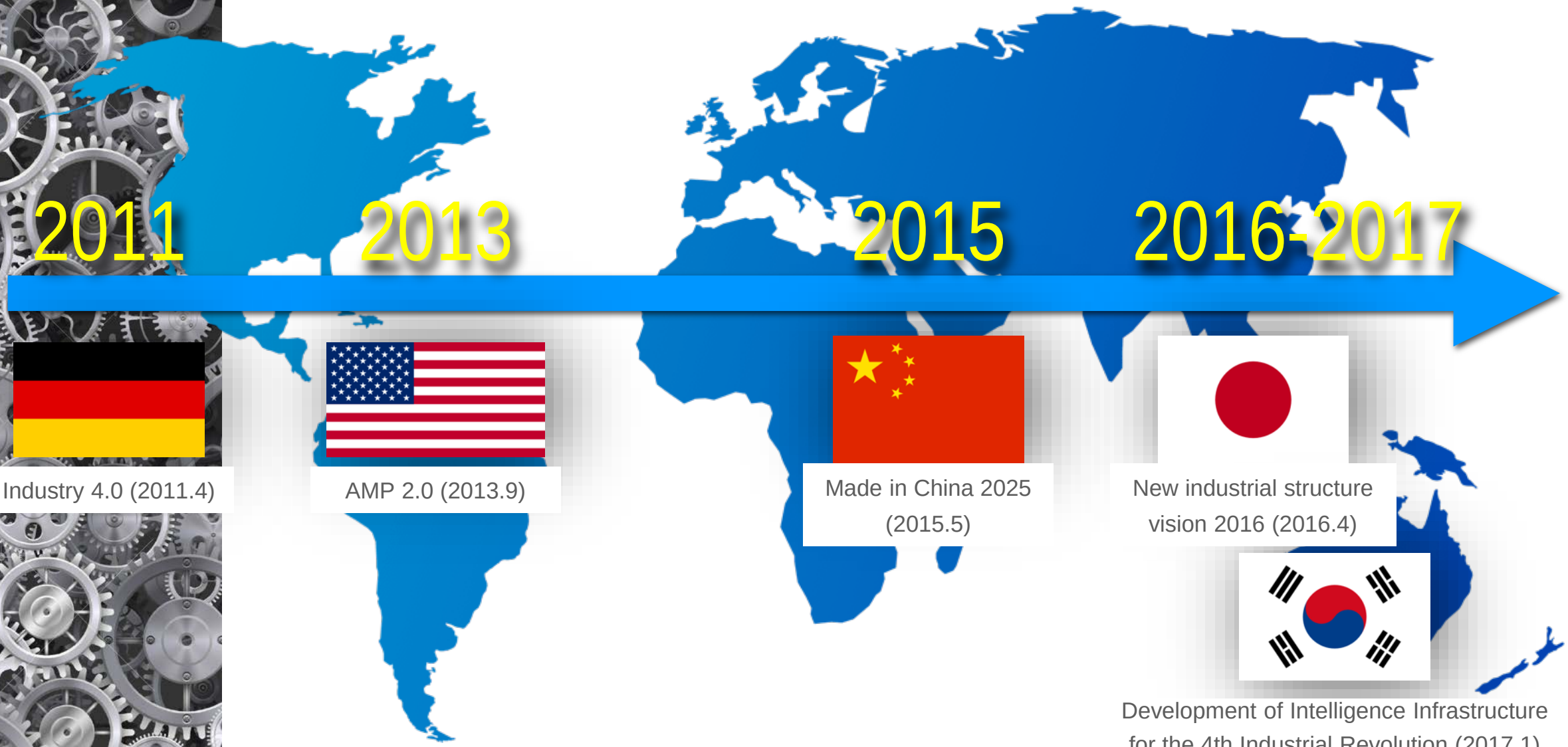
Net employment outlook by job family, 2015–2020

Employees (thousands, all focus countries)



The Future of Jobs by World Economy Forum, January 2016

National Strategy for The 4th Industrial Revolution



2011

2013

2015

2016-2017

Industry 4.0 (2011.4)

AMP 2.0 (2013.9)

Made in China 2025 (2015.5)

New industrial structure vision 2016 (2016.4)

Development of Intelligence Infrastructure for the 4th Industrial Revolution (2017.1)

AMP 2.0 (Advanced Manufacturing Partnership 2.0)


Digital Transformation
4th Industrial Revolution
Technology Trends …

Before talking about new technology …

The era of Zero-Growth

Is the Technology Revolution enough?

The era of Zero-Growth

http://www.quotemaster.org/

Industrial Revolution

Past ► Energy Revolution + Increase Productivity

Future ► ???


Will it be possible only with Technological Innovation?

Technology Trends with Digital Transformation

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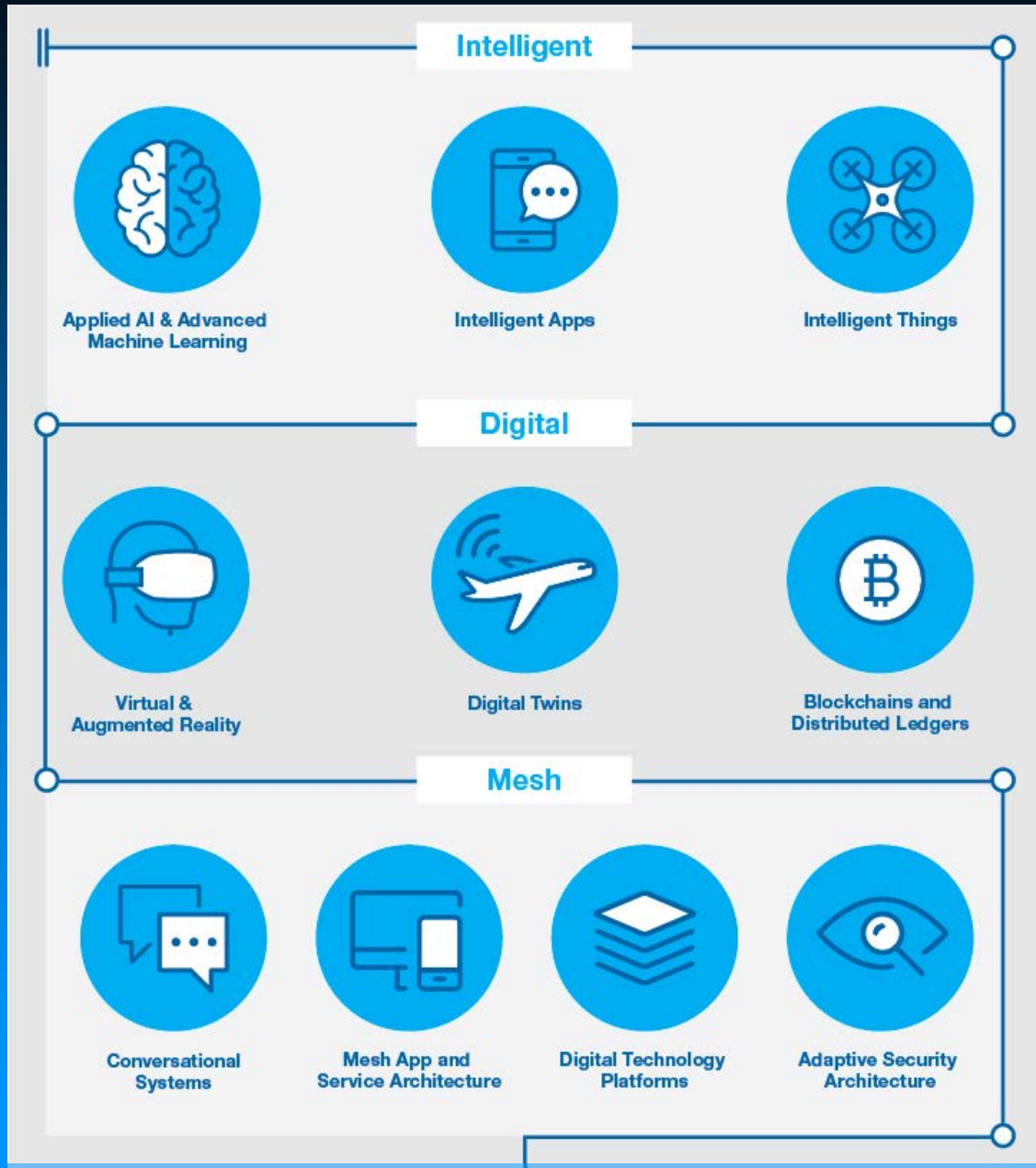
Gartner®

Top 10 Strategic Technology Trends for 2017

1. *AI and Advanced Machine Learning*
2. *Intelligent Apps*
3. *Intelligent Things*
4. *Virtual and Augmented Reality*
5. *Digital Twin*
6. *Blockchain and Distributed Ledgers*
7. *Conversational Systems*
8. *MASA (Mesh App and Service Architecture)*
9. *Digital Technology Platforms*
10. *Adaptive Security Architecture*



Source> http://www.gartner.com/smarterwithgartner/gartners-top-10-technology-trends-2017/

Gartner®

Top 10 Strategic Technology Trends for 2018

1. *AI Foundation*
2. *Intelligent Apps and Analytics*
3. *Intelligent Things*
4. *Digital Twin*
5. *Cloud to the Edge*
6. *Conversational Platforms*
7. *Immersive Experience*
8. *Blockchain*
9. *Event Driven*
10. *Continuous Adaptive Risk and Trust*

Source>https://www.gartner.com/smarterwithgartner/gartner-top-10-strategic-technology-trends-for-2

1 AI FOUNDATION

Feeding massive amounts of data into ever more advanced algorithms to enhance decision making, reinvent business, models and ecosystems, and remake the customer experience

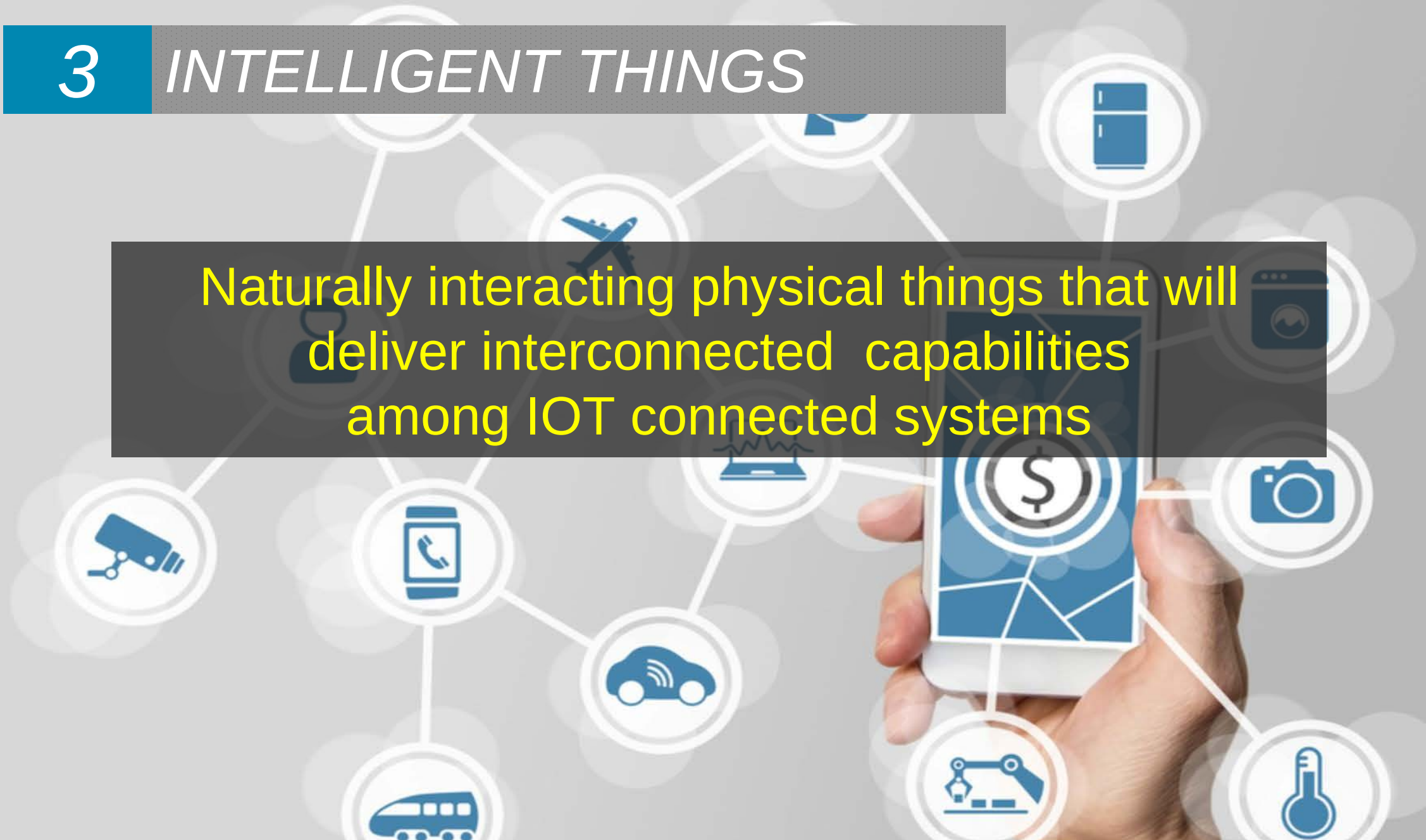
2 INTELLIGENT APPS & ANALYTICS

Transforming the nature of work and the structure of the workplace using AI

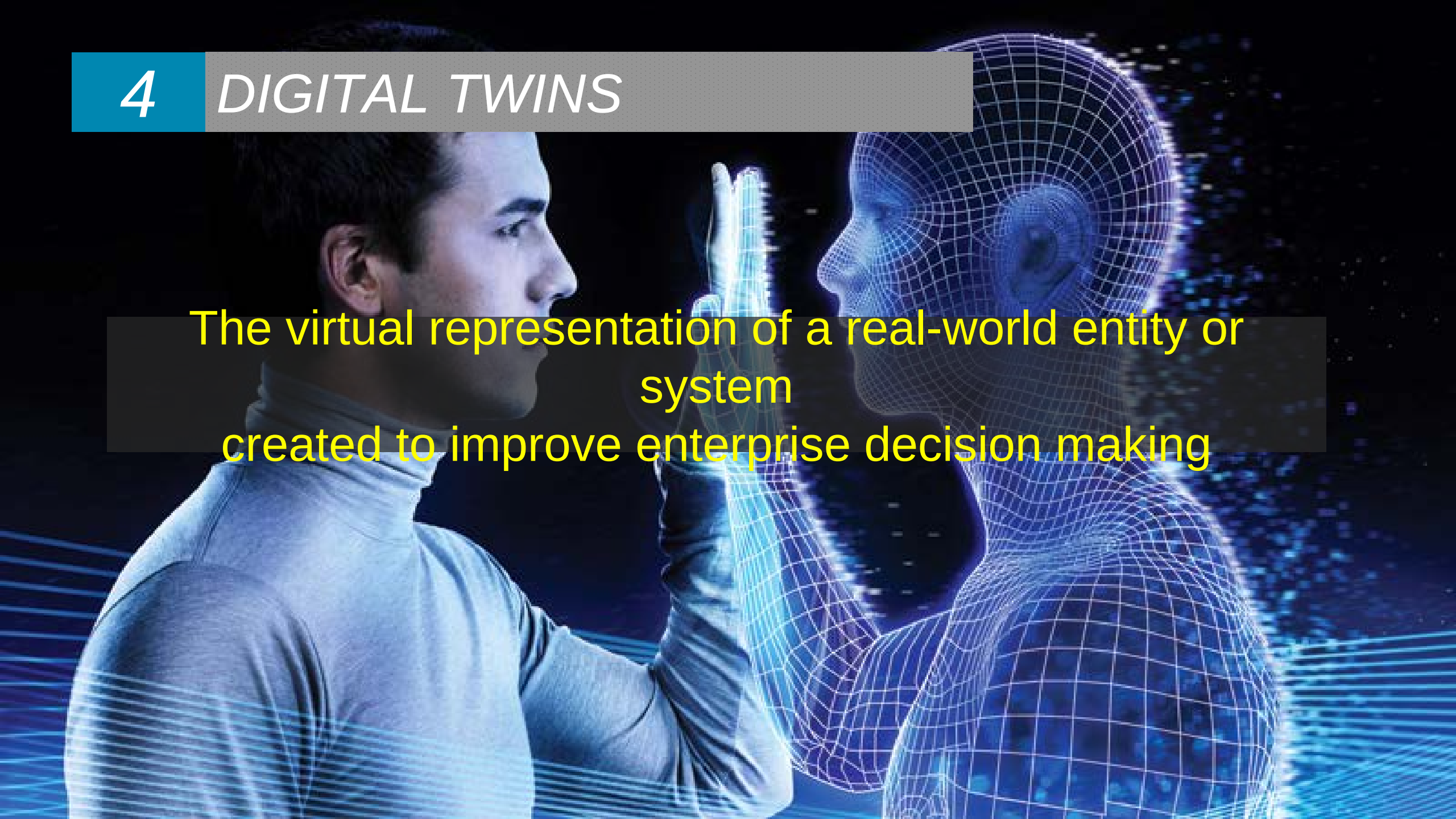
To deliver advanced analytics, intelligent processes and new user experiences

