

# Lecture Plan

- ◆ Lecture 01 Introduction
- ◆ Lecture 02 Overview of Information Society
- ◆ Lecture 03 Information Policy
- ◆ Lecture 04 Information Ethics

[Assignment 1: 10pt]

- ◆ Lecture 05 Information Education
- ◆ Lecture 06 Information Education

[Assignment 2: 10pt] [Essay 1: 25pt]

- ◆ Lecture 07 Information Law
- ◆ Lecture 08 Information Law

[Assignment 3: 10pt]

- ◆ Lecture 09 Information Economy
- ◆ Lecture 10 Information Economy
- ◆ Lecture 11 Information Economy

[Assignment 4: 10pt] [Essay 2: 25pt]

- ◆ Lecture 12 Information Arching
- ◆ Lecture 13 Social Media Analysis, Cloud Computing
- ◆ Lecture 14 Crowdsourcing and Human Computation

[Assignment 5: 10pt]

# Information and Society–E2

## –Information Policy–

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# **JAPAN AND ICT**

# Networked Readiness Index

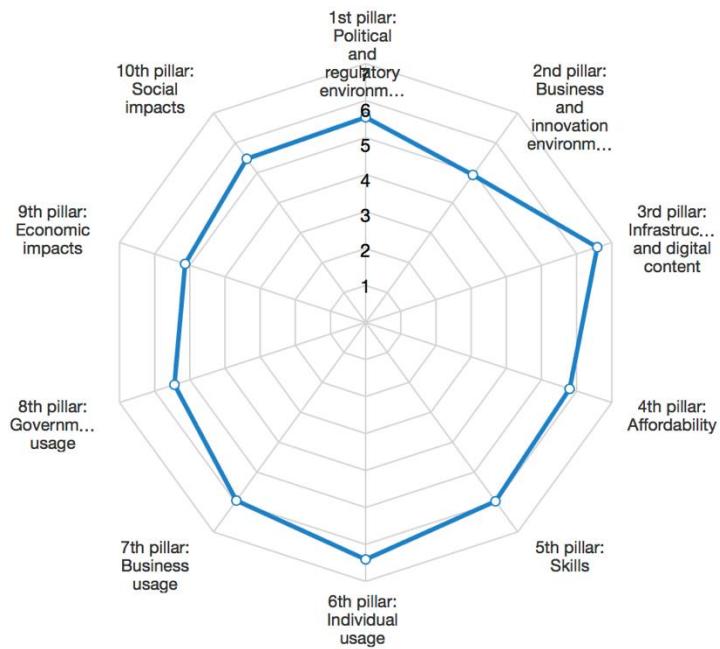
Rank	Economy	Info	Value	Distance from best
1	Singapore	(i)	6.0	
2	Finland	(i)	6.0	
3	Sweden	(i)	5.8	
4	Norway	(i)	5.8	
5	United States	(i)	5.8	
6	Netherlands	(i)	5.8	
7	Switzerland	(i)	5.8	
8	United Kingdom	(i)	5.7	
9	Luxembourg	(i)	5.7	
10	Japan	(i)	5.6	
11	Denmark	(i)	5.6	
12	Hong Kong SAR	(i)	5.6	
13	Korea, Rep.	(i)	5.6	
14	Canada	(i)	5.6	
15	Germany	(i)	5.6	
16	Iceland	(i)	5.5	
17	New Zealand	(i)	5.5	

Propensity for countries to exploit the opportunities offered by information and communications technology (ICT).

Composed of three parts: *the environment for ICT offered by a given country or community (market, political, regulatory, and infrastructure environment), the readiness of the country's key stakeholders (individuals, businesses, and governments) to use ICT, and the usage of ICT among these stakeholders*

# Networked Readiness Index

Japan 2016



Networked Readiness Index 1-7 (best)	10	5.6		
Subindex A: Environment subindex 1-7 (best)	17	5.2		
1st pillar: Political and regulatory environment 1-7 (best)	9	5.5		
2nd pillar: Business and innovation environment 1-7 (best)	33	4.9		
Subindex B: Readiness subindex 1-7 (best)	15	6.1		
3rd pillar: Infrastructure and digital content 1-7 (best)	14	6.6		
4th pillar: Affordability 1-7 (best)	49	5.8		
5th pillar: Skills 1-7 (best)	14	6.0		
Subindex C: Usage subindex 1-7 (best)	2	5.9		
6th pillar: Individual usage 1-7 (best)	11	6.4		
7th pillar: Business usage 1-7 (best)	3	5.9		
8th pillar: Government usage 1-7 (best)	7	5.4		
Subindex D: Impact subindex 1-7 (best)	14	5.3		
9th pillar: Economic impacts 1-7 (best)	15	5.1		
10th pillar: Social impacts 1-7 (best)	16	5.5		

Propensity for countries to exploit the opportunities offered by information and communications technology (ICT).

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2010 Rank	2009 Rank	Company	HQ Country	HQ Continent	Stock Returns 2008-09 * (in %)	Revenue Growth 2008-09 ** (in %)	Margin Growth 2008-09 *** (in %)
1	1	Apple	U.S.	North America	35	30	29
2	2	Google	U.S.	North America	10	31	2
3	4	Microsoft	U.S.	North America	3	10	-4
4	6	IBM	U.S.	North America	12	2	11
5	3	Toyota Motor	Japan	Asia	-20	-11	NA
6	11	Amazon.com	U.S.	North America	51	29	6
7	27	LG Electronics	South Korea	Asia	31	16	707
8	NR	BYD	China	Asia	99	42	-1
9	17	General Electric	U.S.	North America	-22	-1	-25
10	14	Sony	Japan	Asia	-19	-5	NA
11	16	Samsung Electronics	South Korea	Asia	10	17	-9
12	33	Intel	U.S.	North America	3	0	12
13	31	Ford Motor	U.S.	North America	10	-12	NA
14	8	Research In Motion	Canada	North America	17	75	-6
15	18	Volkswagen	Germany	Europe	8	0	14
16	7	Hewlett-Packard	U.S.	North America	9	8	9
17	13	Tata Group	India	Asia	Private	Private	Private
18	20	BMW	Germany	Europe	-8	0	NA
19	24	Coca-Cola	U.S.	North America	9	9	1
20	5	Nintendo	Japan	Asia	-8	22	3

Business Week --- The World's 50 Most Innovative Companies (2010)

➤ 5 Japanese companies

## The World's 50 Most Innovative Companies (2018)

➤ 3 Japanese companies

### EXHIBIT 1

## The Most Innovative Companies of 2018

1 Apple	11 Airbnb	21 Siemens	31 Intel	41 3M
2 Google	12 SpaceX	22 Unilever	32 NTT Docomo	42 SAP
3 Microsoft <sup>1</sup>	13 Netflix	23 BASF	33 Daimler <sup>3</sup>	43 DuPont
4 Amazon	14 Tencent	24 Expedia	34 AXA	44 InterContinental Hotels Group
5 Samsung <sup>2</sup>	15 Hewlett-Packard	25 Johnson & Johnson	35 Adidas	45 Disney
6 Tesla	16 Cisco Systems	26 JPMorgan Chase	36 BMW	46 Huawei
7 Facebook	17 Toyota	27 Bayer	37 Nissan	47 Procter & Gamble
8 IBM	18 General Electric	28 Dow Chemical	38 Pfizer	48 Verizon
9 Uber	19 Orange	29 AT&T	39 Time Warner	49 Philips
10 Alibaba	20 Marriott	30 Allianz	40 Renault	50 Nestlé

Source: 2017 BCG global innovation survey.