3 INTELLIGENT THINGS

Naturally interacting physical things that will deliver interconnected capabilities among IOT connected systems



4 DIGITAL TWINS

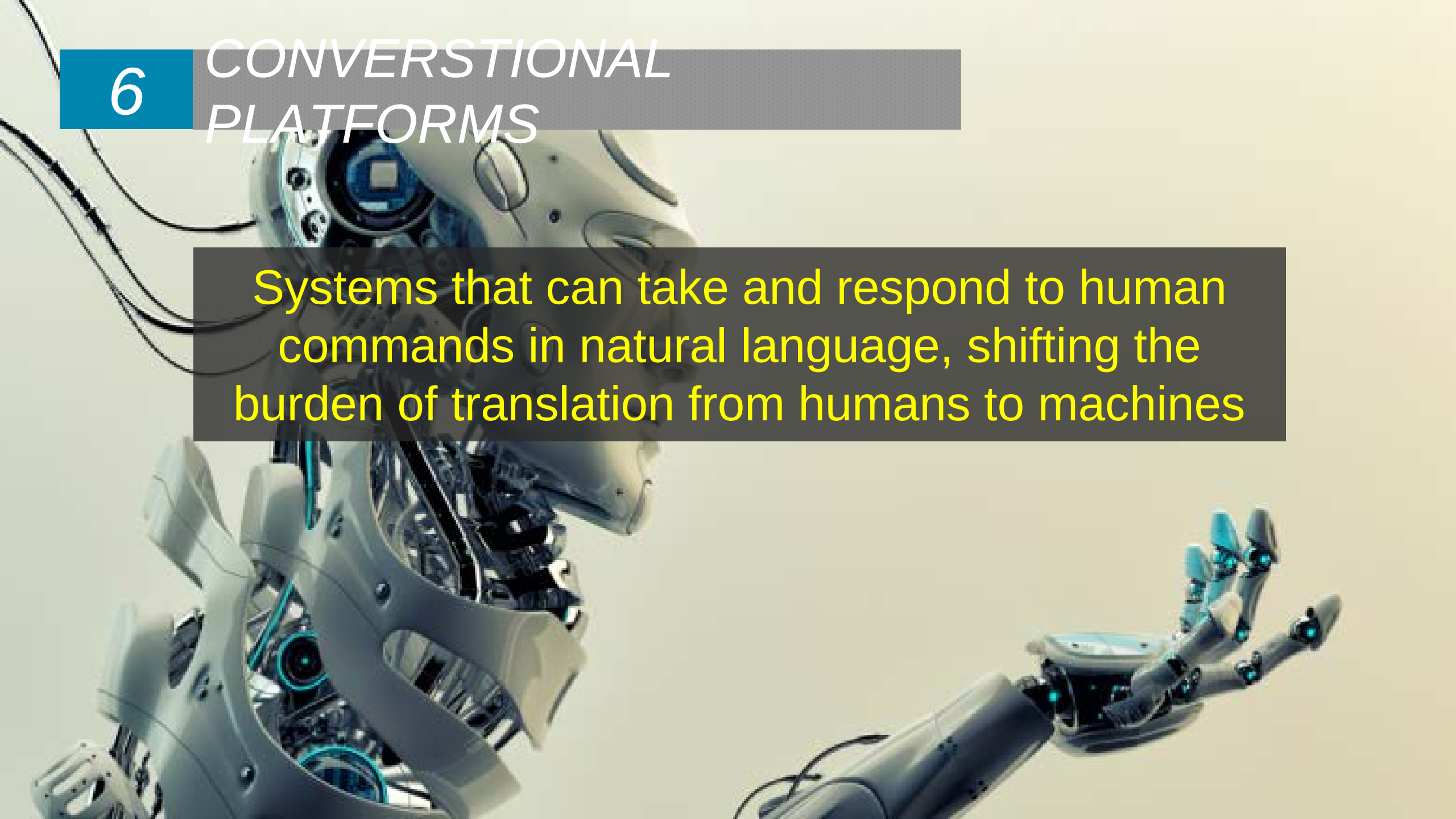


The virtual representation of a real-world entity or system
created to improve enterprise decision making

5 CLOUD TO THE EDGE

Information processing and content collection and delivery are placed closer to the sources to fix high WAN costs and unacceptable latency

6 CONVERSTIONAL PLATFORMS



Systems that can take and respond to human commands in natural language, shifting the burden of translation from humans to machines

7 IMMERSIVE EXPERINCE

The confluence of artificial, virtual, and mixed reality that changes the way that people perceive their world

8 BLOCKCHAIN

Distributed ledger technology that injects trust into untrusted environments, resulting in the disruption of the need for a central regulatory authority

9 EVENT-DRIVEN MODEL

The exploitation of new digital business moments by both technology and people in order to create and architecture optimized for agility, resiliency, extensibility, lower cost of change, open-ended design and scale

10 CONTINUOUS ADPATIVE RISK & TRUST

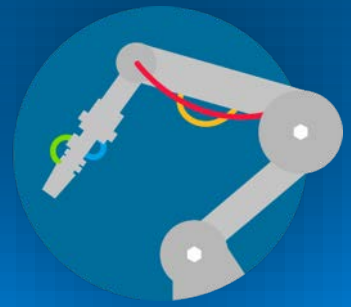
A dynamic approach to risk and security that will enable real-time, risk-and trust-based decision making with adaptive responses


Key Technologies
Leading the 4th Industrial Revolution

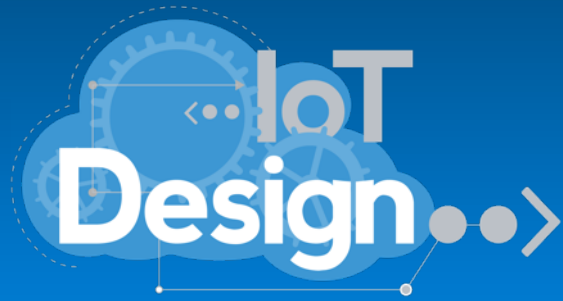
1. Leading Core Technologies

BIG DATA

Deep Learning (AI)



Robotics



Internet of Things

2. Leading Infra Technologies

Cloud Computing

5G

Mobile Services

Security

3. Leading **Service** Technologies

Smart Factory

Smart Farm

Connected CAR

Wearable & Healthcare

AR/VR

Fintech

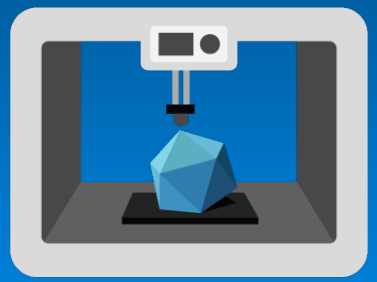
O2O

Blockchain

4. Leading Technologies **Paradigm**

Open Source

Makers



3D Printer

Open H/W

Internet of Things (IoT)

IoT

The connected things will reach 20.8 billion by 2020. In 2016, 5.5 million new things will get connected every day (Gartner)


Fragmentation

Artificial Intelligence (AI)

AI

Software Technology for the human like intelligence (Learning, Inference, Recognition, Understanding)

Data & Knowledge
(Language, Vision, Sense …)

Visual Intelligence

Learning Intelligence

Linguistic Intelligence

Brain Computing
(Cognitive Computing)

Intelligent Computer/Machine

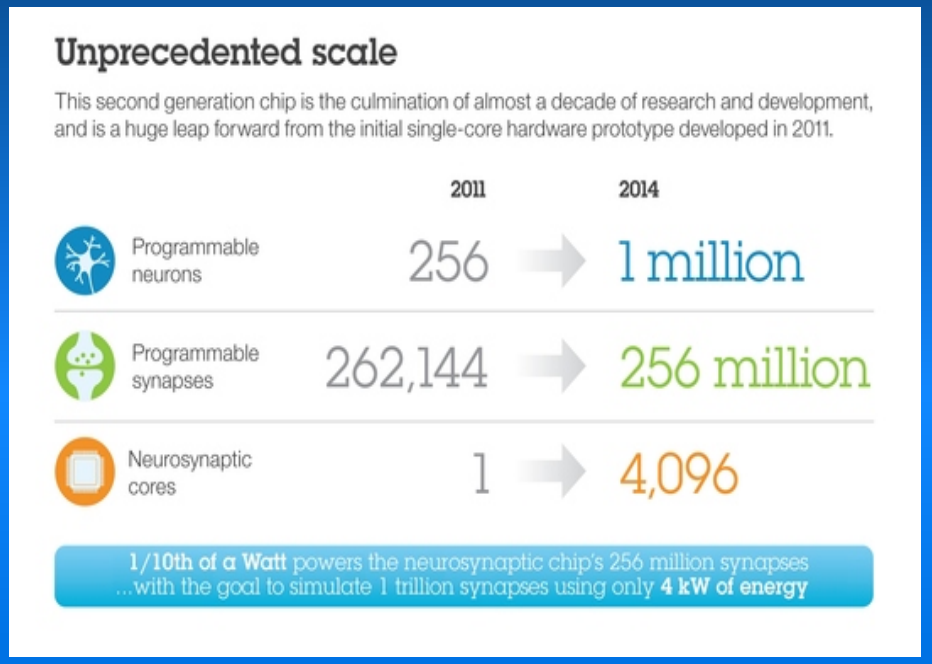
Artificial Intelligence (AI)

AI

Future of Artificial Intelligence with Deep Learning and Neuromorphic Chip

Big Data (Deep) Learning (Cloud Computing)

Realtime Control (Neuromorphic Chips)



* Neuromorphic Chips
Microprocessors configured more like brains than traditional chips could soon make computers far more astute about what's going on around them.

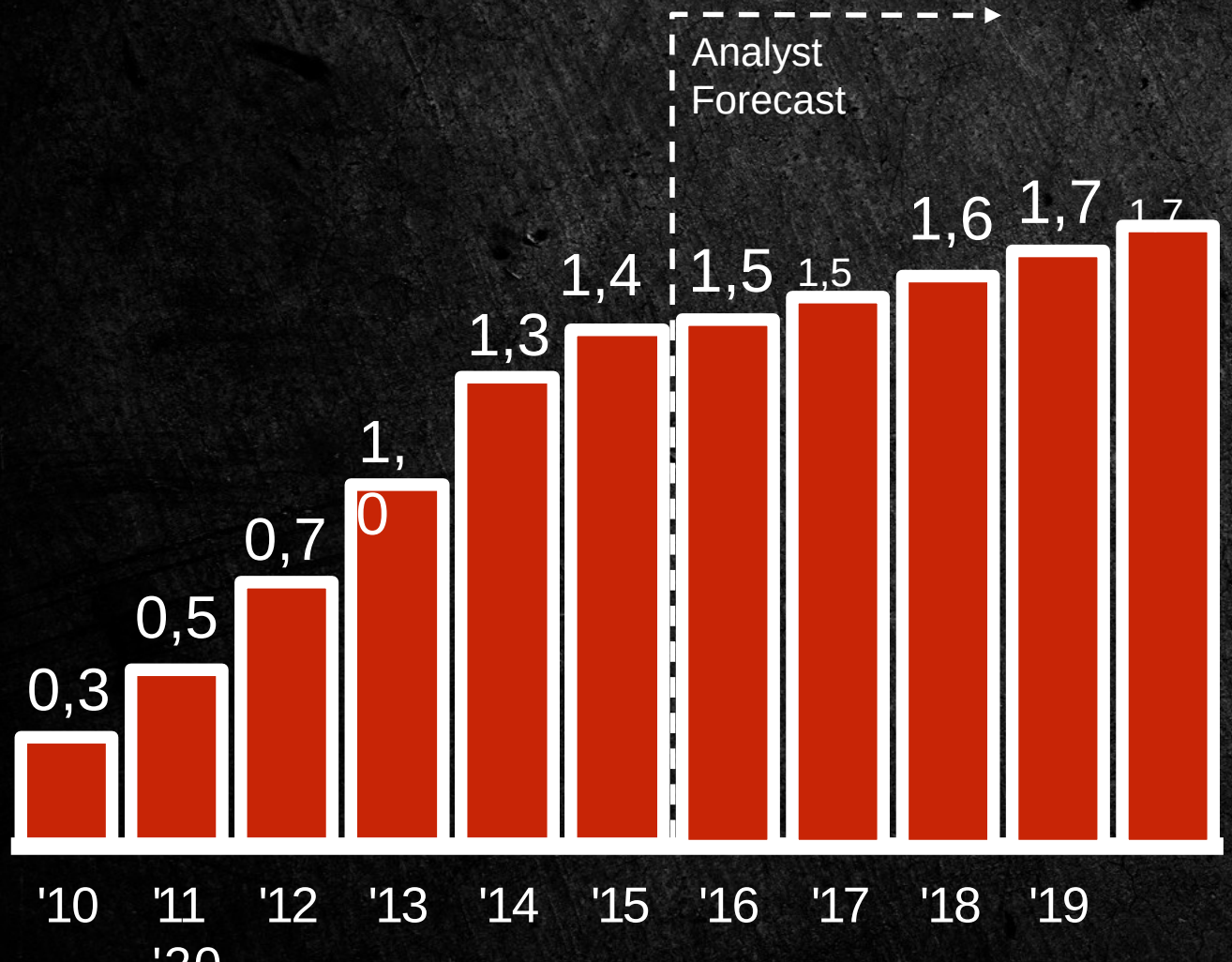

SoftBank
Croup

Inconvenient Truth

기존통신사 (Telco-Biz)

Smartphone Shipments

(Bn)



37% ➡ 4%

(2010-2015) (2016-2020)

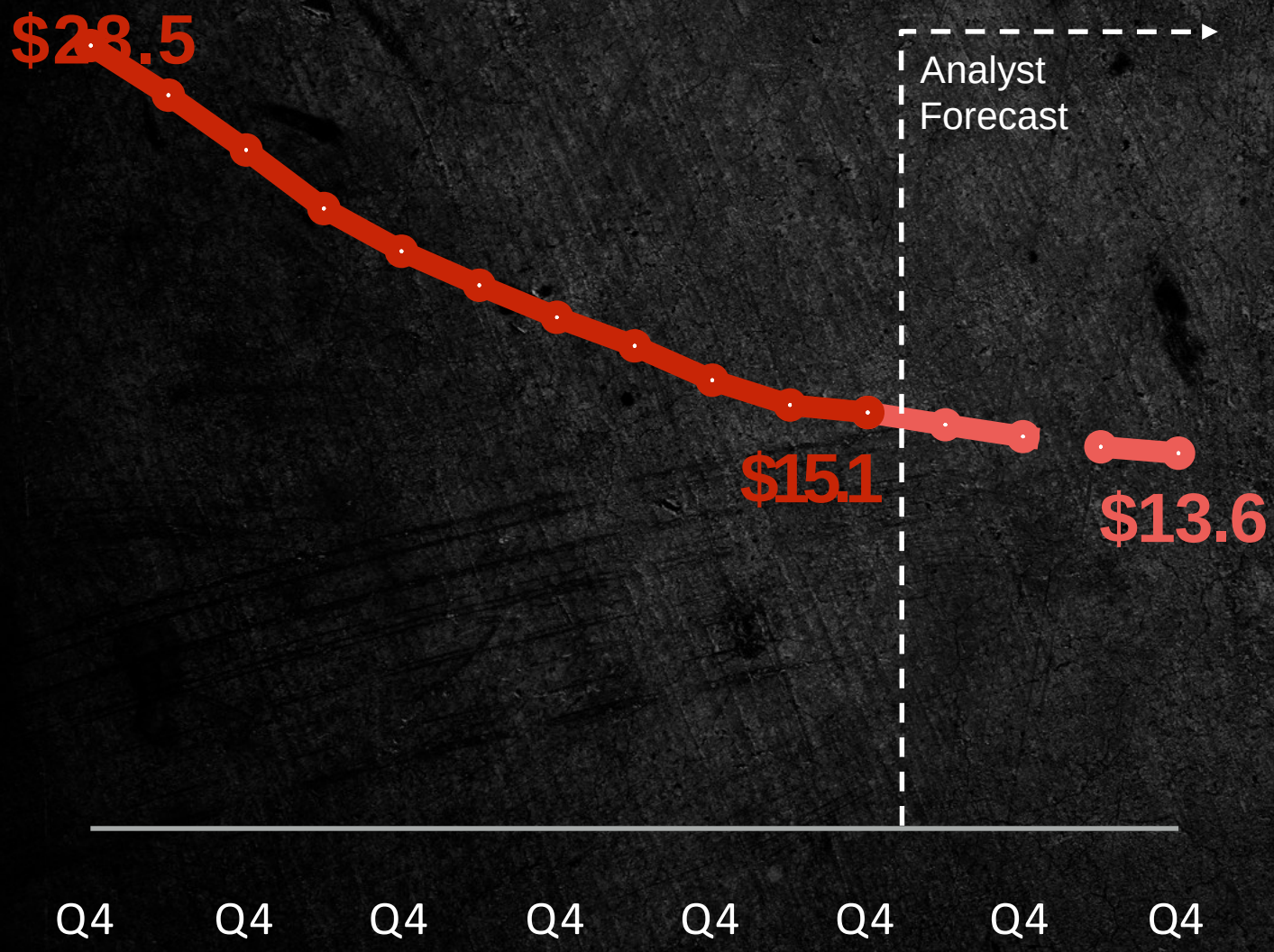
CAGR

(스마트폰생산 연평균성장율)

Source: IDC

ARPU (blended)

Average Revenue Per User (가입자당 매출)



47%

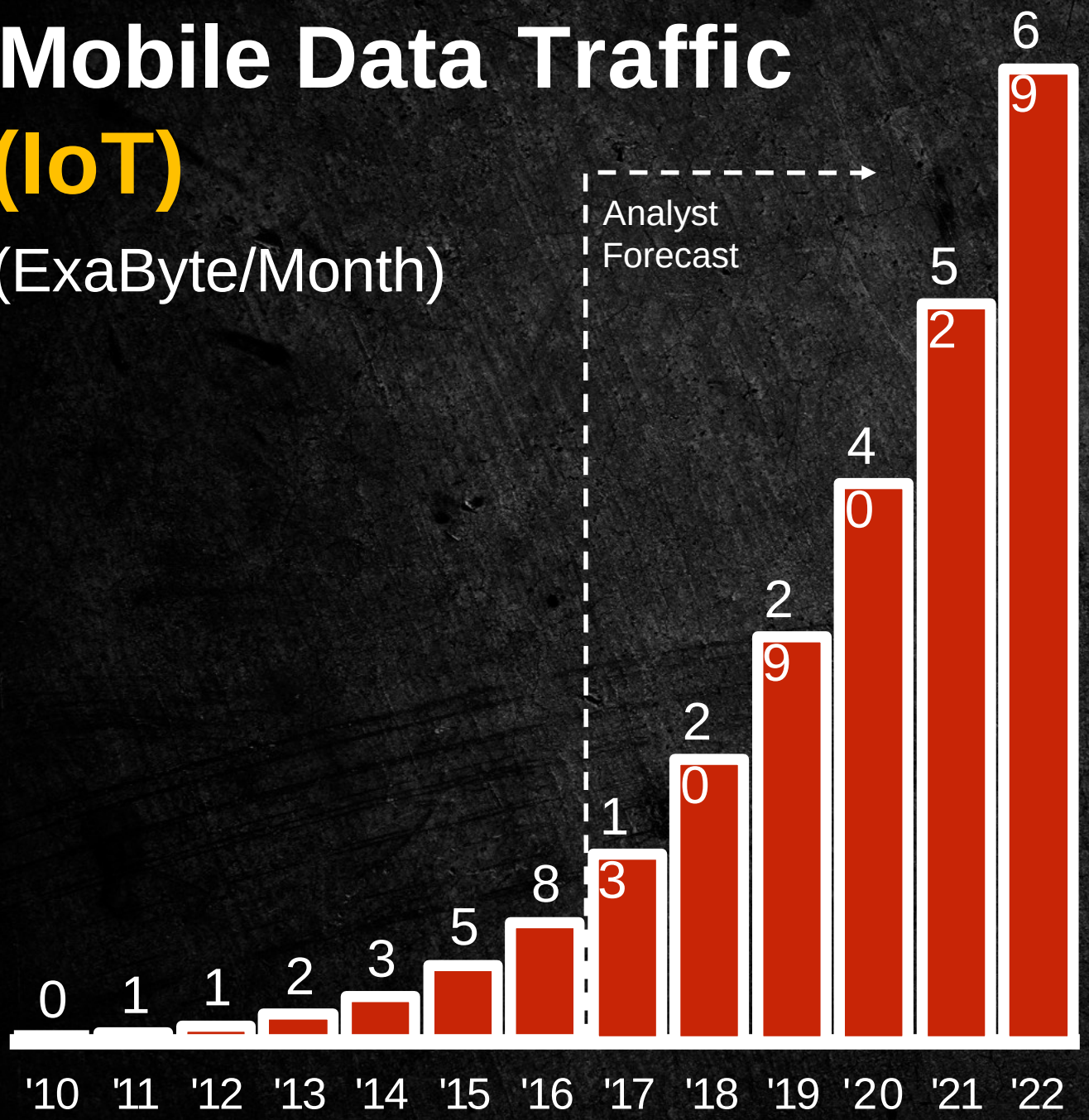
Down

(2006-2016)

Source:

Mobile Data Traffic (IoT)

(ExaByte/Month)



(인터넷 Traffic)

8x

(2016E-2022E)

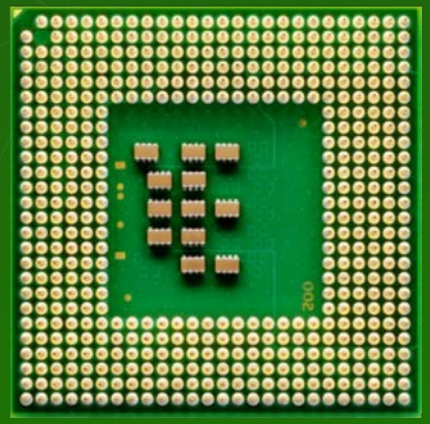
Requires more CAPEX

(신규투자비용)

Source: Ericsso

SINGULARITY

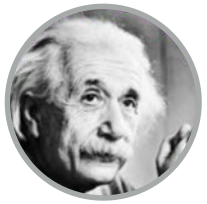
The day computers exceed the human brain



IQ

Average
IQ100

Albert Einstein
IQ190



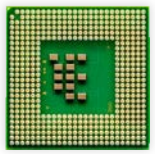
Leonardo Da Vinci
IQ205

55 70 85 100 115 130 145

Transistors

Number of human brain cells
(No. of transistors)

30bn



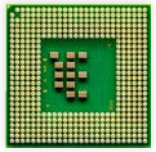
3bn

Exceeds number of human brain cells in 2018

2010

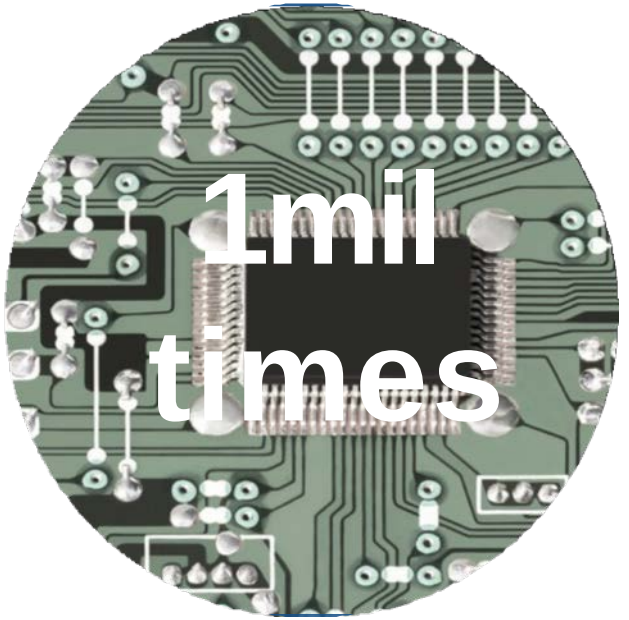
2018

Transistors



3 quadrillion 10^{15}

Number of human brain cells
(No. of transistors)



3bn

30bn

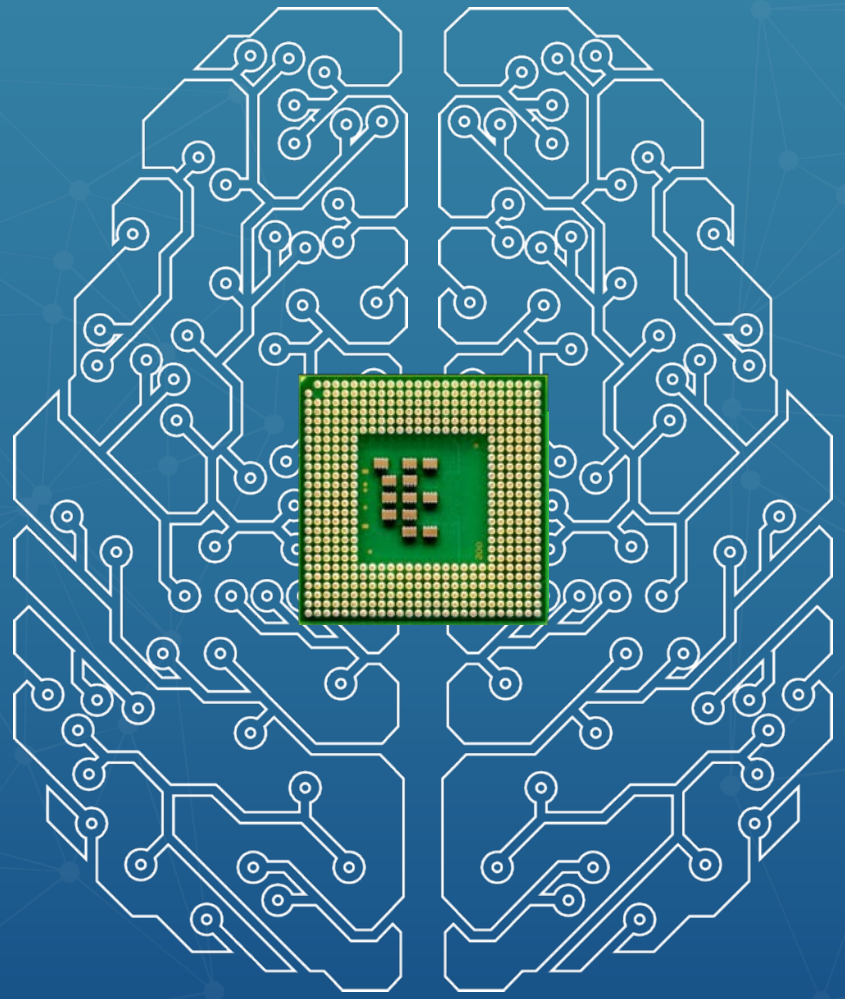
human brain

2010

2018

2040

Birth of Super-Intelligence



Smart Robots

10bn

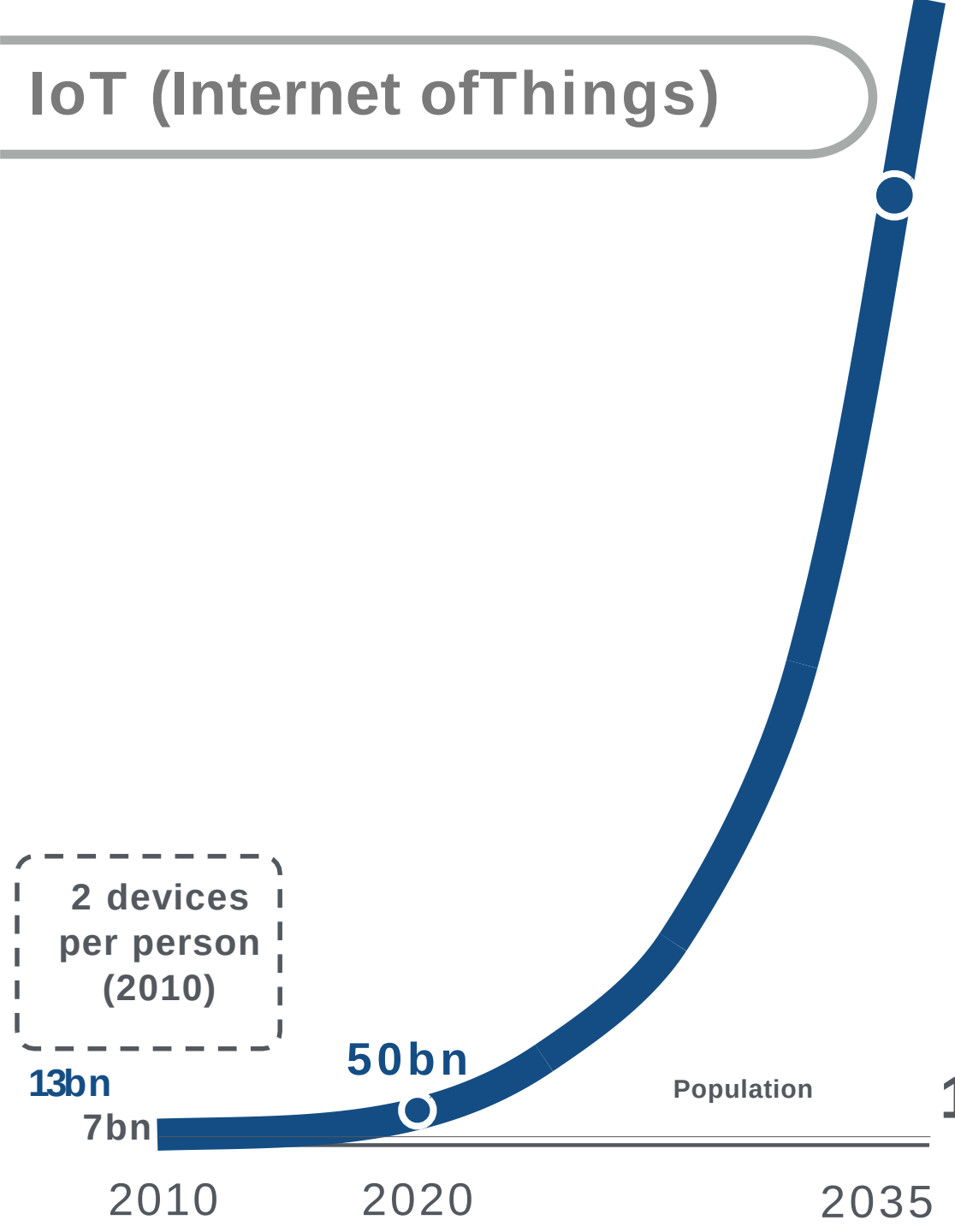
10bn Population

2010

7.5B (2017)

2040

IoT (Internet ofThings)



1 trillion

10^{12}

10bn

100 things
per person (2035)

Note: Created by SoftBank Corp. based on data by Cisco IBSG, 2011

Everything Connected


SoftBank
Croup

Big DATA

Big Data

Big data will become a key basis of competition, underpinning new waves of productivity growth, innovation, and consumer surplus


BIG DATA
How to make the Value from the garbage ?