<sup>1</sup>Includes Nokia. <sup>2</sup>Includes all Samsung business groups (electronics and heavy industry). <sup>3</sup>Includes Mercedes-Benz.



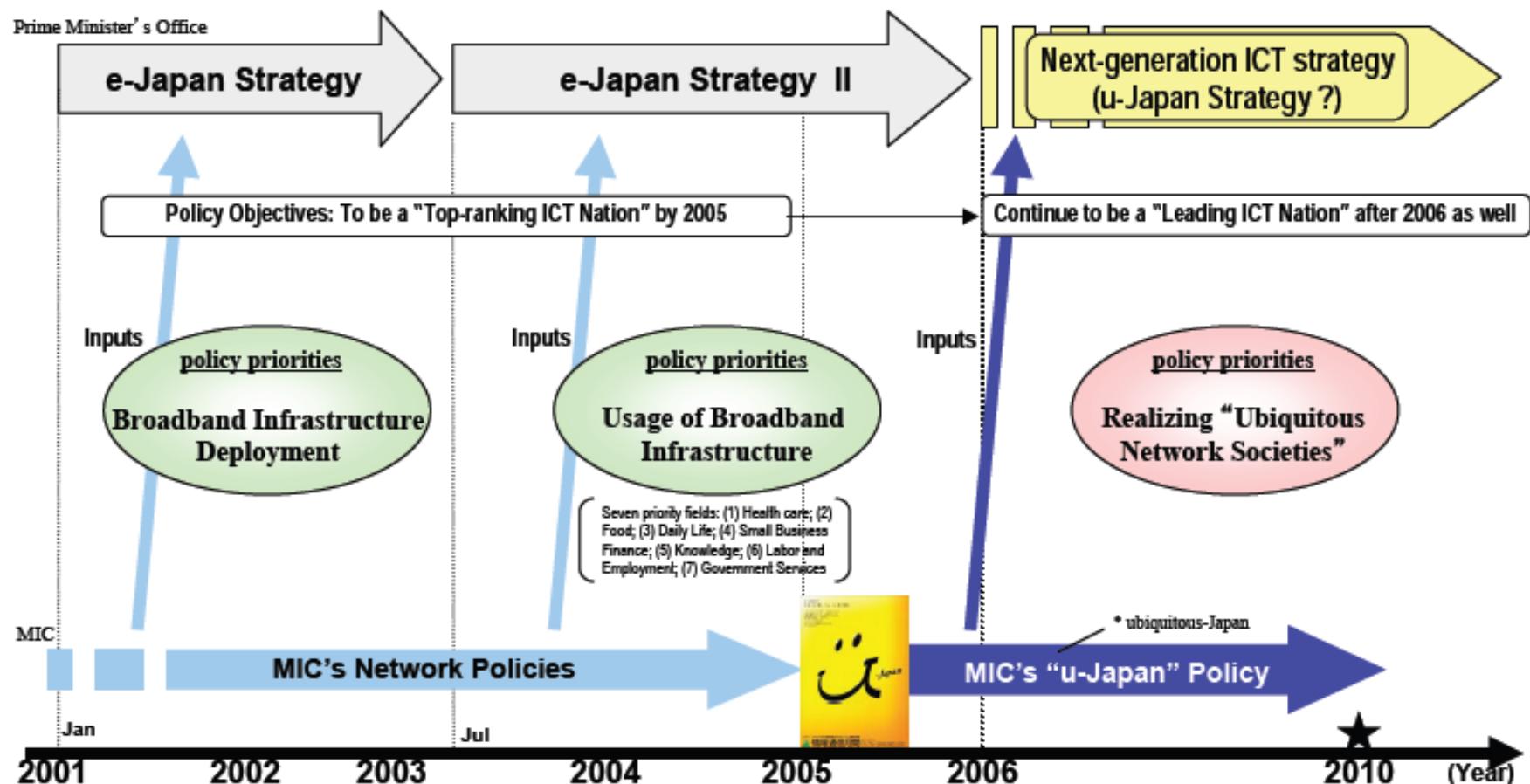
# Japan ICT Strategies (2001–2010)

# Japan ICT Strategies (2001–2010)

## Backgrounds: National ICT Strategies in Japan



The national ICT strategies in Japan are evolving from “e” (electronics) towards “u” (ubiquitous).



# History of Japan's ICT Policy (1)

- ◆ Slow start:
  - In 1999, Japanese Internet penetration rate was 13.4%
  - In 2001 only 737,000 broadband subscribers
- ◆ 2001: Establishing *Advanced Information and Telecommunications Society Promotion Headquarters*
  - E-Japan strategies with specific targets: upgrading Japan's Internet Network to meet global standards and making super-high speed access (30–100 Mbps) available cheaply to everyone
- ◆ Many infrastructure building targets were quickly achieved (35mln households with DSL in 2003) so the interest shifted to the promotion of ICT usage
  - ICT formed about 10% of GDP and ICT industry contributed 40% to the change in Japan GDP

# Number of Internet Users in Japan

Figure 3-4-1-1 Transitions in Internet user numbers and penetration rate

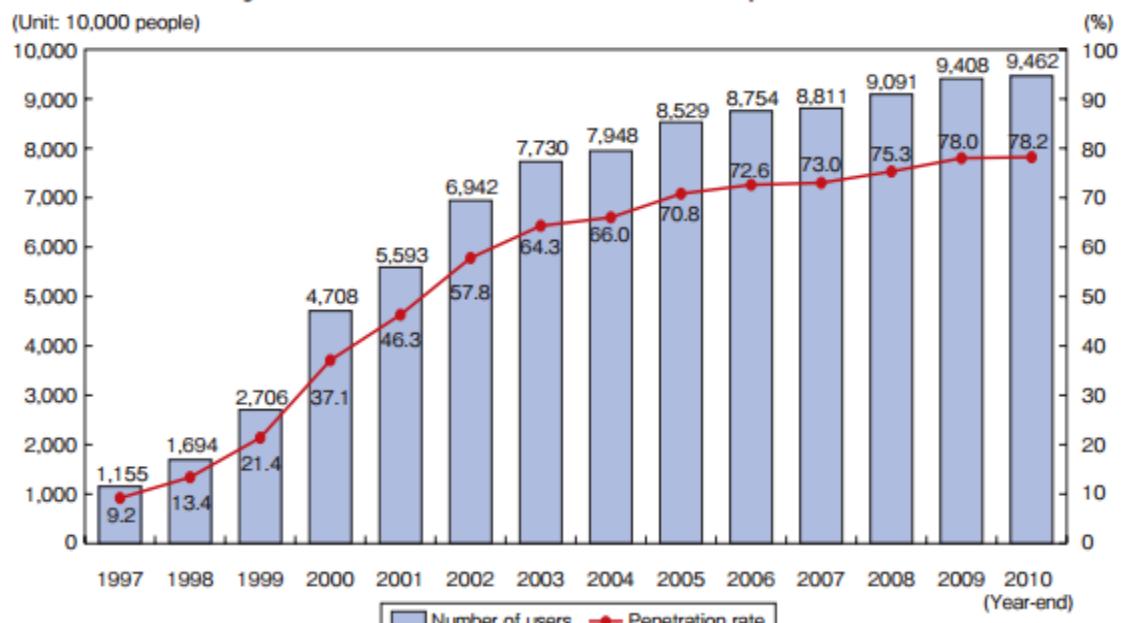
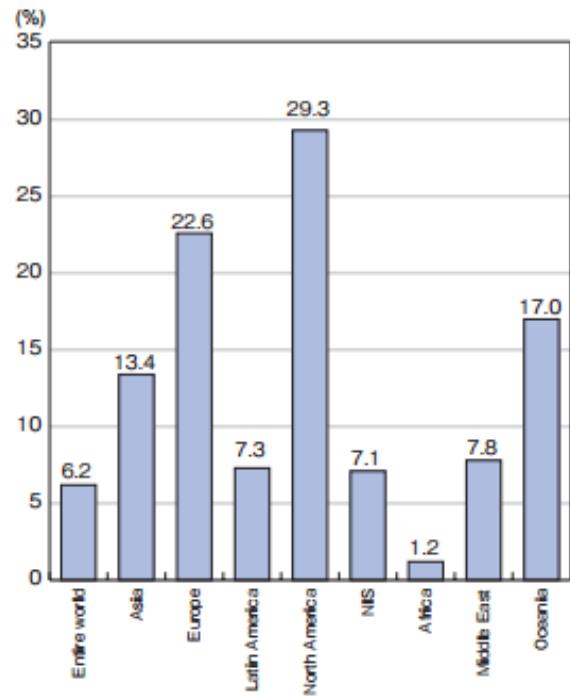


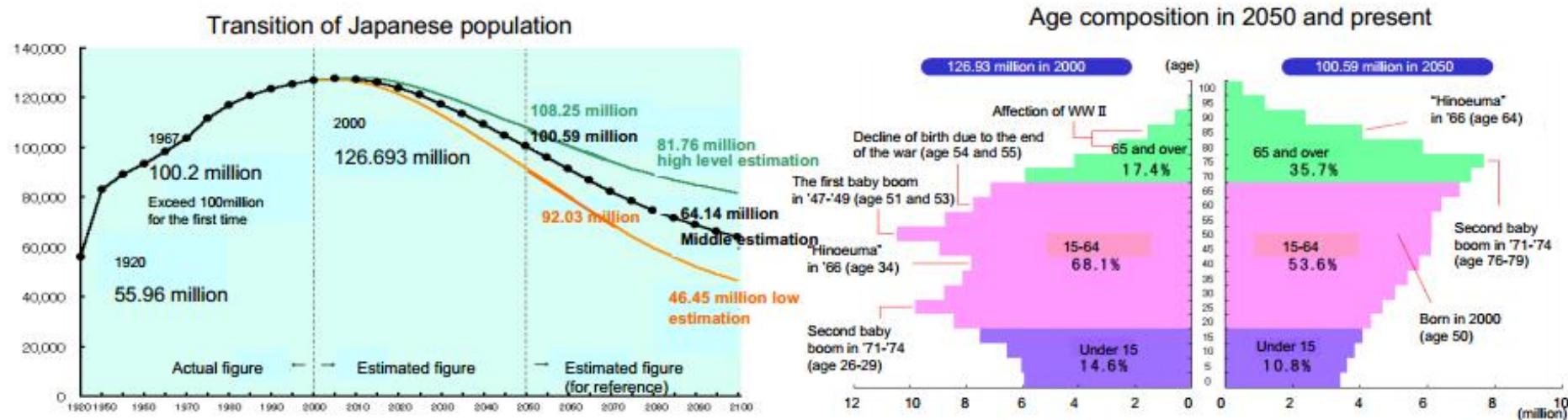
Figure 3-4-8-2 Internet penetration rates by region (based on number of subscriptions) (2009)



## History of Japan's ICT Policy (2): Towards Ubiquitous Networked Society

- ◆ In 2004 before the end of the e-Japan, Ministry of Internal Affairs and Communications drafted u-Japan policy
  - Ubiquitous networked society by 2010 that will permit **ICT access at any time, anywhere, with anything and by anyone**
    - Goal is to lead the world as the most advanced ICT nation and **disseminate ICT contribution** to the world. Principle of private-sector driven development
  - Basic elements of the policy: a) **development of ubiquitous networks** that can be used seamlessly for both wireless and fixed networks, b) **advanced usage of ICT to assist in resolving social issues** (high unemployment, stagnation, declining birthrate and aging population), c) **improvement of environment for ICT usage** in a **safe** and **secure** manner

# Declining Birthrate and Aging Population



# Potential of ICT to Resolve Social Problems in Japan

- ◆ “Our country faces a **mountain of social issues** to be resolved, including safe and secure countermeasures and revitalizing the economy amid the **declining population growth** and **aging of society**.” (*Ministry of International Affairs and Communications*)
- ◆ “As the ‘**magic bullet**’ to solve these issues, great expectations have been placed on **Information and Communications Technology or ICT**.” (*Ministry of International Affairs and Communications*)

# i-Japan Strategy 2015

- ◆ Striving to Create a **Citizen-Driven, Reassuring and Vibrant Digital Society**
  - Towards **Digital Inclusion & Innovation**
- ◆ Focusing on socio-economic problems such as:
  - Shrinking domestic market, declining productivity and incomes, decrease in social vitality, **intensifying international competition** and declining international competitiveness in conjunction with **advancing globalization of markets**, tighter constraints concerning resources and the environment including **global warming**, structural limitations on an export-oriented economy under a slowing global economy, and persistent **regional disparities**
- ◆ Challenges in digital use environment
  - “increasing need for **higher reliability of network-based information**, and **appropriate selection** and **use of tremendous volumes of information**”

# i-Japan 2015 Strategy Issues

## ◆ Major issues:

### ■ Easy-to-Use Digital Technologies

- “Environments under which digital technologies and information can be used safely and securely from **anywhere** and at **anytime**, regardless of scale, time, and location, will be developed”

### ■ Breaking Down the Barriers Hindering the Use of Digital Technologies

- “Barriers in **systems**, **practices**, **organizations**, and so on in various fields including government services, healthcare, and industry will be broken down through **comprehensive business process reengineering**”

### ■ Ensuring Security when Using Digital Technologies

- “Addressing concerns and the growing risk of **leaks of confidential information** such as personal and technology information through the use of digital technologies”

# i-Japan 2015 Strategy Issues

- ◆ Creating a New Japan by Diffusing Digital Technologies and **Information throughout the Economy and Society**
  - “Broad diffusion of digital technologies and information throughout Japan’s socio-economy ”
- ◆ Strategies:
  - (1) Three Priority Areas
    - (a) **Electronic Government and Electronic Local Government Fields**
    - (b) **Healthcare and Health Fields**
    - (c) **Education and Human Resource Fields**
  - (2) Revitalizing Industry and Local Communities and Nurturing New Industries
  - (3) Development of Digital Infrastructure