DATA MANAGEMENT

Acquisition, Storing, Processing, …

VS

DATA ANALYTICS

Mining, Social Analysis, Visualization, …

CHINADAILY.COM.CN

US EUROPE AFR
中文 双语 Français

HOME CHINA WORLD BUSINESS LIFESTYLE CULTURE TRAVEL SPORTS OPINION REGIC

Business Macro Companies Industries Technology Motoring China Data Fina

• Home / Business / Industries

China aims high in big data industry

Xinhua | Updated: 2017-01-17 16:52

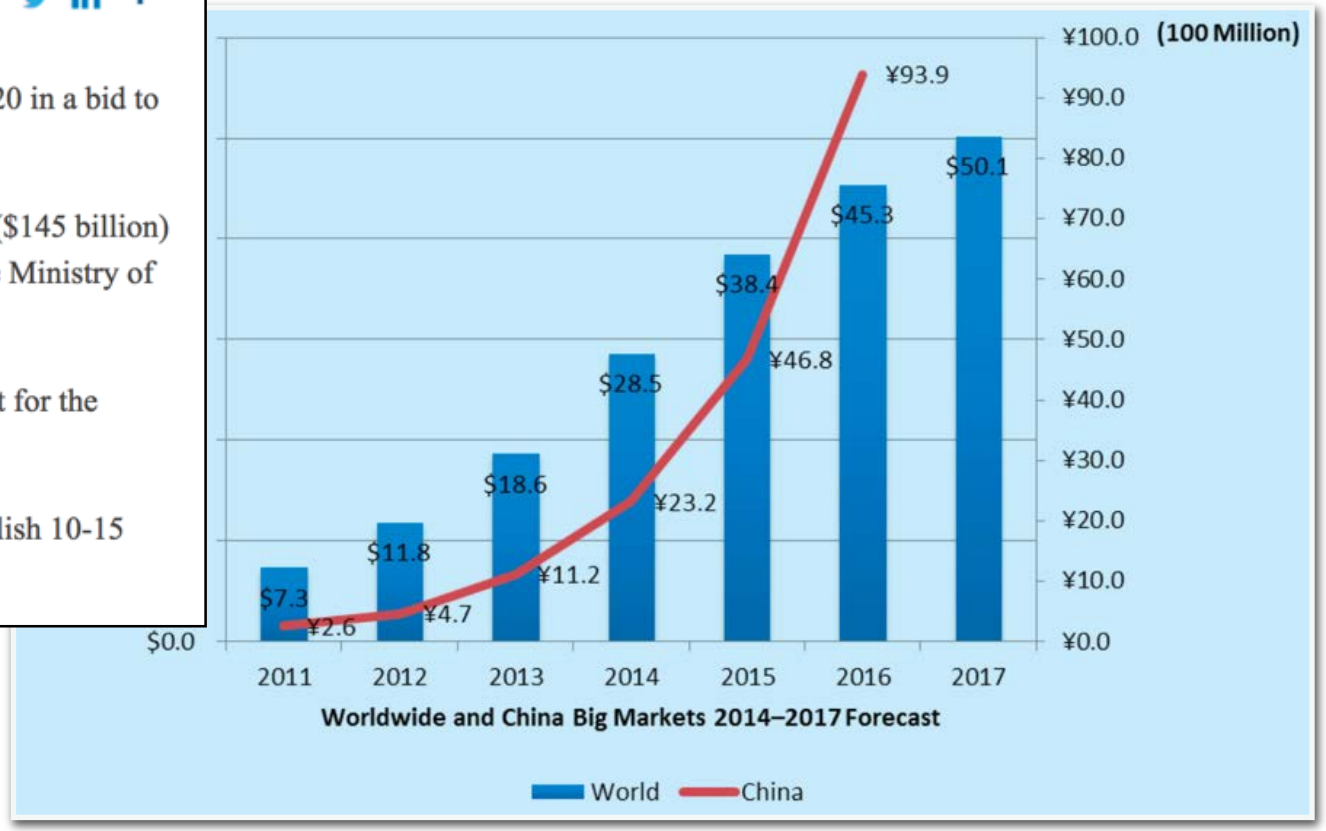
BEIJING - China aims to more than triple the scale of its big data industry by 2020 in a bid to foster new economic drivers, according to a government plan released Tuesday.

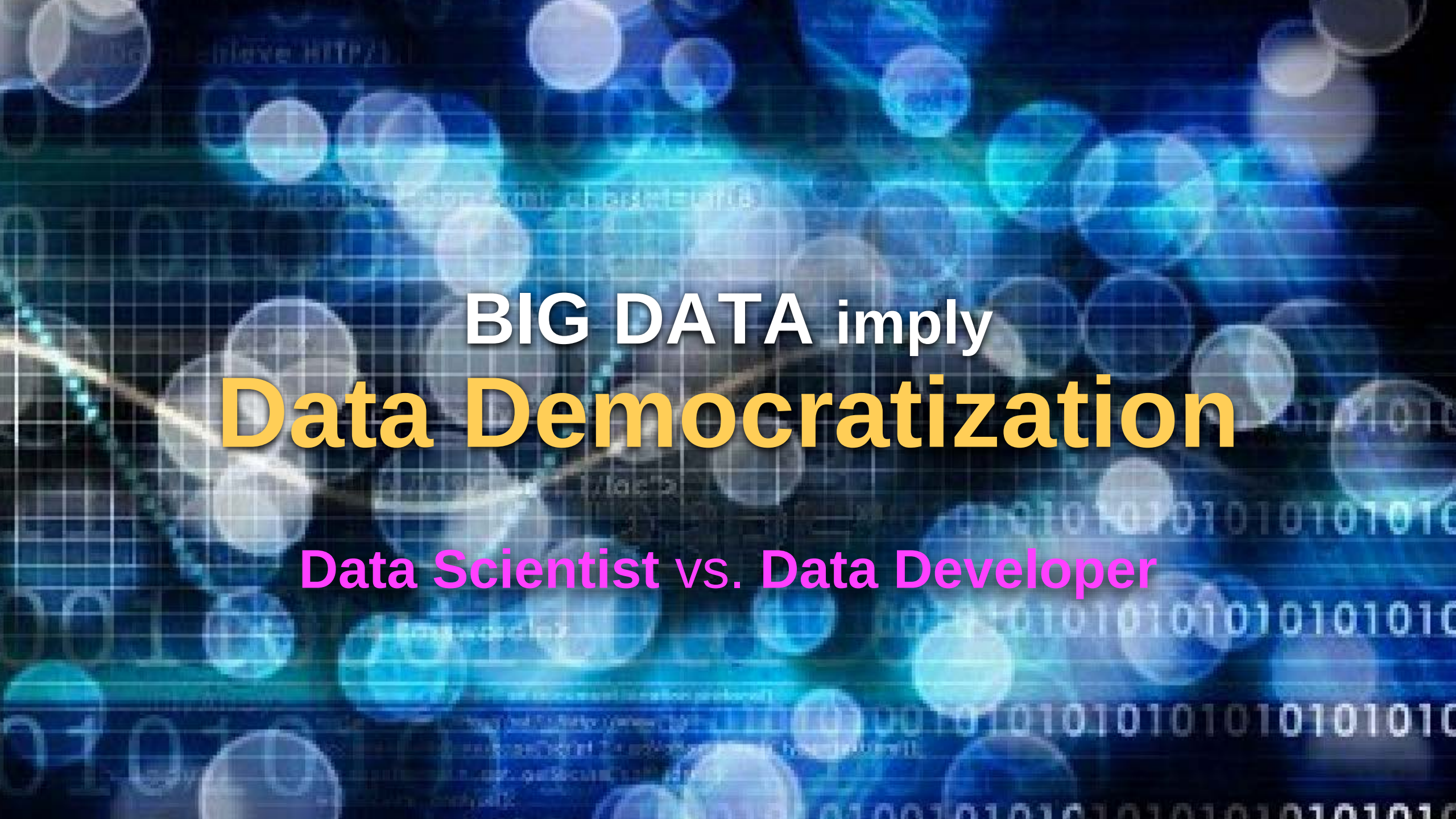
The country's big data industry should increase its annual sales to 1 trillion yuan ($145 billion) by 2020 from an estimated 280 billion yuan in 2015, said the plan released by the Ministry of Industry and Information Technology (MIIT).

The government is targeting a compound annual growth rate of around 30 percent for the industry's sales in 2016-2020, according to the plan.

It also set goals to create 10 world-leading big data companies by 2020 and establish 10-15 experimental zones to speed up the industry's development.

(Big) DATA Industry




BIG DATA imply
Data Democratization
Data Scientist vs. Data Developer

CDO (Chief Data Officer)

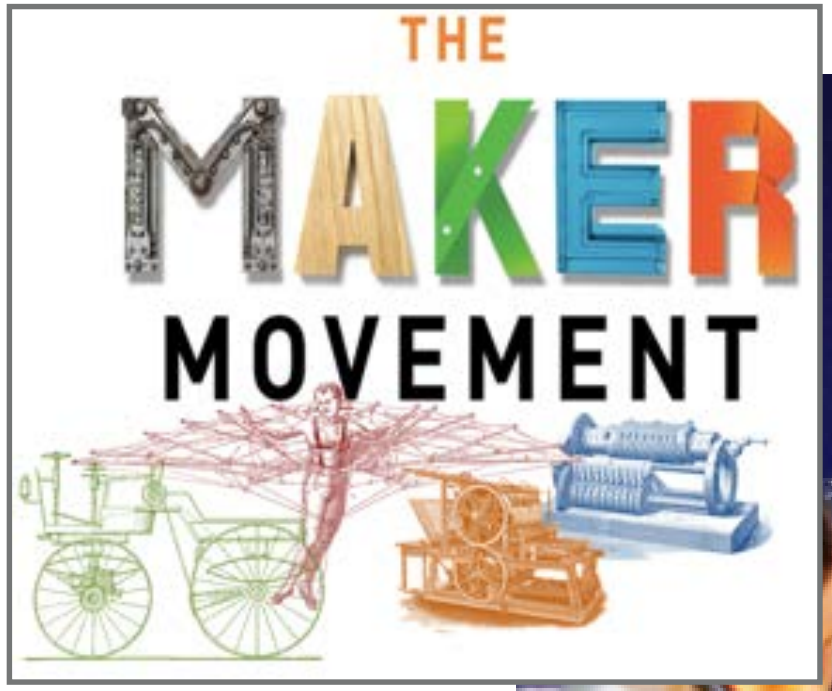
responsible for enterprise wide governance and utilization of information as an asset, via data processing, analysis, data mining, information trading and other means.


BIG DATA
FOR SOCIAL GOOD
16
operators
2bn
connections
100
countries
Epidemics
Natural Disasters
NEXT
ELEMEN
#MWC17
THE FOURTH INDUSTRIAL REVOLUTION
PLATFORMS
CONSUMER IOT
DEVELOPMENT
MOBILE
GSMA
MOBILE
WORLD CONGRESS
BARCELONA 27 FEB - 2 MAR 2017

Big Data Will Drive The Fourth Industrial Revolution

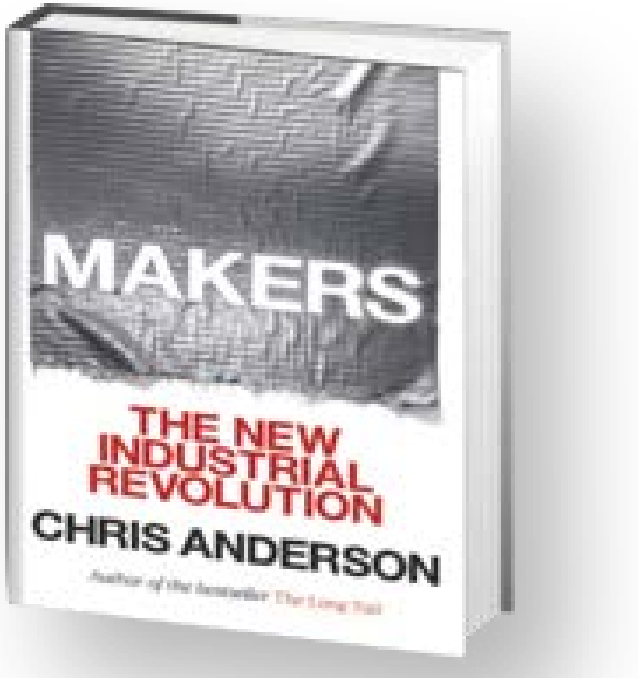
https://datafloq.com/read/big-data-drive-fourth-industrial-revolution/3

The 4th Industrial Revolution & Maker Movement

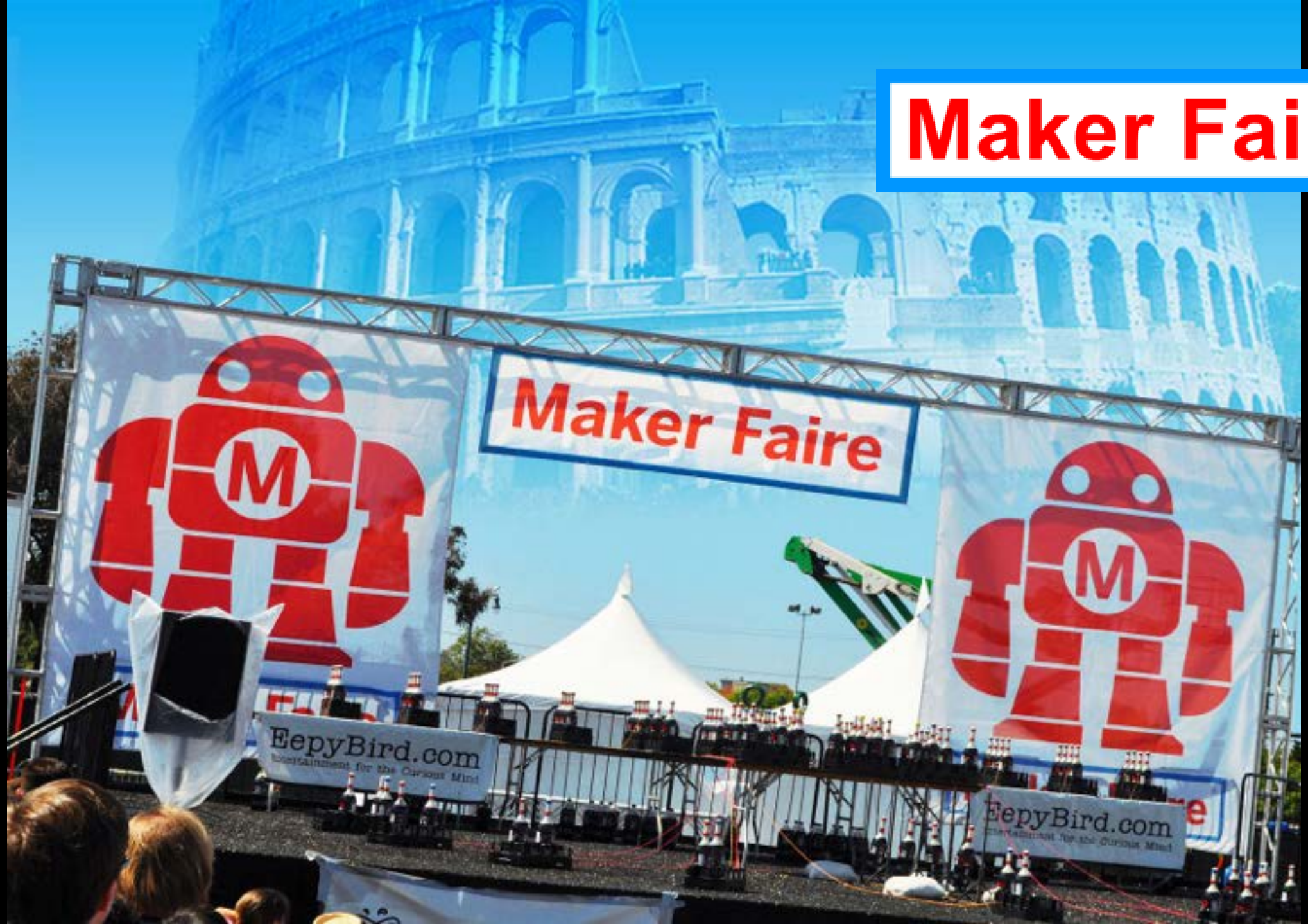


The age of “Maker Economy”

Maker will leading the new Industrial Revolution !
Not Just Hobby !