# i-Japan 2015 Strategy Issues: Electronic Government and Electronic Local Government Fields

## ◆ Reform of Government Offices

- “The administrative offices of government agencies will interconnect data to implement **paperless exchange** of information among government agencies and eliminate the need for citizens to perform **unnecessary administrative procedures and submit documents**”
- “**Government will be made much more transparent**, enabling citizens, businesses, and others to **trace the processing of administrative procedures** and to confirm the existence of information concerning themselves”
- “The use and **public announcement of valuable government information** will be promoted by digitalizing the information”

# i-Japan 2015 Strategy Issues: Healthcare and Health Fields

- ◆ “Digital technologies and information can make substantial contributions to resolving various issues resulting from the **aging society** with a **declining birth rate**, and the **shortage and maldistribution of doctors** in promoting **reforms in healthcare**, resulting in significantly improved healthcare by 2015”
- ◆ Addressing healthcare issues including **shortages of doctors in rural areas** and **management of health information**
  - “The use of **telemedicine technologies** will enable patients who have difficulty traveling to hospitals to receive high-quality healthcare from their homes”
  - “By **managing health-related personal information** obtained from healthcare institutions and providing it to healthcare workers, **medical errors can be reduced**, **continuous treatment** based on the content of prior diagnoses can be made available, and unnecessary medical tests can be avoided”

## i-Japan 2015 Strategy Issues: Education and Human Resource Fields

- ◆ The desire of children to **learn** and their academic abilities will be **enhanced** using methods whose effects are **objectively measured**
  - The **use of digital technologies in classrooms** will be encouraged
  - The ability of children to **use information** will be **enhanced**
  - **Information education, digital infrastructure, remote education**, and so on at universities and other educational institutions will be expanded and improved

# New Vision: 2013–

- ◆ Declaration to be the world's most advanced IT nation ([http://japan.kantei.go.jp/policy/it/2013/0614\\_declaration.pdf](http://japan.kantei.go.jp/policy/it/2013/0614_declaration.pdf))
  - ICT as a prime growth driver for Japan's economy
  - Success to be measured by key performance indicators
  - Attention shifting to new forms of ICT:
    - Open data, IoT, Big data, AI
  - Revision of the new vision
    - Created on June 14, 2013
    - Revised on June 24, 2014
    - Revised on June 30, 2015
    - Revised on May 20, 2016

# Post 2015 Vision

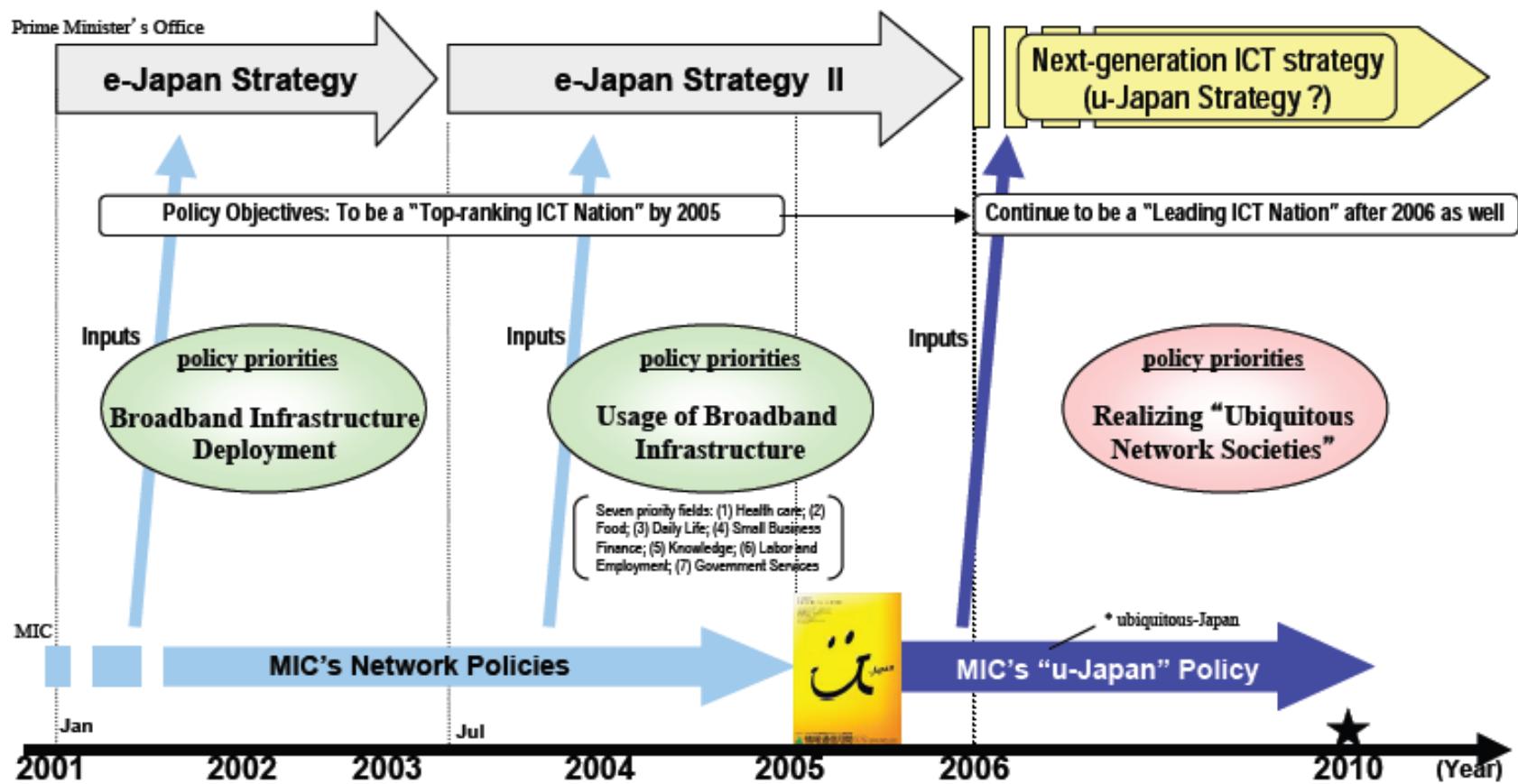
**SOCIETY 5.0 (JAPAN)**

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# Society 5.0

**Society 5.0** is the vision for the next stage in the evolution of human society, following its previous stages as a hunter-gatherer society (Society 1.0), agrarian society (Society 2.0), industrial society (Society 3.0), and information society (Society 4.0).



It was initially proposed by Keidanren (経団連, Japan Business Federation) and incorporated in **the 5th Science and Technology Basic Plan (2016–2021)** in Japan as a concept for the future society to which we should aspire. Thus Keidanren has collaborated with various stakeholders including the government, academia and so on to develop a new social model.

トップ > 会見・報道・お知らせ > 報道発表 > 令和2年度 報道発表 > 令和3年度の戦略的創造研究推進事業の戦略目標等の決定について

## 令和3年度の戦略的創造研究推進事業の戦略目標等の決定について

令和3年3月12日

令和3年度における科学技術振興機構の戦略的創造研究推進事業の戦略目標と、日本医療研究開発機構の革新的先端研究開発支援事業の研究開発目標を決定しましたので、お知らせいたします。

### 1. 概要

国立研究開発法人科学技術振興機構（JST）の「戦略的創造研究推進事業（新技術シーズ創出）」は、文部科学省が定めた戦略目標の下、組織・分野の枠を超えた時限的な研究体制（ネットワーク型研究所）を構築し、イノベーションの源泉となる基礎研究を戦略的に推進する事業です。

また、国立研究開発法人日本医療研究開発機構（AMED）の「革新的先端研究開発支援事業」は、文部科学省が定めた研究開発目標の下、革新的な医薬品や医療機器、医療技術等を創出することを目的に、組織の枠を超えた時限的な研究体制を構築し、画期的シーズの創出・育成に向けた先端的研究開発を推進するとともに、有望な成果について研究を加速・深化する事業です。

これらの事業における令和3年度の戦略目標と研究開発目標の策定にあたっては、論文動向や研究者アンケート等の分析の他、有識者ヒアリングやワークショップの開催等を通じて、科学的価値や経済・社会的インパクト等、多角的な観点から議論を行い、政策的な要請等との関連も踏まえ、次のとおり、「グリーン社会の実現」、「デジタル社会の形成」、「コロナ後の新たな社会の創造」の3本柱に対応した8件の目標を決定しました。

なお、本内容は円滑な事業の実施に向け予算成立に先立ち発表するものであり、国会審議の状況により変更等が生じる可能性があり得ます。

[令和3年度戦略目標・研究開発目標 \(PDF:860KB\)](#)

### 2. 令和3年度 戦略目標及び研究開発目標

(1) [資源循環の実現に向けた結合・分解の精密制御【JST】 \(PDF:2,086KB\)](#)

[\(English version\) Precision control of bonding and decomposition for resource recycling](#)

(2) [複雑な輸送・移動現象の統合的理解と予測・制御の高度化【JST】 \(PDF:796KB\)](#)

[\(English version\) Comprehensive understanding and advanced prediction and control of complex transport phenomena](#)

(3) [Society 5.0時代の安心・安全・信頼を支える基盤ソフトウェア技術【JST】 \(PDF:1,032KB\)](#)

[\(English version\) System software technology to support safety, security, and trust in the era of Society 5.0](#)

(4) [『バイオDX』による科学的発見の追究【JST】 \(PDF:2,697KB\)](#)

[\(English version\) Toward scientific discoveries through DX in life science research](#)

(5) [元素戦略を基軸とした未踏の多元素・複合・準安定物質探査空間の開拓【JST】 \(PDF:2,583KB\)](#)

[\(English version\) Opening up of unexplored exploration space of materials with multi-element, composite, and metastable phases based on elements strategy](#)

(6) [感染症創薬科学の新潮流【AMED】 \(PDF:1,645KB\)](#)

[\(English version\) New approaches in drug and vaccine discovery for infectious diseases](#)

# Society 4.0 V.S. Society 5.0

## Society 4.0 Information society



Individual optimization through application of ICT

Efficient use of natural resources

World bound by various constraints (temporal, spatial, etc.)

Seeking solutions to individual problems  
Making individual industries more efficient

## Society 5.0 Super-smart society



Optimizing society as a whole through integration of cyberspace and physical space

Use of new resources (data)  
World released from various constraints

**SUSTAINABLE DEVELOPMENT GOALS**  
17 GOALS TO TRANSFORM OUR WORLD

# Society 5.0 for SDG

## SUSTAINABLE DEVELOPMENT GOALS 17 GOALS TO TRANSFORM OUR WORLD

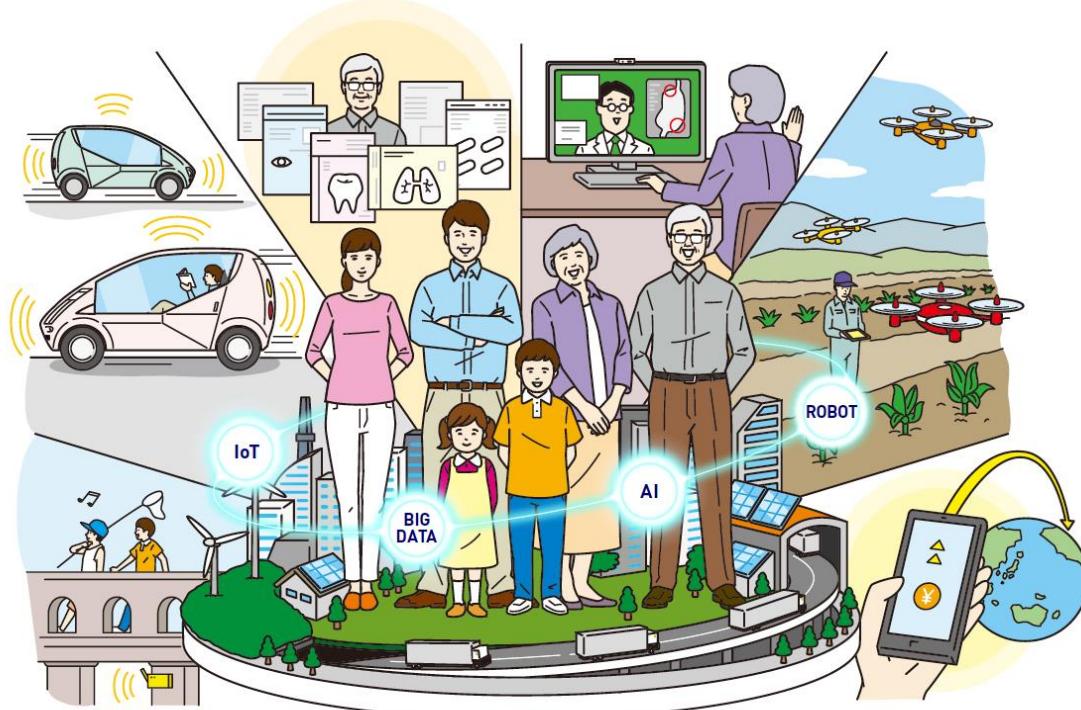


# ICT for Society 5.0

## Society 5.0



# Vision of Society 5.0



This is Society 5.0, a super-smart society. Japan will take the lead to realize this ahead of the rest of the world.

We aim at creating a society where we can resolve various social challenges by incorporating the innovations of the fourth industrial revolution (e.g. IoT, big data, artificial intelligence (AI), robot, and the sharing economy) into every industry and social life. By doing so the society of the future will be one in which new values and services are created continuously, making people's lives more comfortable and sustainable.