Open Hardware


Maker Faire®
Maker Faire
M
EepyBird.com
Entertainment for the Curious Mind
M
EepyBird.com

Maker Faire
BAY AREA
May 17 & 18
2014

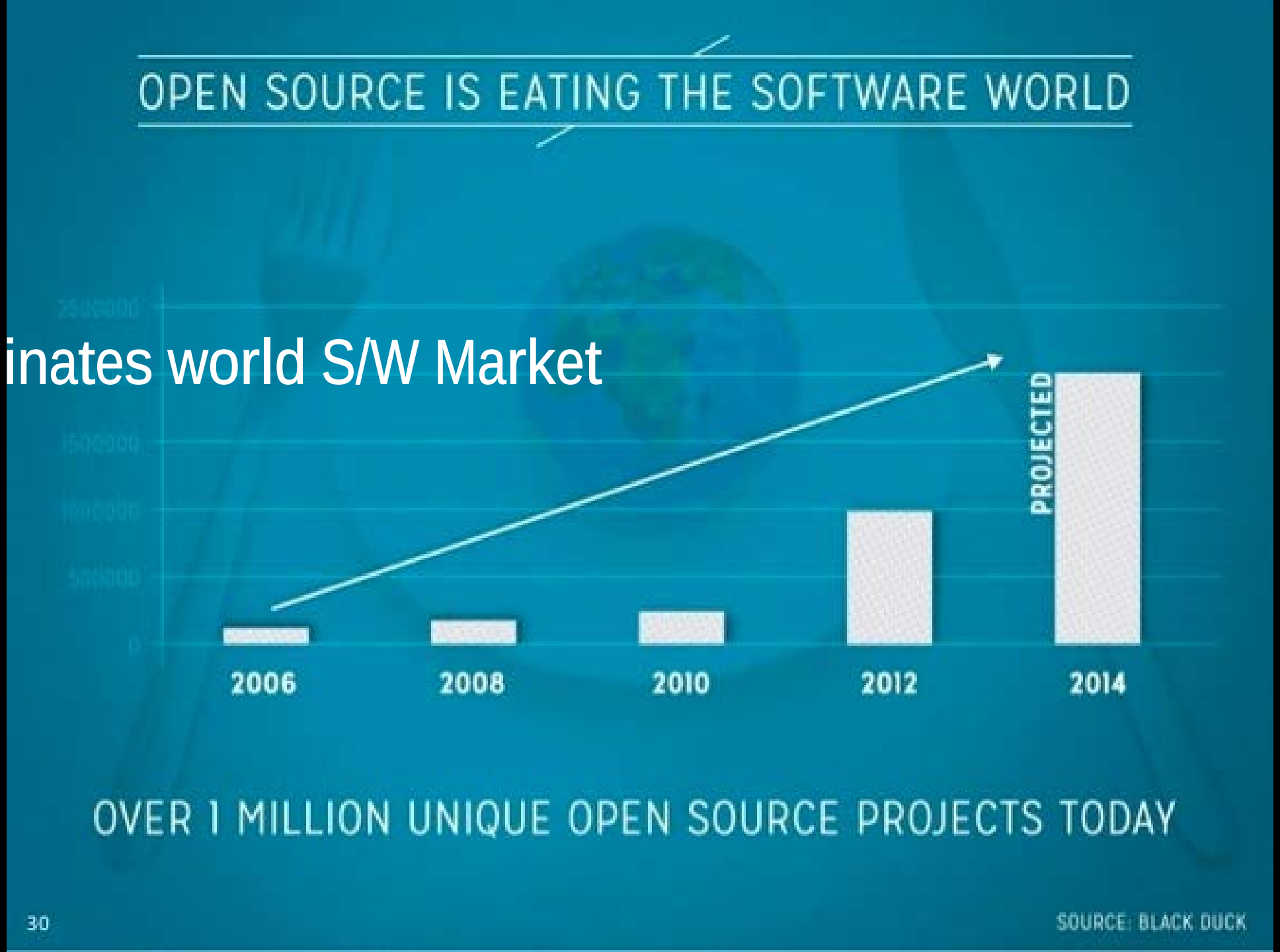
World First 3D Printing CAR ?

VIDEO CLIP for Open Source HW example

https://www.youtube.com/watch?v=kfzqUsGMHE0

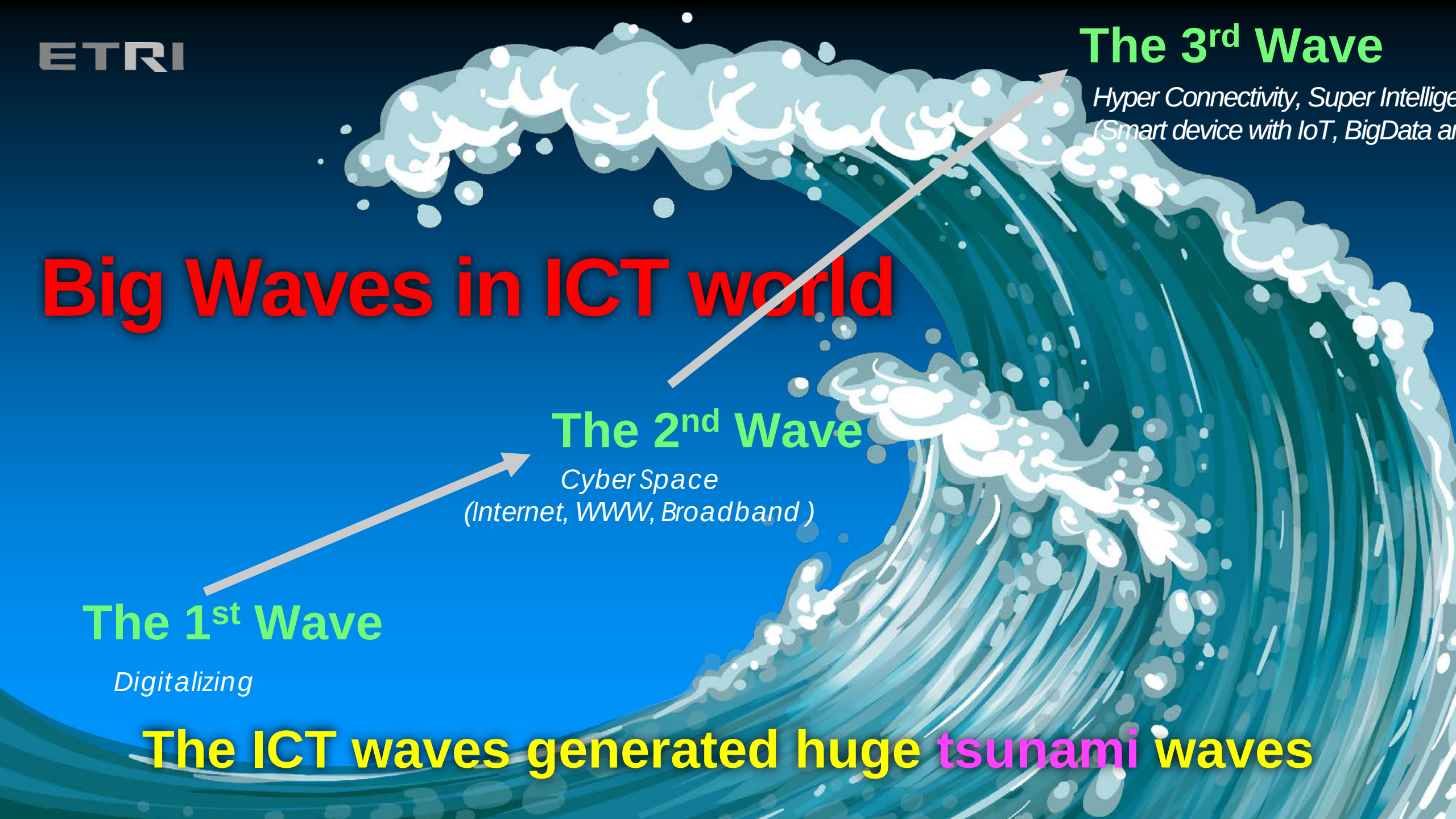
OPEN SOURCE REVOLUTION

it dominates world S/W Market




SOCIAL
DEVELOPMENT
NETWORK
MEDIA
CULTURE
OPEN
SOURCE
SOFTWARE
HARDWARE
USERS
INNOVATION
CREATIVE
FORMAT
CONTENT
CODE
PUBLIC
BUSINESS
INFORMATION
COMMUNITY
WEBSITE
RESEARCH

ETRI ’s view for future technology


ETRI
The 3rd Wave
Hyper Connectivity, Super Intellige
(Smart device with IoT, BigData a
Big Waves in ICT world
The 2nd Wave
Cyber Space
(Internet, WWW, Broadband)
The 1st Wave
Digitalizing
The ICT waves generated huge tsunami waves

ETRI

ETRI

IDX

Intelligent Digital Transformation

Hyper Connectivity

Super Intelligence

Immersive Media

"Leading the 4th Industrial Revolution"

Technology Trends with Digital Transformation

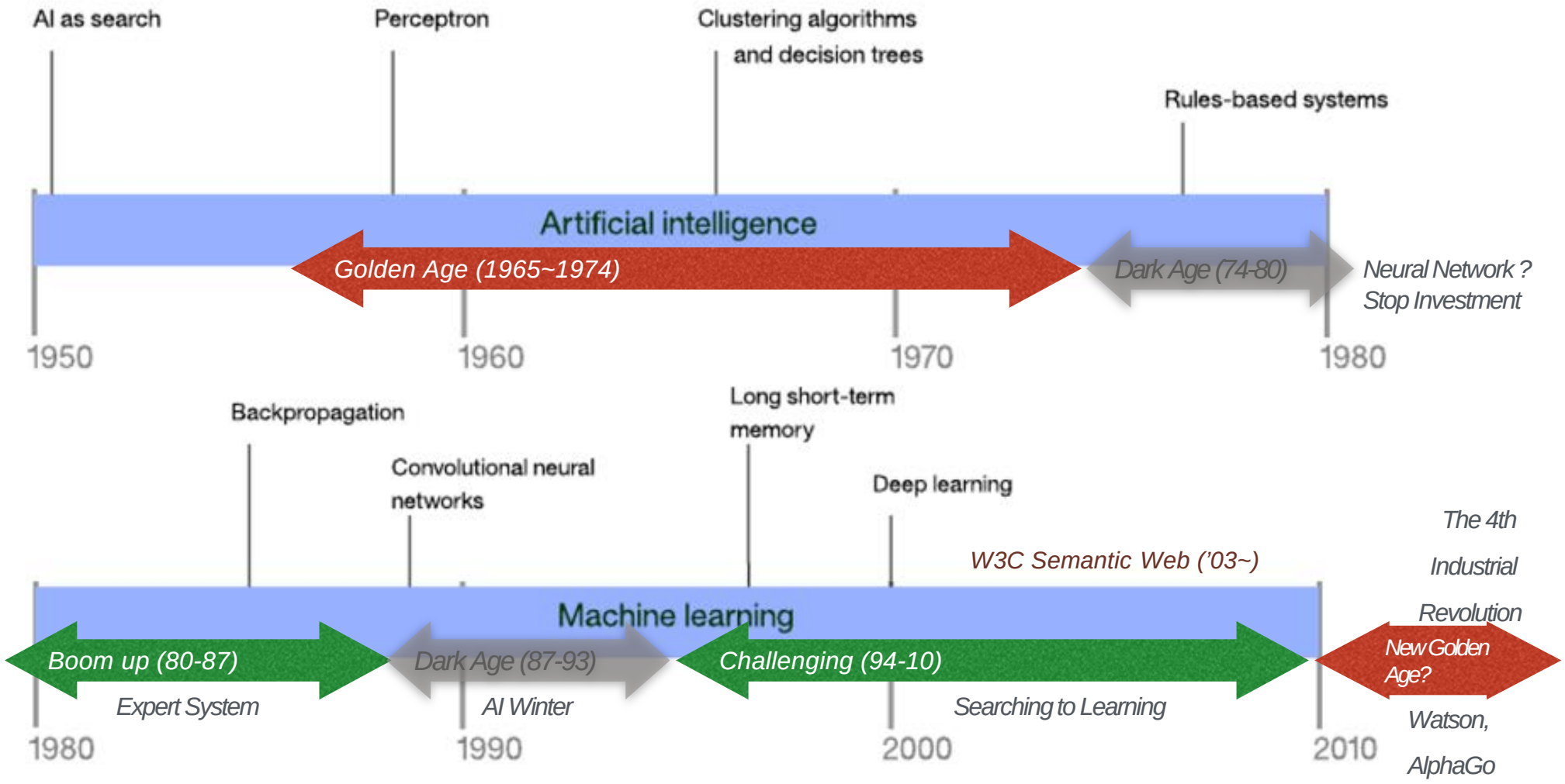
- PART 1. ICT Trends with 4th Industrial Revolution
- PART 2. Key Technology for 4th Industrial Revolution
- **PART 3. Artificial Intelligence (AI) Trends**
- Annex. New Technology Issue on Standards


The New Era of Artificial Intelligence

At a Glance, Artificial Intelligence

History and Issues

History of AI



Source> Wikipedia & IBM's developerWorks, June 2017

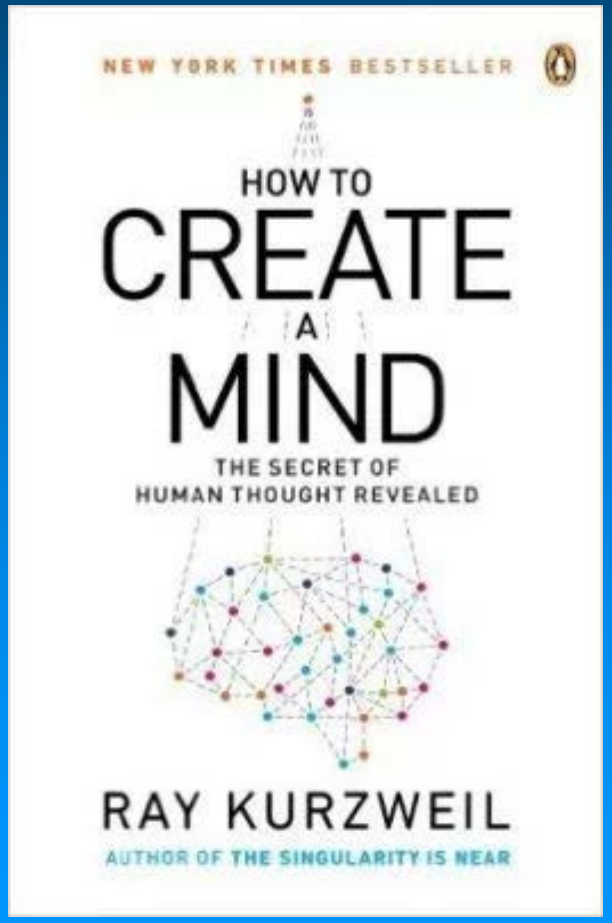
The reason for failure:

Limitation of Search, Pattern Matching, …

Too Big positive expectation …

How to realize AI ?

Intelligence vs. Expression



RDF (Resource Description Framework)

GRDDL (Gleaning Resource Descriptions from Dialects of Languages)

POWDER (Protocol for Web Description Resources)

Semantic Web Technology

Since 2003

RDF(a), GRDDL, POWDER, Linked Data, …

W3C provides some "feasible approaches"

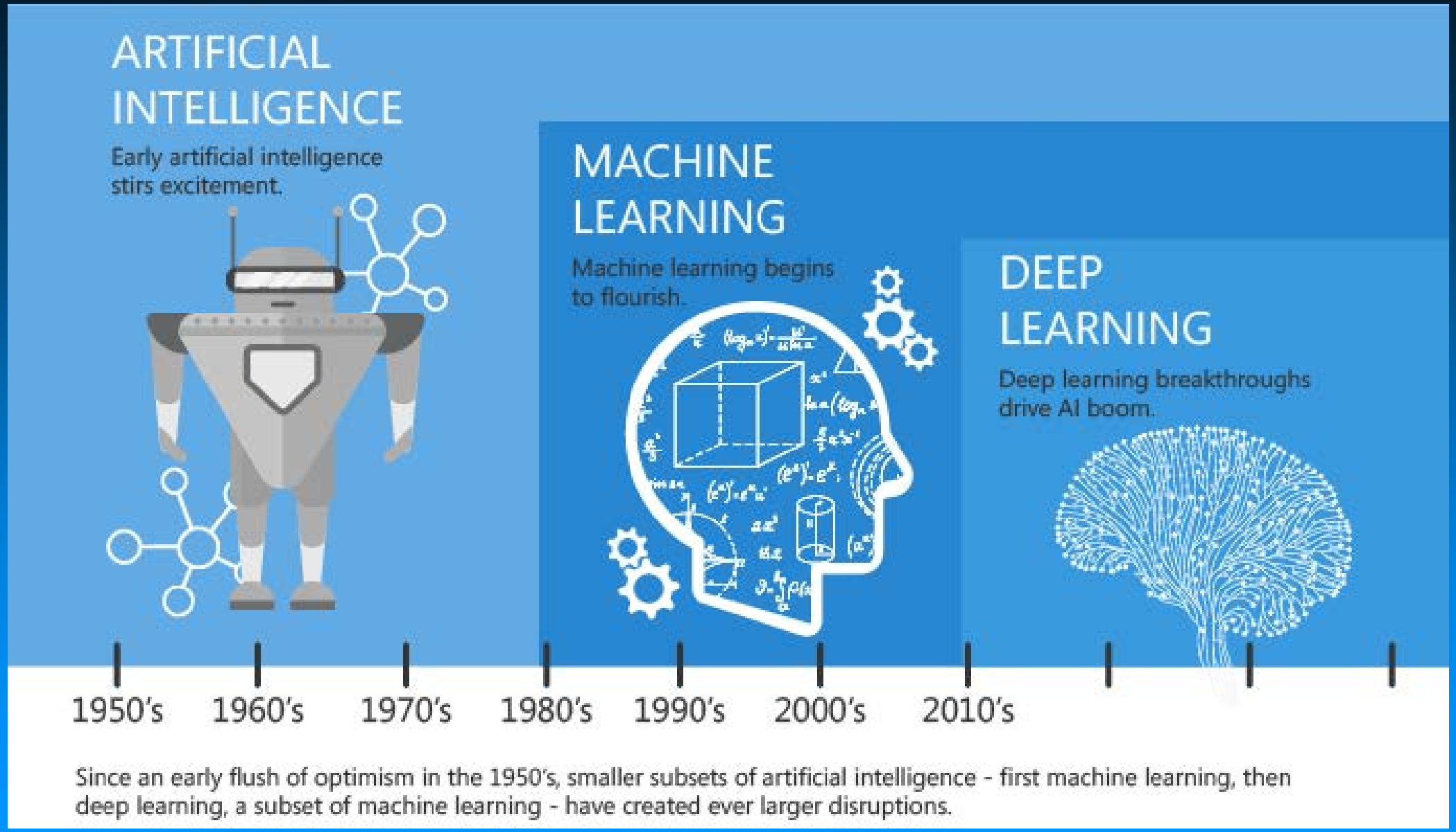
Raw Data Now (Tim Bernes Lee):

https://www.ted.com/talks/tim_berners_lee_the_year_open_data_went_worldwide

Recent revolution & emerging technology :

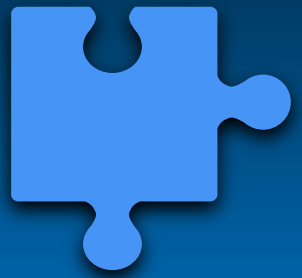
Make it possible AI again !

Learning Technology



Since an early flush of optimism in the 1950's, smaller subsets of artificial intelligence - first machine learning, then deep learning, a subset of machine learning - have created ever larger disruptions.

https://blogs.nvidia.com/blog/2016/07/29/whats-difference-artificial-intelligence-machine-learning-deep-learning-ai/



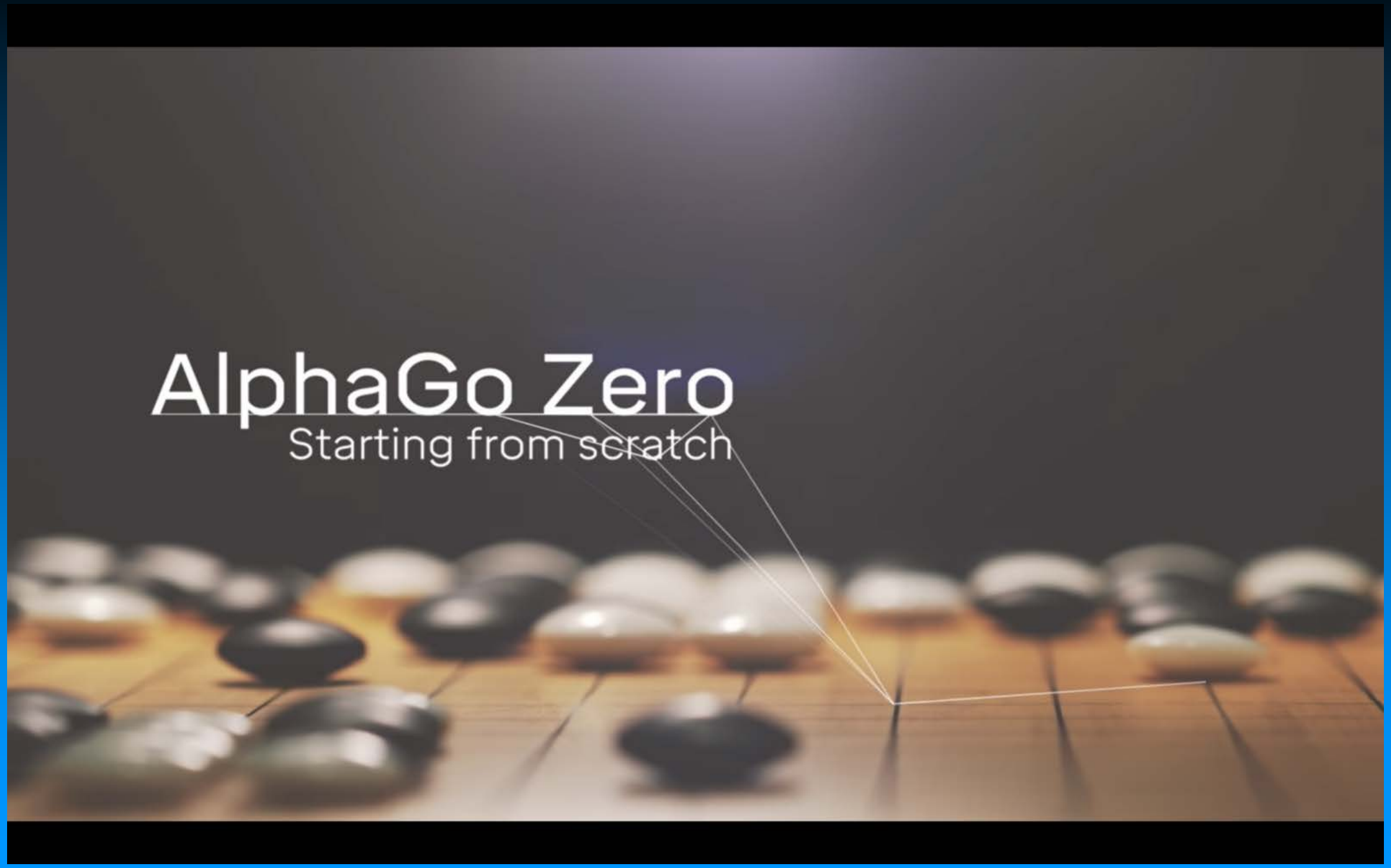
Major Issues on Artificial Intelligence

Need to be considered seriously

*Spectators watch a broadcast of the final, decisive game in the rematch between **Garry Kasparov** and the **IBM computer Deep Blue**. (1977)*

Google's Go-playing AI still undefeated with victory over world number one…

http://www.theguardian.com/


AlphaGo Zero
Starting from scratch

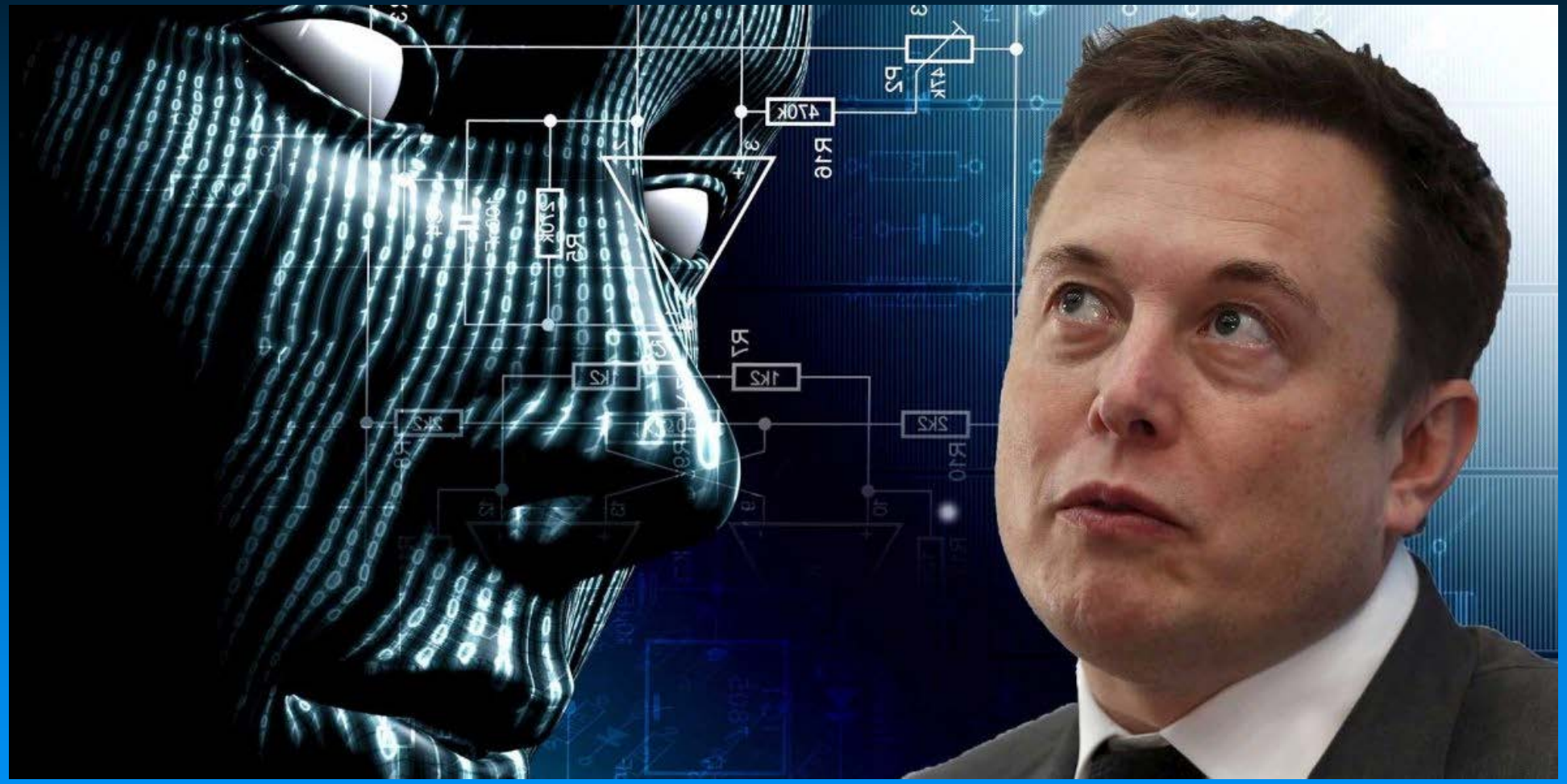
"Artificial intelligence would be the ultimate version of Google…

would understand exactly what you wanted, and it would give you the right thing

Larry Page, CEO of Google

“The development of full artificial intelligence could spell the end of the human race…”

Stephen Hawking



Artificial Intelligence is like ***Summoning the Demon***

Elon Musk, CEO of Tesla

Does AI be Regulated?

TechRepublic

Top 10 AI failures of 2016

some of the biggest examples

1. AI built to **predict future crime** was racist
2. Non-player characters in a **video game** crafted weapons beyond creator's plans
3. Robot **injured a child**
4. **Fatality in Tesla Autopilot** mode
5. **Microsoft's chatbot Tay** utters racist, sexist, homophobic slurs
6. AI-judged **beauty contest is racist**
7. Pokémon Go keeps game-players in white neighborhoods
8. Google's AI, AlphaGo, **loses game 4 of Go to Lee Sedol**
9. Chinese facial recognition study predicts convicts but shows bias
10. Insurance company uses Facebook data to issue rates, shows bias

source> https://www.techrepublic.com/article/top-10-ai-failures-of-2016/

Microsoft forced to apologize after epic chatbot fail

March 2016, https://blogs.microsoft.com/blog/2016/03/25/learning-tays-introduction/

Although we had prepared for many types of abuses of the system, we had made a critical oversight for this specific attack.

As a result, Tay tweeted wildly inappropriate and reprehensible words and images.

** 욕설, 인종 성차별 발언, 자극적인 정치적 발언 등을 하도록 유도*

What could be the Key point in AI ?

Availability vs. Responsibility

VIDEO CLIP for Artificial Intelligence

https://drive.google.com/open?id=0B75vPB9iMrhGTjJieTZLdlZRemM

STANDARS Perspectives

Why do we need AI standards?

30 years ago

ISO/IEC JTC 1 N 365

ISO/IEC JTC 1 N **365**
Date: 1988-12-1

日本工業標準調査会 '89. 1. 12 標準部 工業技術院

ISO/IEC JTC 1
INFORMATION TECHNOLOGY
Secretariat: USA (ANSI)

TITLE: Proposal for a New Work Item: Terminology related to Artificial Intelligence and Expert Systems (new part of ISO 2382).