# Japan's advantages that make Society 5.0 possible

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# Japan's advantages that make Society 5.0 possible

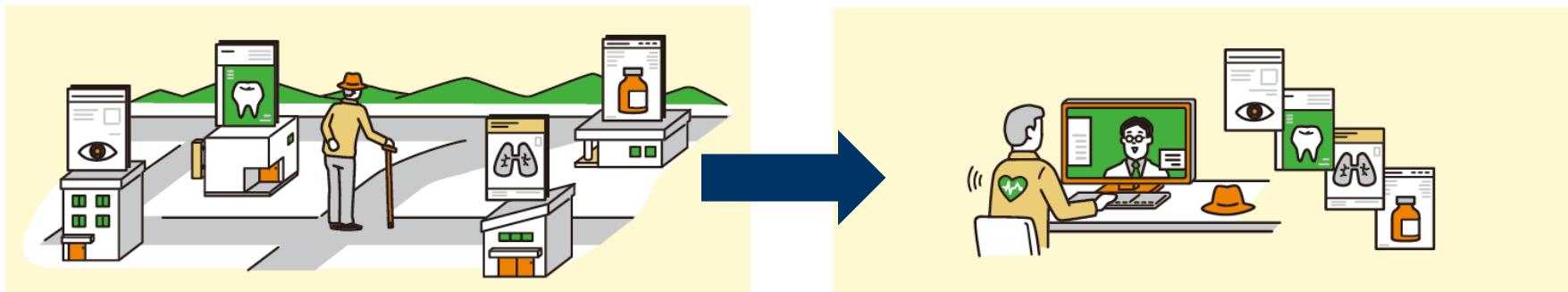
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  - Japan's advanced technology cultivated from “monozukuri” (Japan's **excellence in the manufacturing of things**) and years of basic research, will work as advantages toward creating products using information technologies like Big Data and AI, which can then be released into our society.

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- By taking advantage of these unique factors, Japan will overcome social challenges such as a **decrease in the productive-age population, aging of local communities, energy and environmental issues** ahead of other nations.

# Society 5.0 will change the world – Healthcare

- ◆ **Issues:** Japan is facing **an aging society** ahead of other countries. The country is suffering from **increasing medical, social security expenses and demands** for caring for the elderly.
- ◆ **Solutions**
  - **Connect and share information** between medical data users including medical checkup records, as well as treatment and nursing care records.
  - Put **remote** medical care services into practice.
  - Use **AI and robots** at nursing-care facilities to support people's independence.



# Society 5.0 will change the world – Healthcare

## Society 4.0



Digitalization of the individual



Advances in biotechnology

## Society 5.0



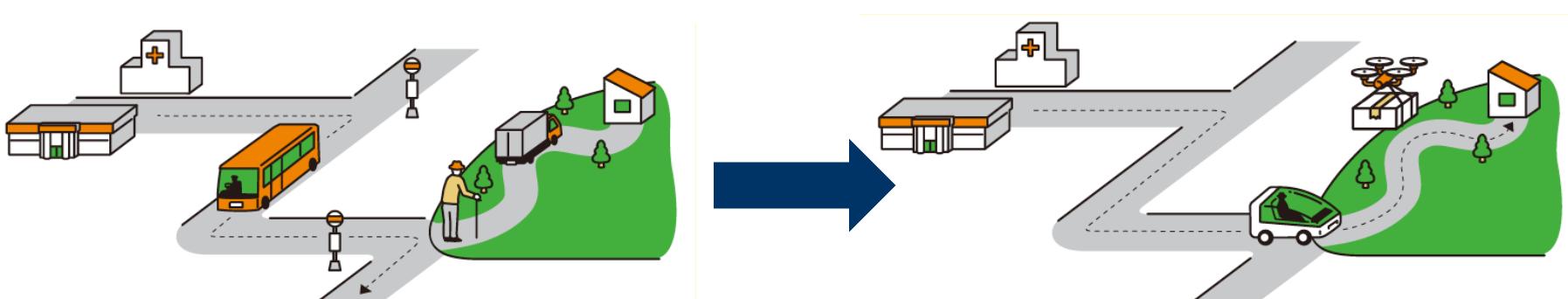
Shift to personalized care



Healthcare with broadened scope/Longer periods of good health

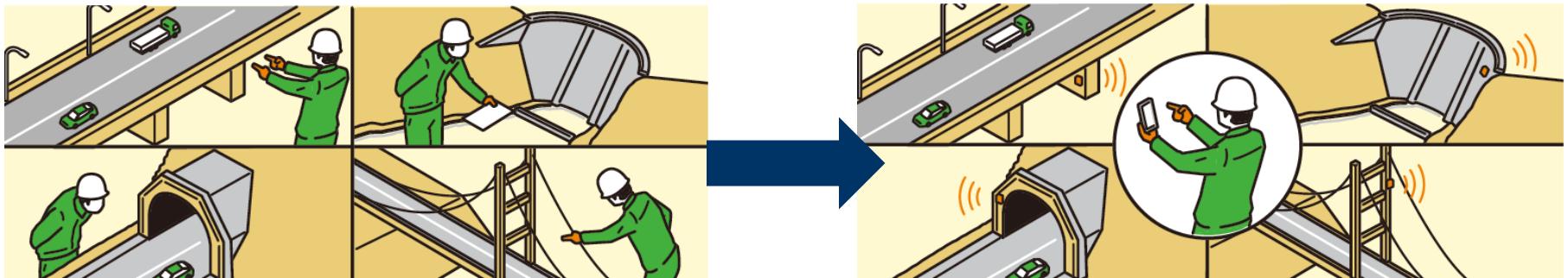
# Society 5.0 will change the world – Mobility

- ◆ **Issues:** Population decline results in underpopulated rural areas which **lack access to public transportation**. The fast growing e-commerce segment has seen a **shortage of drivers**.
- ◆ **Solutions**
  - Promote use of **autonomous driving** taxis and buses for public transportation to make rural transportation more readily available.
  - Improve **distribution and logistics** efficiency by introducing innovations such as a **single driver cargo truck** in a convoy using **unmanned-following** vehicle system and by using drones.



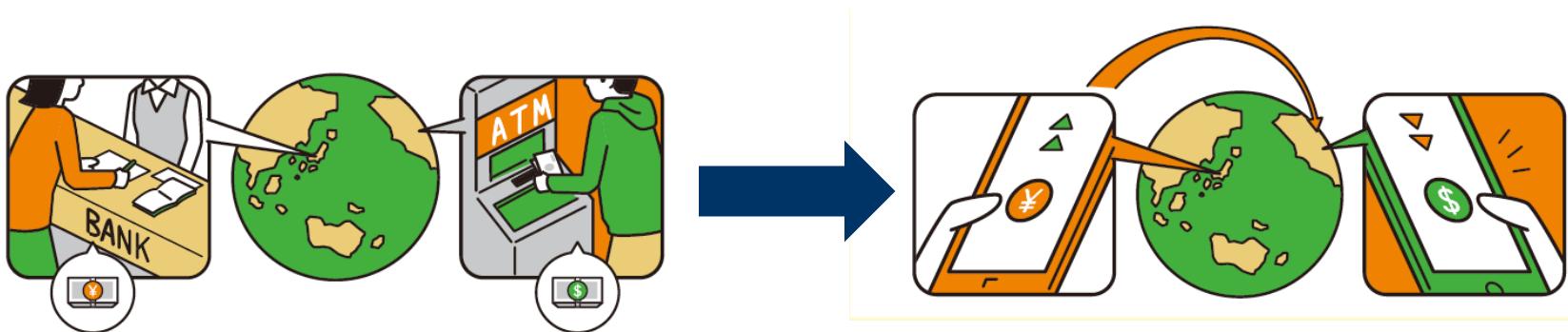
# Society 5.0 will change the world – Infrastructure

- ◆ **Issues:** Deterioration of public infrastructure developed during Japan's rapid economic growth period has created a **shortage of skilled labor** and **an increase in the financial burden for inspection and maintenance**.
- ◆ **Solutions**
  - **Sensors, IoT, AI** and **robots** will be used to inspect and maintain roads, bridges, tunnels and dams.