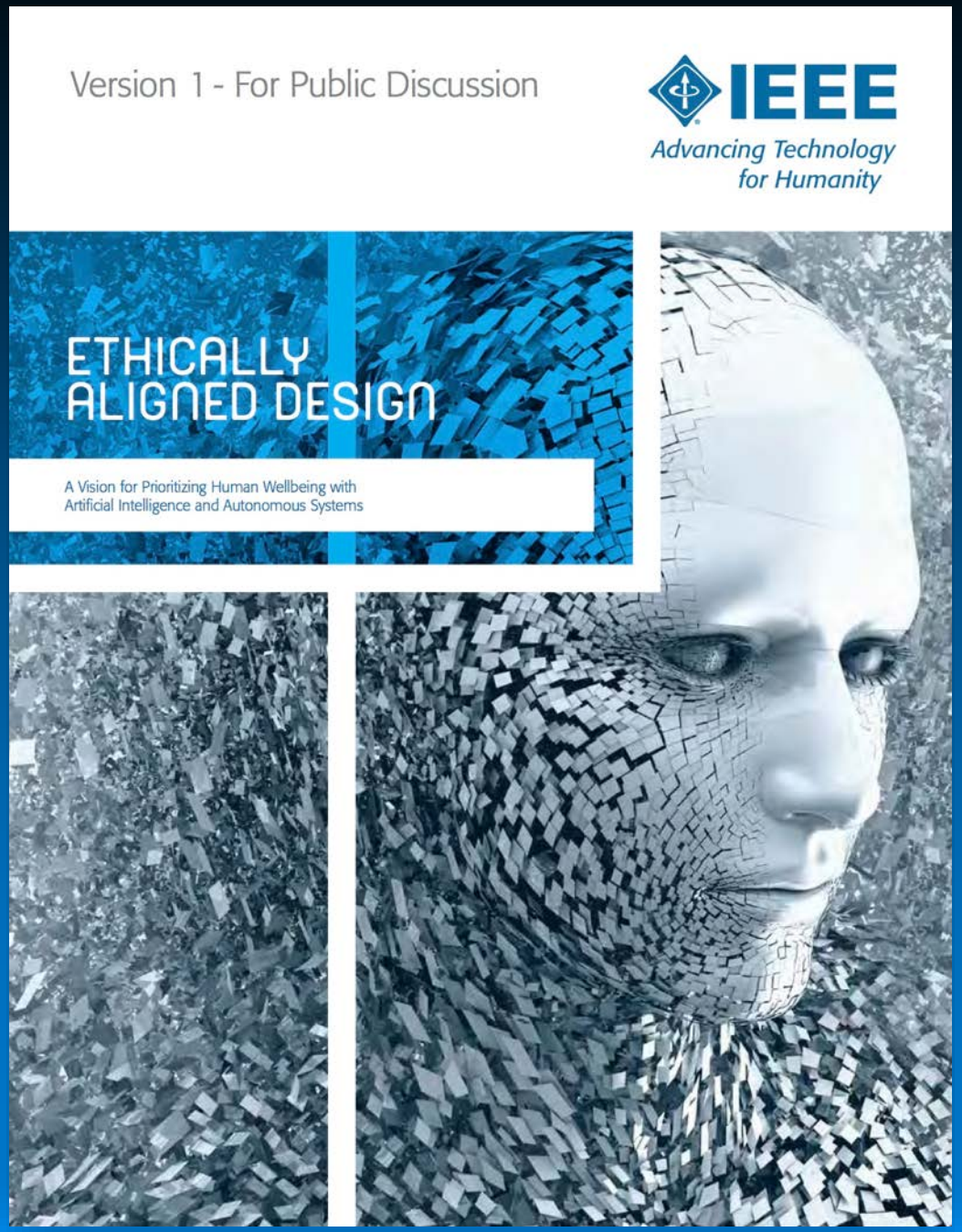
SOURCE: SC 1

PROPOSAL FOR A NEW WORK ITEM FORM 3

date of presentation of proposal 1988-09-19	proposer N. RIBOULET
secretariat AFNOR	ISO/IEC JTC 1/SC 1

The Area of Standardization

- Domains
- Software engineering
- Performance
- Metrics
- Safety
- Usability
- Interoperability
- Security
- Privacy
- Traceability
- Risk Analysis
- Ethics

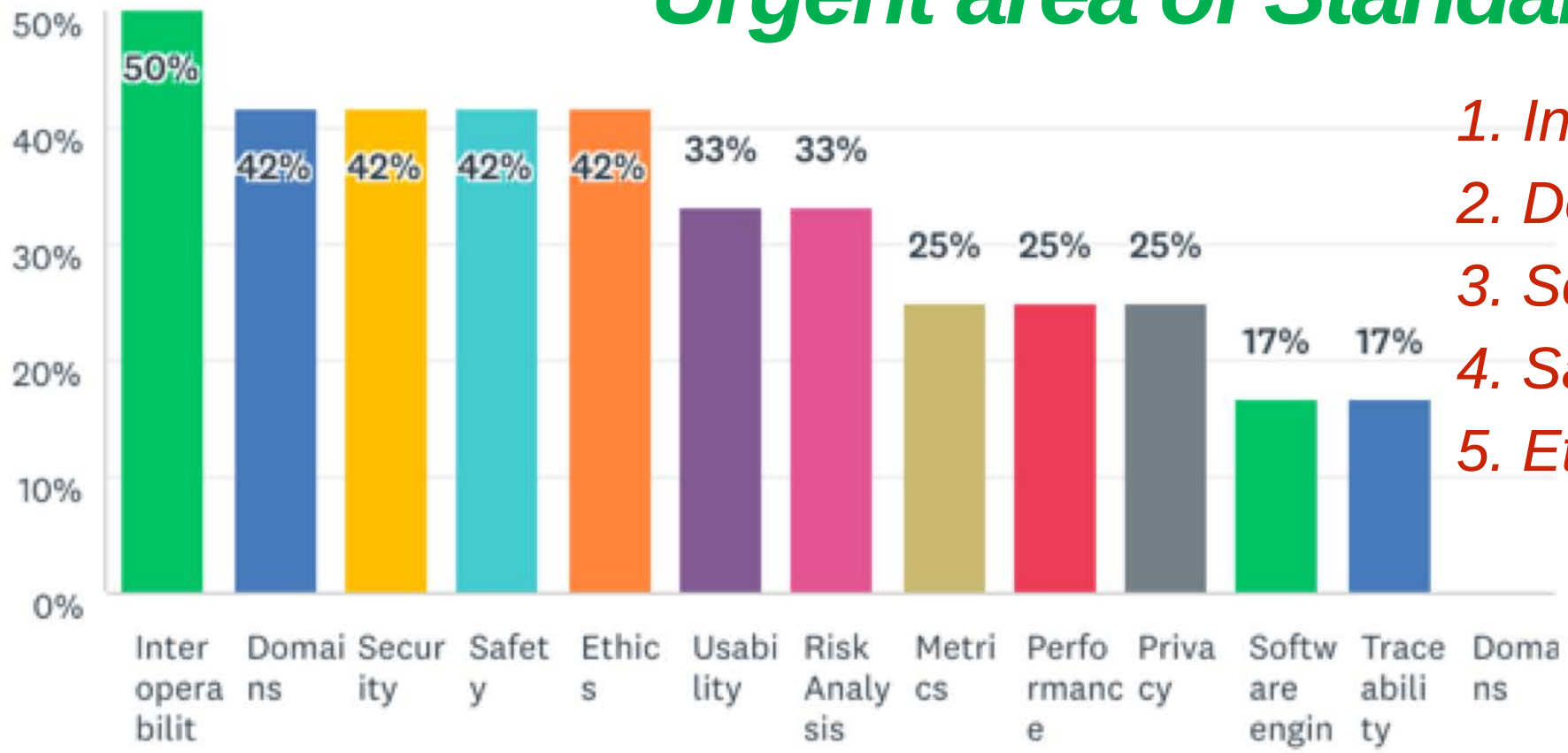


Ethically Aligned Design

- Human rights
- Responsibility
- Transparency
- Education

2017 Survey on AI (ISO/IEC JTC 1)

Urgent area of Standardization



1. *Interoperability*
2. *Domains*
3. *Security*
4. *Safety*
5. *Ethics*

AI Standards

We need the right compass
for journeying into future AI world !

Technology Trends with Digital Transformation

- PART 1. ICT Trends with 4th Industrial Revolution
- PART 2. Key Technology for 4th Industrial Revolution
- PART 3. Artificial Intelligence (AI) Trends
- PART 4. **New Technology Issue on Standards**

Technology Trends with Digital Transformation

Top 15 Priority Technologies

for future ICT standards

by ISO/IEC JTC 1 (2017-2018)

Top 15 Priority Technologies for future ICT standards

1. Smart Car
2. Autonomous Systems
3. Robotics
4. Connected Car
5. Digital Twin
6. Autonomous Vehicles
7. Quantum Computing
8. Augmented Data Discovery
9. Virtual Assistance
10. Brain-Computer Interface
11. 4D Printing
12. Cognitive Computing
13. Drone
14. Smart Workspace
15. Neuromorphic Computing

by ISO/IEC JTC 1 (2017-2018)

Top 15 Priority Technologies for future ICT standards

1. Smart Car

Smart car is an automobile with advanced electronics. Microprocessors have been used in car engines since the late 1960s and have steadily increased in usage throughout the engine and drivetrain to improve stability, braking and general comfort.

The 1990s brought enhancements such as GPS navigation, reverse sensing systems and night vision (able to visualize animals and people beyond normal human range). The 2000s added assisted parking, Web and e-mail access, voice control, smart card activation instead of keys and systems that keep the vehicle a safe distance from cars and objects in its path. Of course, **the ultimate smart car is the one that drives itself**

Top 15 Priority Technologies for future ICT standards

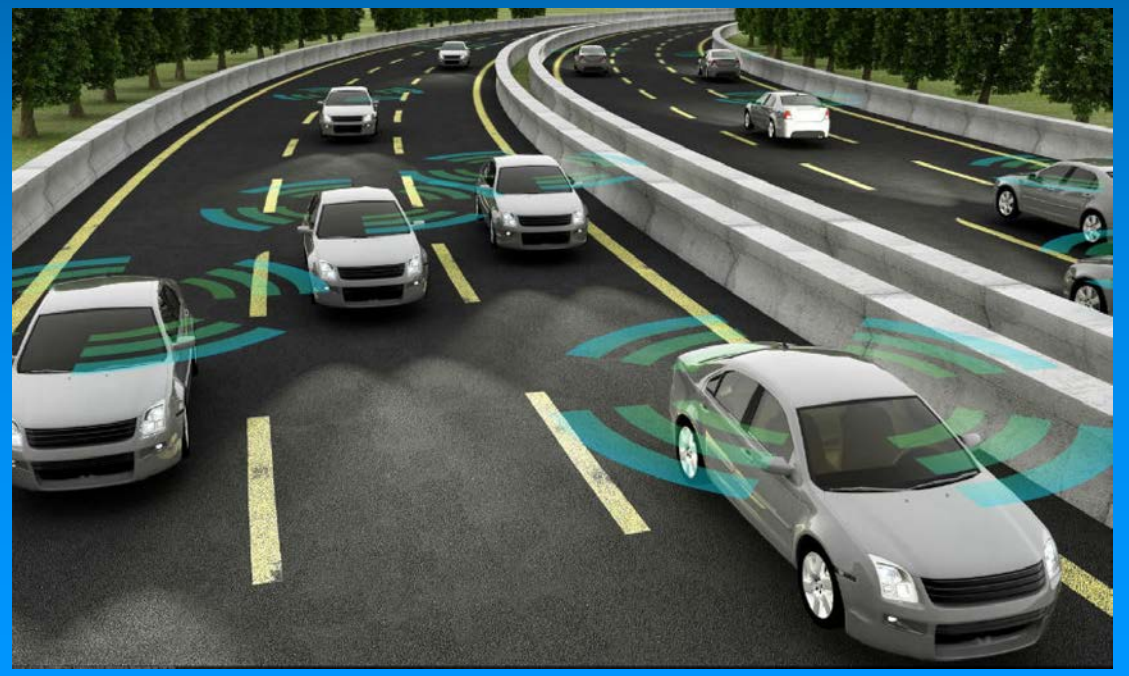
2. Connected Car

A connected car is a car that is **equipped with Internet access, and usually also with a wireless local area network**. This allows the car to share internet access with other devices both inside as well as outside the vehicle. Often, the car is also outfitted with special technologies that tap into the internet or wireless LAN and provide additional benefits to the driver.

Top 15 Priority Technologies for future ICT standards

3. Autonomous Vehicles

An autonomous vehicle is one that **can drive itself** from a starting point to a predetermined destination in **“autopilot”** mode using various in-vehicle technologies and sensors, including adaptive cruise control, active steering (steer by wire), anti-lock braking systems (brake by wire), GPS navigation technology, lasers and radar.



Top 15 Priority Technologies for future ICT standards

4. Autonomous Systems

Autonomous systems must be **capable of planning and executing complex functions as intended**, with limited human intervention, operating in uncertain and unstructured physical and/or information environments, and managing unexpected external or internal events, e.g., faults.

This distinguishes them from mere automated systems, which also are able to execute complex functions, but which mostly assume structured environments, have limited capacity to learn and adapt to unexpected events.

Top 15 Priority Technologies for future ICT standards

5. Robotics

Robotics is **an interdisciplinary branch of engineering and science that includes mechanical engineering, electrical engineering, computer science, and others.**

Robotics deals with the design, construction, operation, and use of robots, as well as computer systems for their control, sensory feedback, and information processing.

Top 15 Priority Technologies for future ICT standards

6. Digital Twin

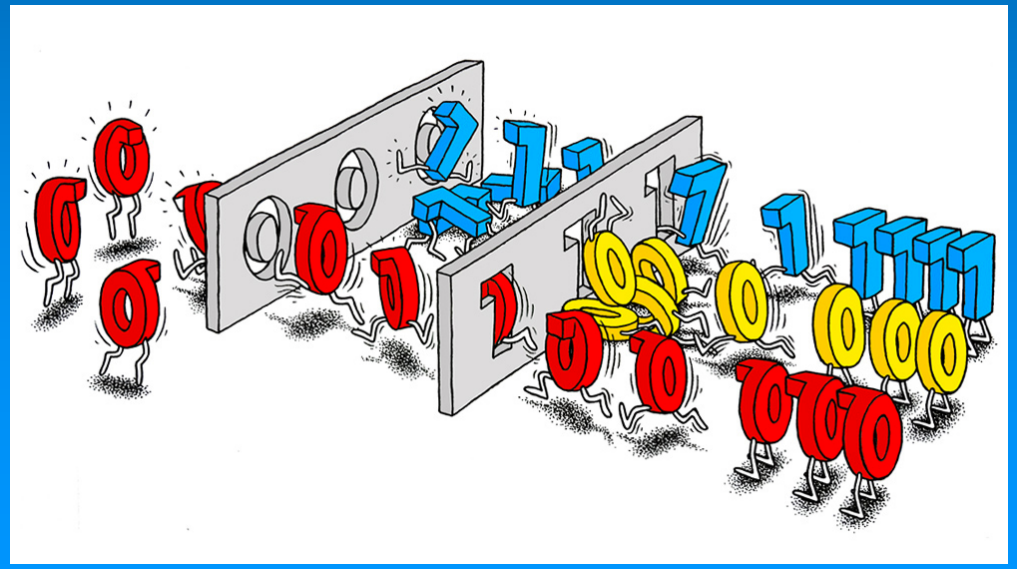
Digital twin refers to a **digital replica of physical assets, processes and systems that can be used for various purposes**. The digital representation provides both the elements and the dynamics of how an Internet of Things device operates and lives throughout its life cycle.

Digital twins offer strong potential to achieve better insights on their objects and drive better decisions.

Top 15 Priority Technologies for future ICT standards

7. Quantum Computing

Quantum computing is **computing using quantum-mechanical phenomena, such as superposition and entanglement**. A quantum computer is a device that performs quantum computing. They are different from binary digital electronic computers based on transistors. Whereas common digital computing requires that the data be encoded into binary digits (bits), each of which is always in one of two definite states (0 or 1), **quantum computation uses quantum bits(cubits), which can be in superpositions of states**.