# Society 5.0 will change the world – Fintech

- ◆ **Issues:** A high proportion of Japanese money transactions are still conducted in cash and bank procedures are cumbersome. **Usage of IT in companies** is limited and installation of **cashless payment and convenient financial services** is slow.
- ◆ **Solutions**
  - Use **blockchain** technology for money transfer.
  - Introduce open application programming interfaces (**API**) to FinTech firms and banks.
  - Promote **cashless payment**.

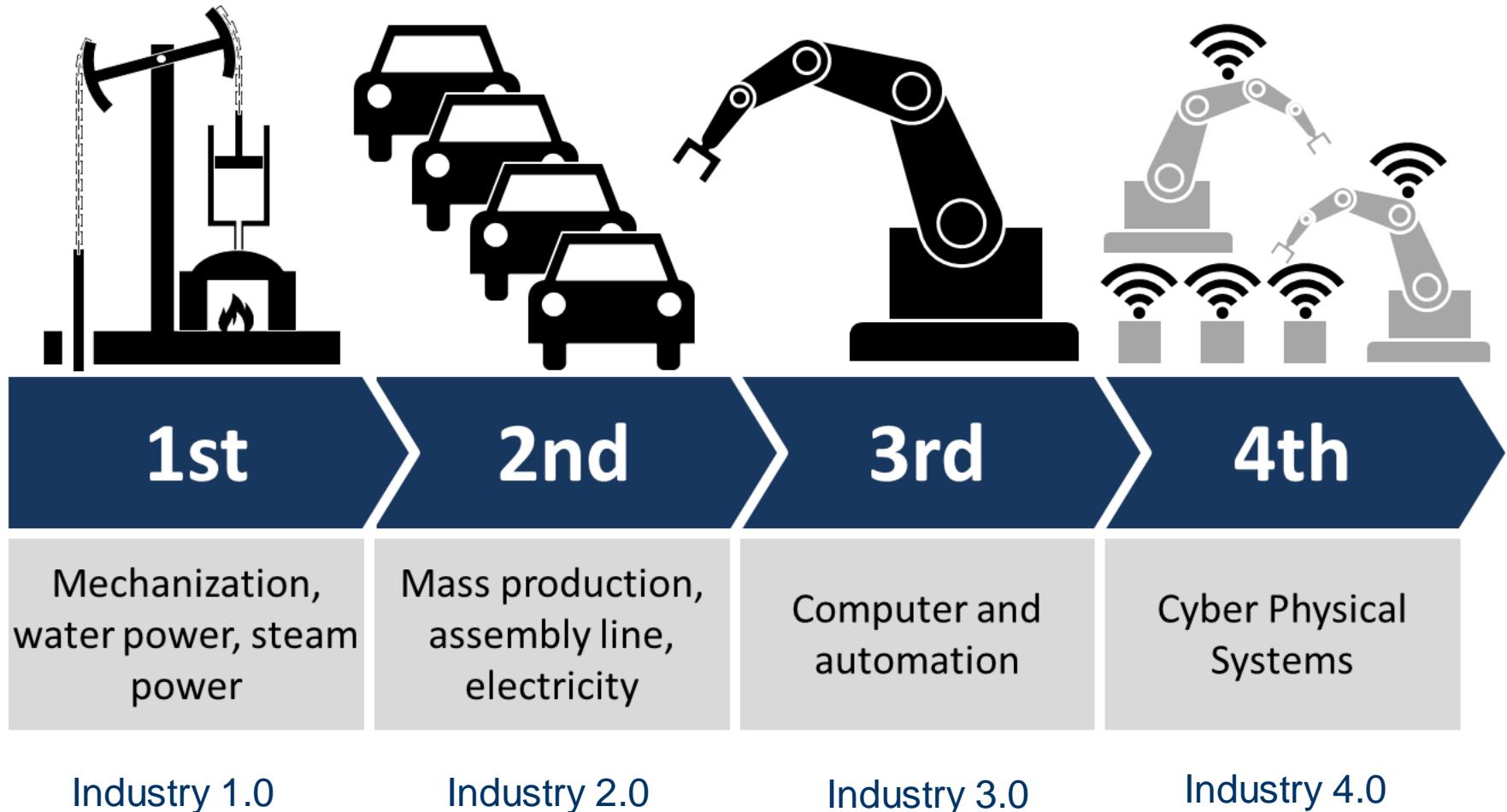




# Society 5.0 and Industry

- ◆ German experience
- ◆ Industry 4.0

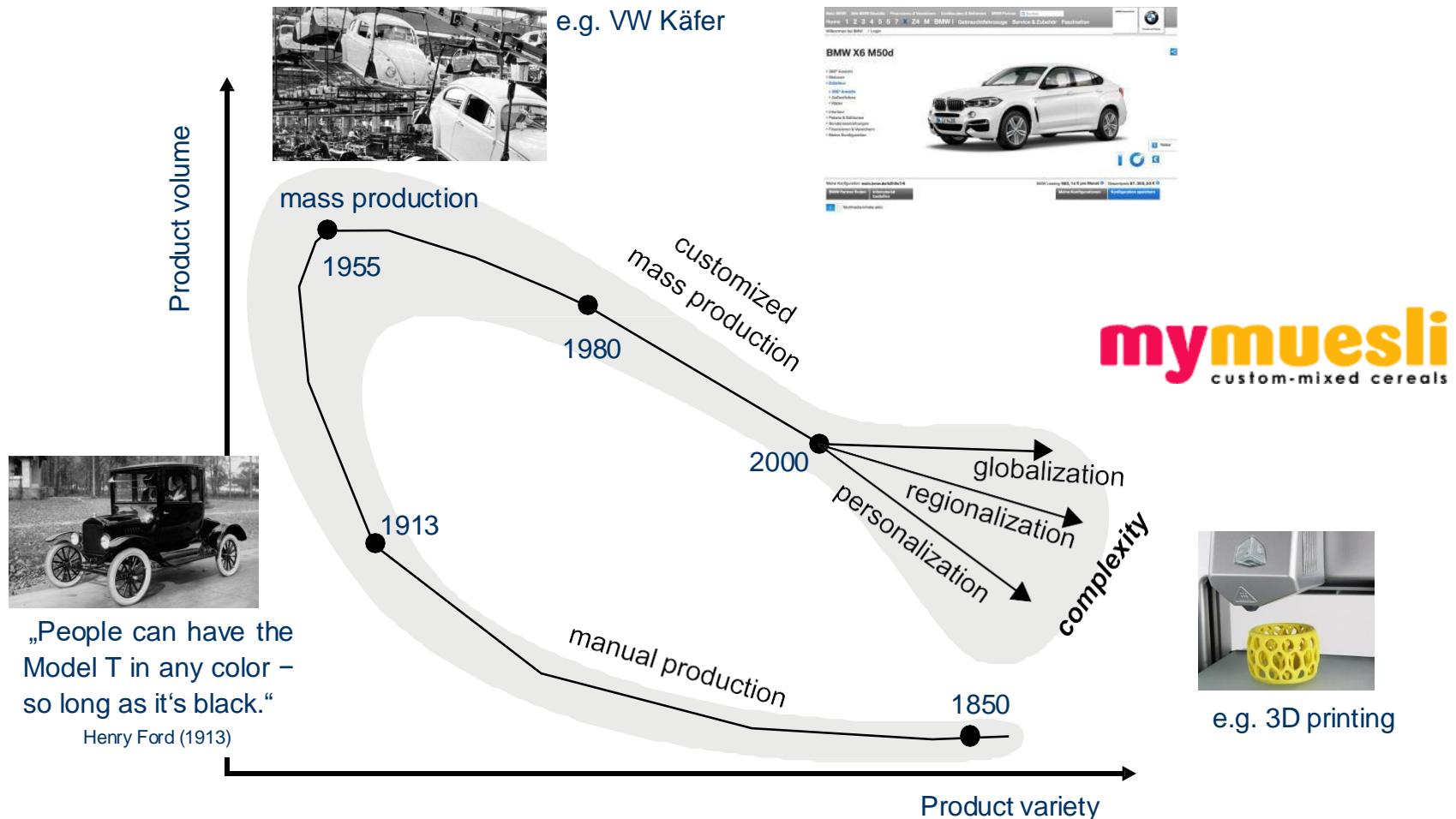
# Industrial Evolution



# Industry 4.0

- ◆ Industry 4.0 is a name given to the current trend of automation and data exchange in manufacturing technologies.
- ◆ It includes cyber–physical systems, the Internet of things, cloud computing and cognitive computing.
- ◆ The term "Industry 4.0", shortened to I4.0 or simply I4, originates from a project in the high–tech strategy of the German government, which promotes the computerization of manufacturing.

# From Manual Production via Mass Production to Mass Customization



Based on: The Global Manufacturing Revolution; sources: Ford, beetlewORLD.net, bmw.de, dw.de, DFKI

# Digital Production

## Internet of Services

Using Internet portals to configure and order a personalized product



### Smart Shop:

Innovative Retail Software

A screenshot of the mymuesli website. The top navigation bar includes links for MUESLI, MIXER, BLOG, FRAGEN, and ÜBER UNS. On the left, there's a sidebar with categories like Müsli, Reis, Porridge, and Extras. The main content area shows a list of cereal types under 'Früchte' (Fruit), including Gojibeeren, Heidelbeeren, Himbeeren, Mango, and Papaya, each with a small image and a brief description. To the right, there's a large image of a cereal canister with various toppings listed on it, such as Cranberries, Papaya, Dinkel grützt, Getreideflocken, Honey, Sesam, Volksom-Cereales, Bircher Oatmeal, and Haferflocken. Below the canister, there's a price of 575g für 6,55€ and a 'fertig gemischt?' (mixed ready?) button.

### Make to Order

Tailored production:  
566 billion  
variants of custom-  
mixed cereals  
from:

**mymuesli**  
custom-mixed cereals

### Smart Factory:

Innovative Factory Software



## Internet of Things

Active Product Memories

Service-based manufacturing control based on CPSS



# Mass Customization of Perfumes



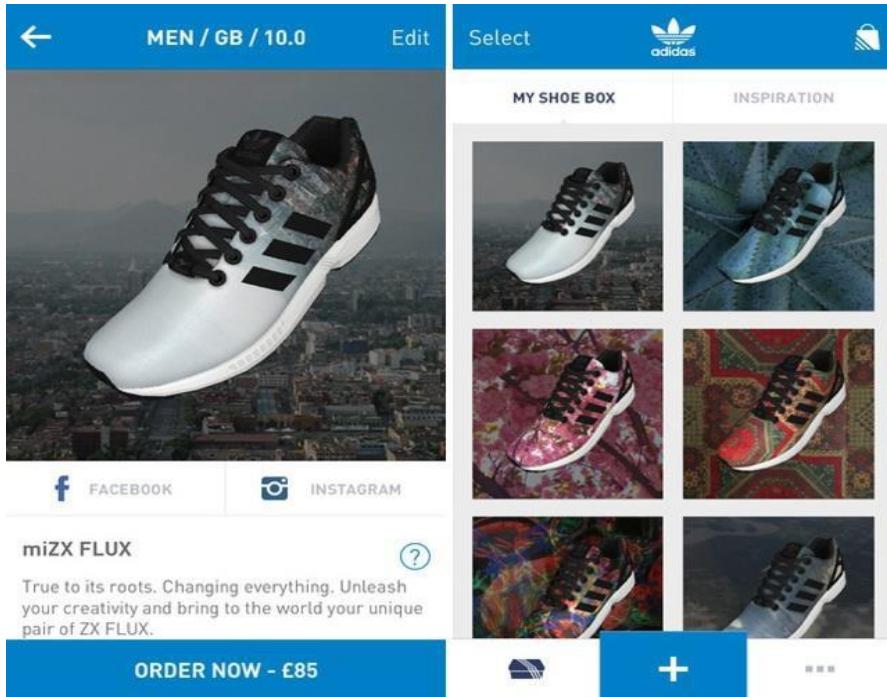