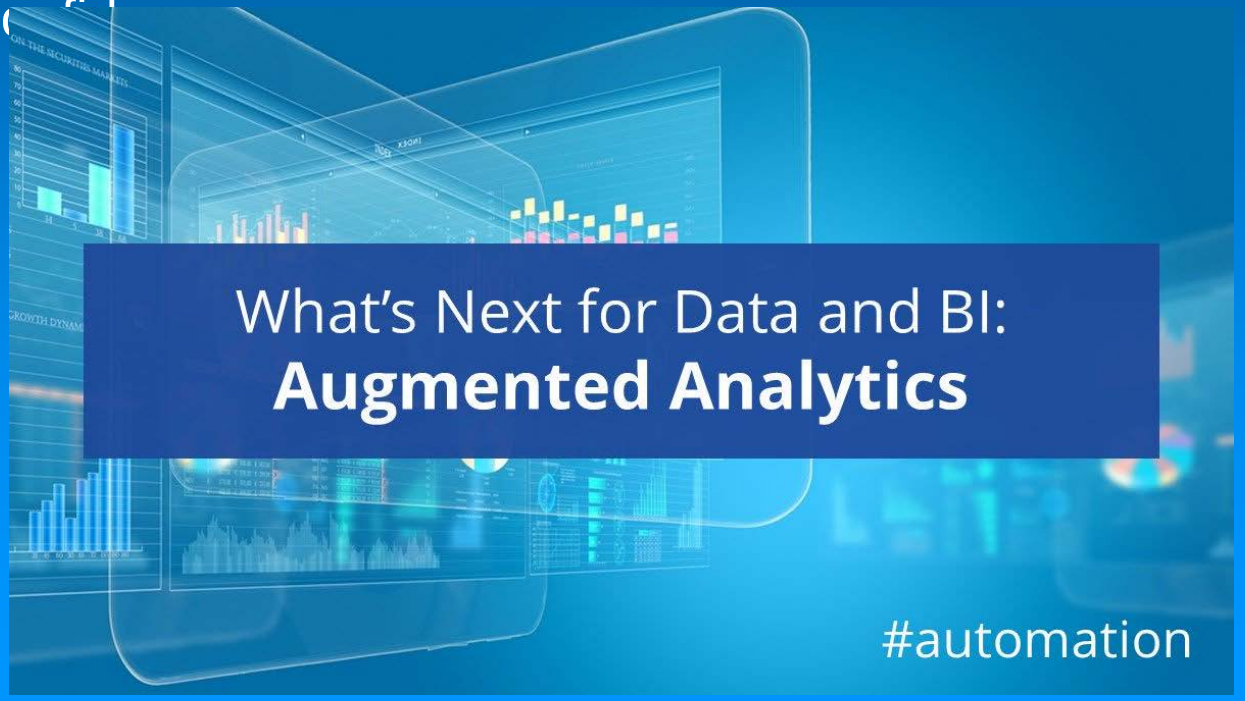


https://youtu.be/JhHMJCUmq28

Top 15 Priority Technologies for future ICT standards

8. Augmented Data Discovery

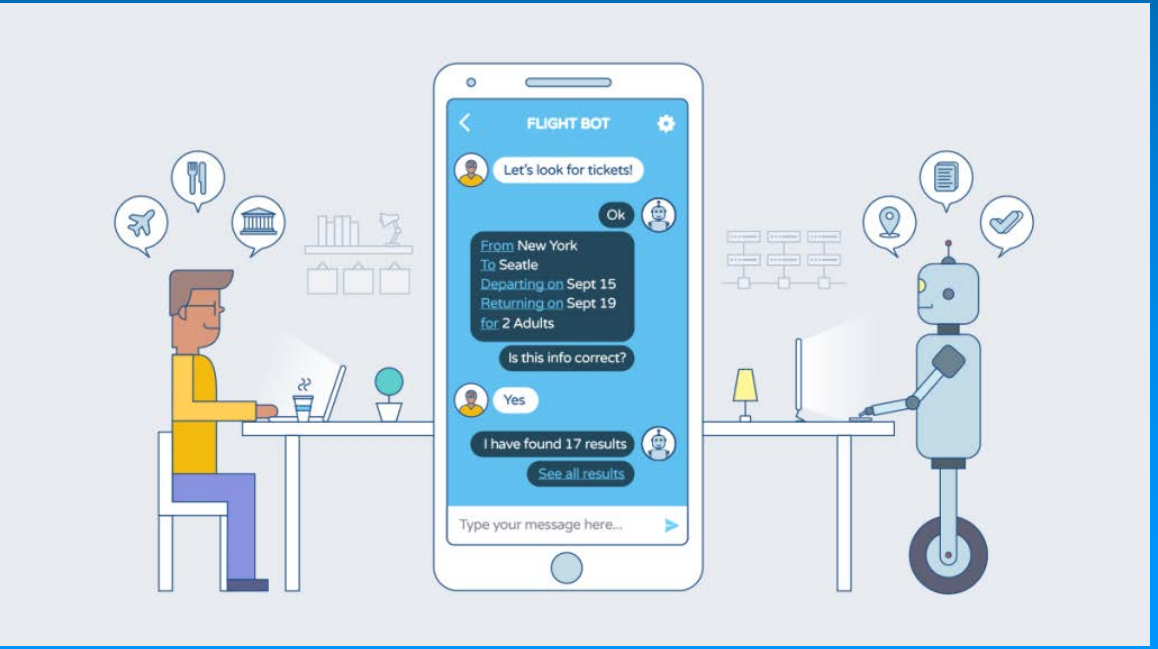
Augmented Data Discovery **allows your business to go beyond data monitoring and helps users discover the more subtle yet crucial factors that affect business success**. It **identifies hidden issues and patterns within the data** so the organization can address challenges, capitalize on competitive and market advantages and plan for the future with more co



Top 15 Priority Technologies for future ICT standards

9. Virtual Assistance

A virtual assistant is **a software agent that can perform tasks or services for an individual**. Sometimes the term **"chatbot"** is used to refer to virtual assistants generally or specifically those accessed by online chat (or in some cases online chat programs that are for entertainment and not useful purposes).



Top 15 Priority Technologies for future ICT standards

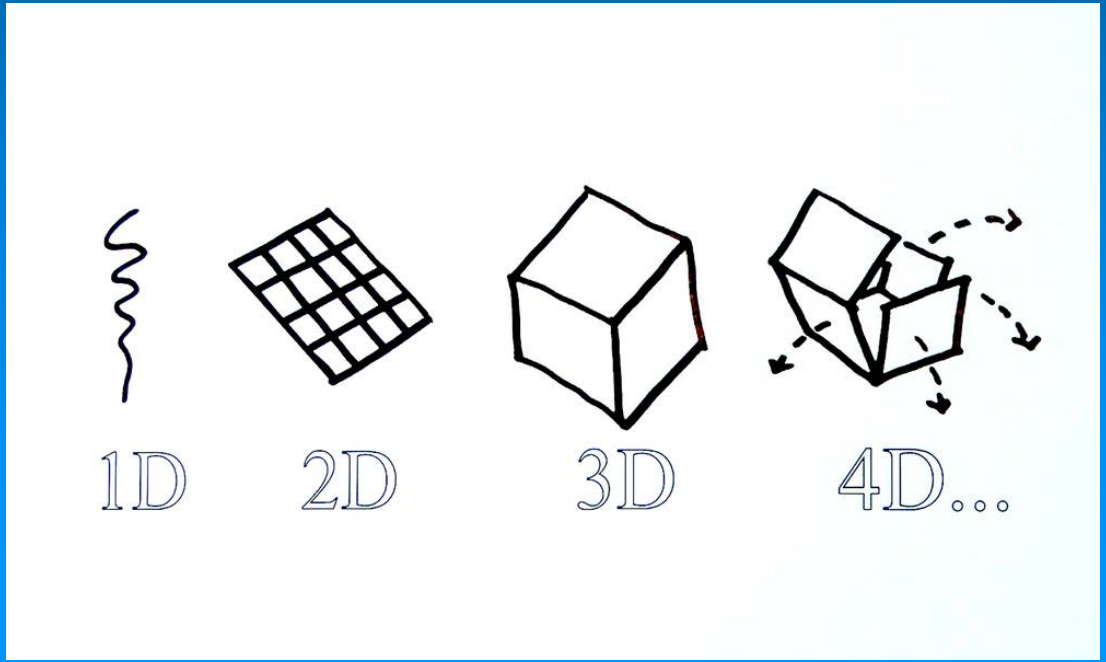
10. Brain-Computer Interface

Brain–computer interface (BCI), sometimes called a neural-control interface (NCI), mind-machine interface (MMI), direct neural interface (DNI), or brain–machine interface (BMI), is **a direct communication pathway between an enhanced or wired brain and an external device**. BCI differs from neuromodulation in that it allows for bidirectional information flow. BCIs are often directed at researching, mapping, assisting, augmenting, or repairing human cognitive or sensory-motor functions.

Top 15 Priority Technologies for future ICT standards

11. 4D Printing

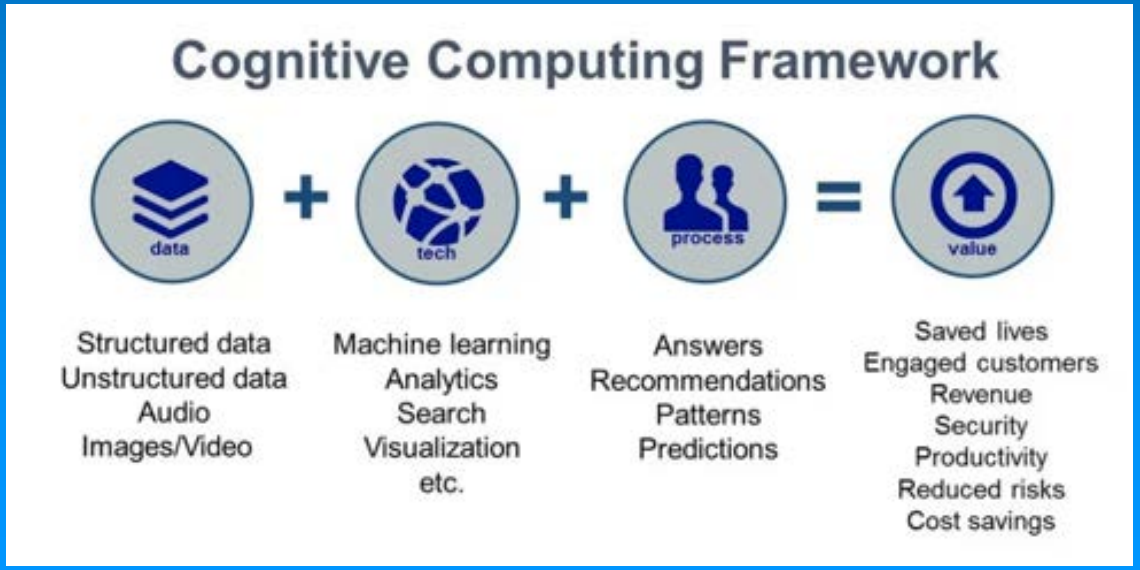
4-dimensional printing (4D printing; also known as 4D bioprinting, active origami, or shape-morphing systems,) uses the same techniques of 3D printing through computer programmed deposition of material in successive layers to create a three-dimensional object. However, **4D printing adds the dimension of transformation over time.**



Top 15 Priority Technologies for future ICT standards

12. Cognitive Computing

Cognitive computing (CC) describes **technology platforms that, broadly speaking, are based on the scientific disciplines of artificial intelligence and signal processing**. These platforms encompass machine learning, reasoning, natural language processing, speech recognition and vision (object recognition), human–computer interaction, dialog and narrative generation, among other technologies.



Top 15 Priority Technologies for future ICT standards

13. Drone

An unmanned aerial vehicle (UAV), commonly known as a drone, is **an aircraft without a human pilot aboard**. UAVs are a component of an unmanned aircraft system (UAS); which includes a UAV, a ground-based controller, and a system of communications between the two.

Top 15 Priority Technologies for future ICT standards

14. Smart Workspace

The Smart Workplace is **a concept powered by IoT technologies and solutions** and is **composed of smart workforce, intelligent environments, and smart components**.

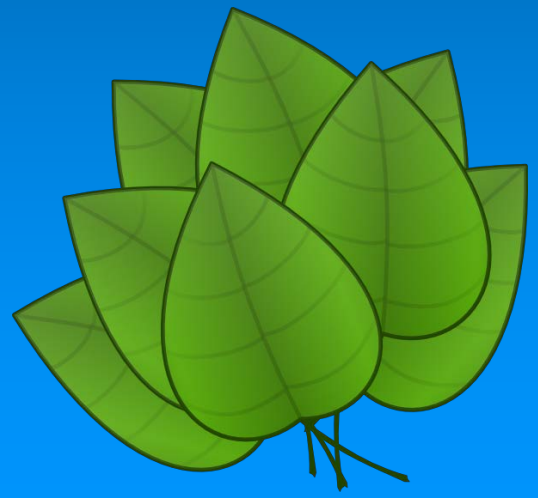
Top 15 Priority Technologies for future ICT standards

15. Neuromorphic Computing

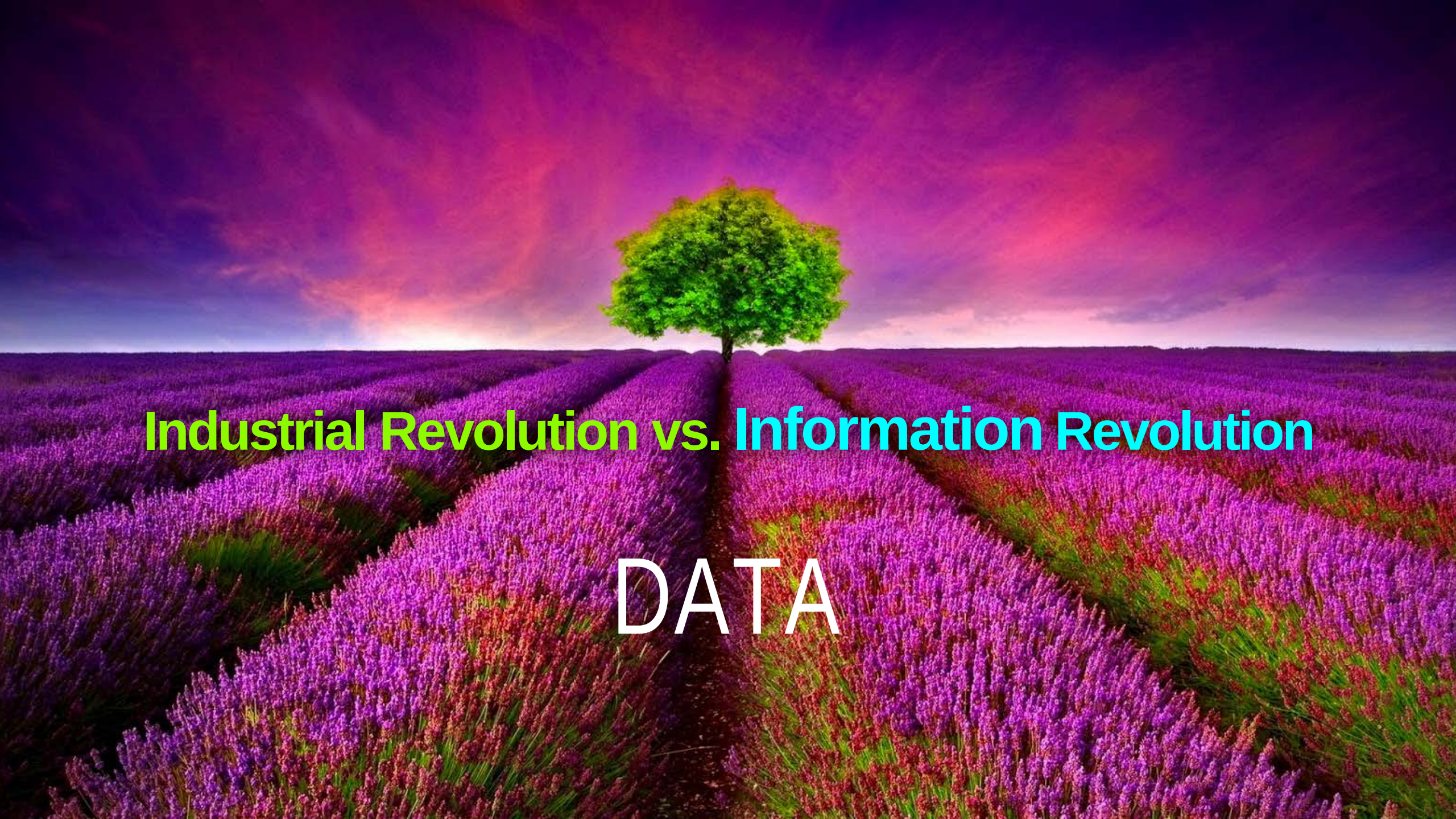
Neuromorphic engineering, also known as neuromorphic computing, The concept developed by Carver Mead, in the late 1980s, **is describing the use of very-large-scale integration (VLSI) systems containing electronic analog circuits to mimic neurobiological architectures present in the nervous system**.

“for 4th Industrial Revolution”

Some Considerations…




OPEN Environments
The era of 4th Industrial Revolution


Industrial Revolution vs. Information Revolution
DATA


Misuse of technology brings disaster

Thank You

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