Customer can create her own perfume from millions of possibilities via a web portal

Smart Factory can produce 36 000 Unique Perfume Packages per day

24 hours after the order via the Internet has been completed the individualized product is ready for shipment.

Since the customer of an individualized product, that she has designed by herself, does not accept long delivery times, the product should be produced close to the customer.

# The Adidas Speedfactory



- The customers can design their own short shoes using an App.
- Since the customer wants to receive his personalized product on the next day or faster, long logistic chains from low-wage countries are no longer acceptable in the era of mass customization.
- Thus, adidas decided to open various "speedfactories" for personalized shoes in Germany close to the customer, using Cyber-physical production systems.

# Key Industry 4.0 Technologies

- ◆ Big Data
- ◆ Internet of Services
- ◆ Internet of Things (IoT)
- ◆ Smart Factory
  - The concept of smart factory is the seamless connection of individual production steps, from planning stages to actuators in the field.
- ◆ Cyber Physical Systems
  - Cyber physical systems are **integrations of computation, networking and physical processes**. Computers and networks monitor and control physical processes with feedback loops; the physical system reacts, the system uses software to interpret action and tracks results.

# Design Principles for Industry 4.0

- ◆ **Interoperability**: the ability of **cyber–physical systems** (i.e. work piece carriers, assembly stations and products), humans and Smart Factories to connect and communicate with each other via the **Internet of Things** and the **Internet of Services**
- ◆ **Virtualization**: a virtual copy of the Smart Factory which is created by linking sensor data (from monitoring physical processes) with virtual plant models and simulation models
- ◆ **Decentralization**: the ability of **cyber–physical systems** within Smart Factories to make decisions on their own
- ◆ **Real–Time Capability**: the capability to collect and analyze data and provide the insights immediately
- ◆ **Service Orientation**: offering of services (of **cyber–physical systems**, humans and Smart Factories) via the **Internet of Services**
- ◆ **Modularity**: flexible adaptation of Smart Factories for changing requirements of individual modules



# Questions ?

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