

# Roles of the Fourth Industrial Revolution for Inclusive Growth during the Pandemic

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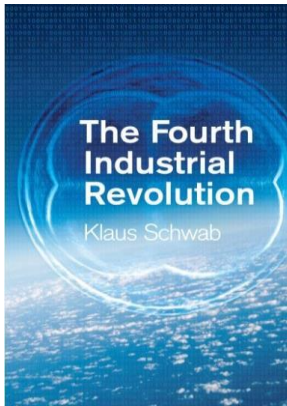
**International Conference on Emerging Technologies  
to Combat the COVID-19 Pandemic**



4IR as Emerging Technologies  
COVID-19 Impacts  
4IR for Inclusive Growth  
Epilogue

# KAIST KPC4IR

Davos Forum  
(Jan 2016)



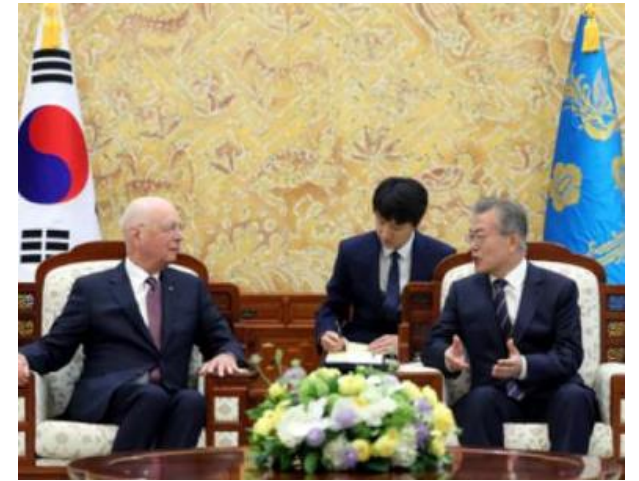
WEF Center for 4IR in San Francisco (Mar 2017)



Korea Presidential Committee on 4IR (Oct 2017)



President Moon and Dr. Schwab Agreeing on Korea-WEF Collaboration (Apr 2018)



AlphaGo Shock  
(Mar 2016)



KAIST 4IR Intelligence Center (FIRIC) (Jul 2017)



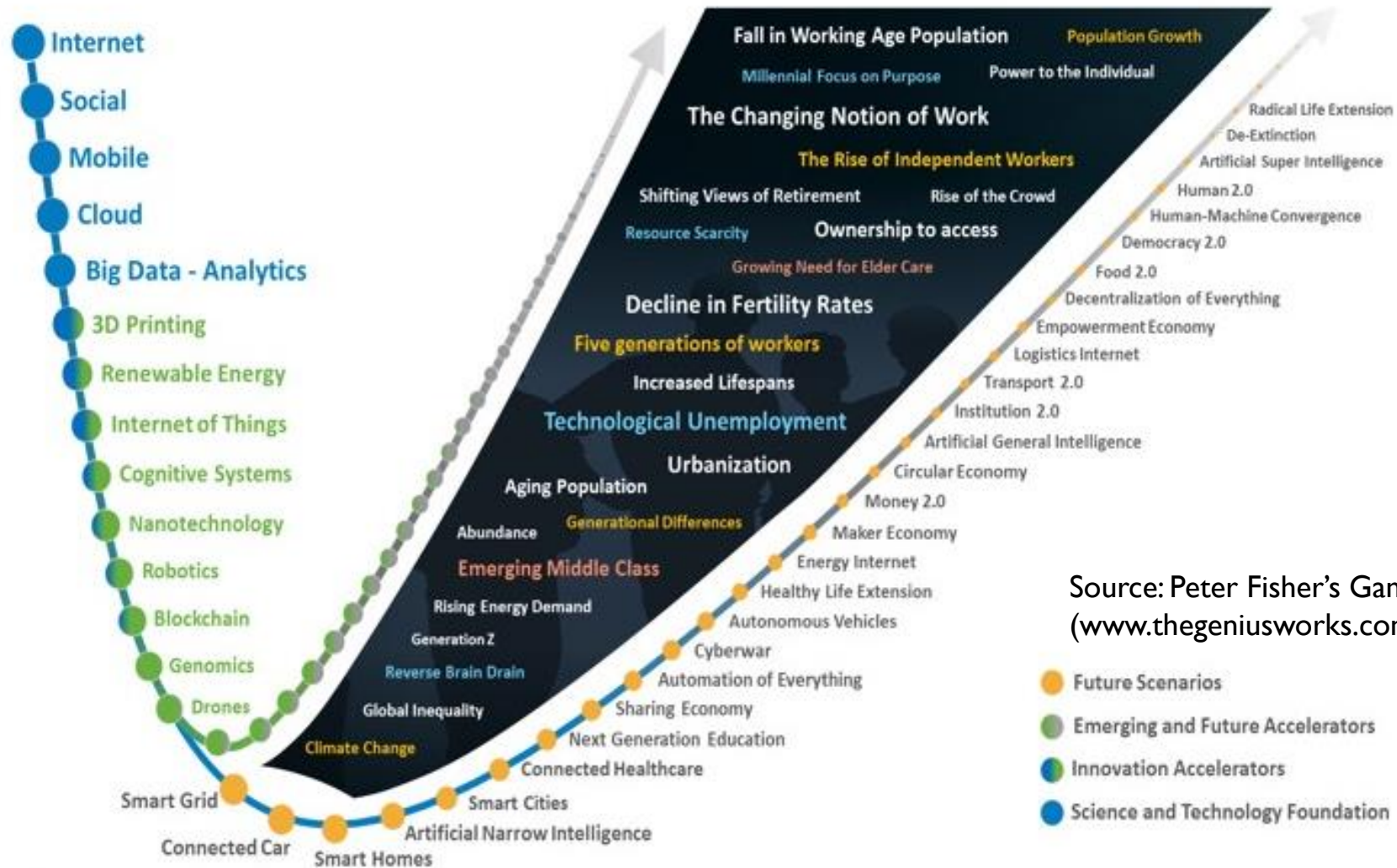
WEF-KAIST Roundtable on Future of Jobs and Inclusive Growth (Oct 2017)



WEF-MSIT-KAIST Collaboration Opening Korea Policy Center for 4IR (Dec 2019)



# (Perpetually) Emerging Technologies



# (Perpetually) Emerging Technologies

- Emerging technologies identified by WEF (2019 vs. 2020)



Bioplastics for a Circular Economy, Social Robots, Tiny Lenses for Miniature Devices, Disordered Proteins as Drug Targets, Smarter Fertilizers, Collaborative Telepresence, Advanced Food Tracking & Packaging, Safer Nuclear Reactors, DNA Storage, Utility-Scale Renewable Energy



Microneedles, Sun-powered Chemistry, Virtual Patients, Spatial Computing Digital Medicine, Electric Aviation, Low-carbon Cement, Quantum Sensing, Green Hydrogen, Whole-genome Sequencing

Source: World Economic Forum

# 4IR Integrating Physical/Digital/Biological Spheres

- Fusion of the digital, biological, and physical worlds,
- Growing utilization of emerging technologies (e.g., artificial intelligence, cloud computing, big data, IoT, robotics, autonomous vehicles, AR/VR, 3D printing, advanced wireless technologies, precision medicine, etc.)



**Phygital** experience

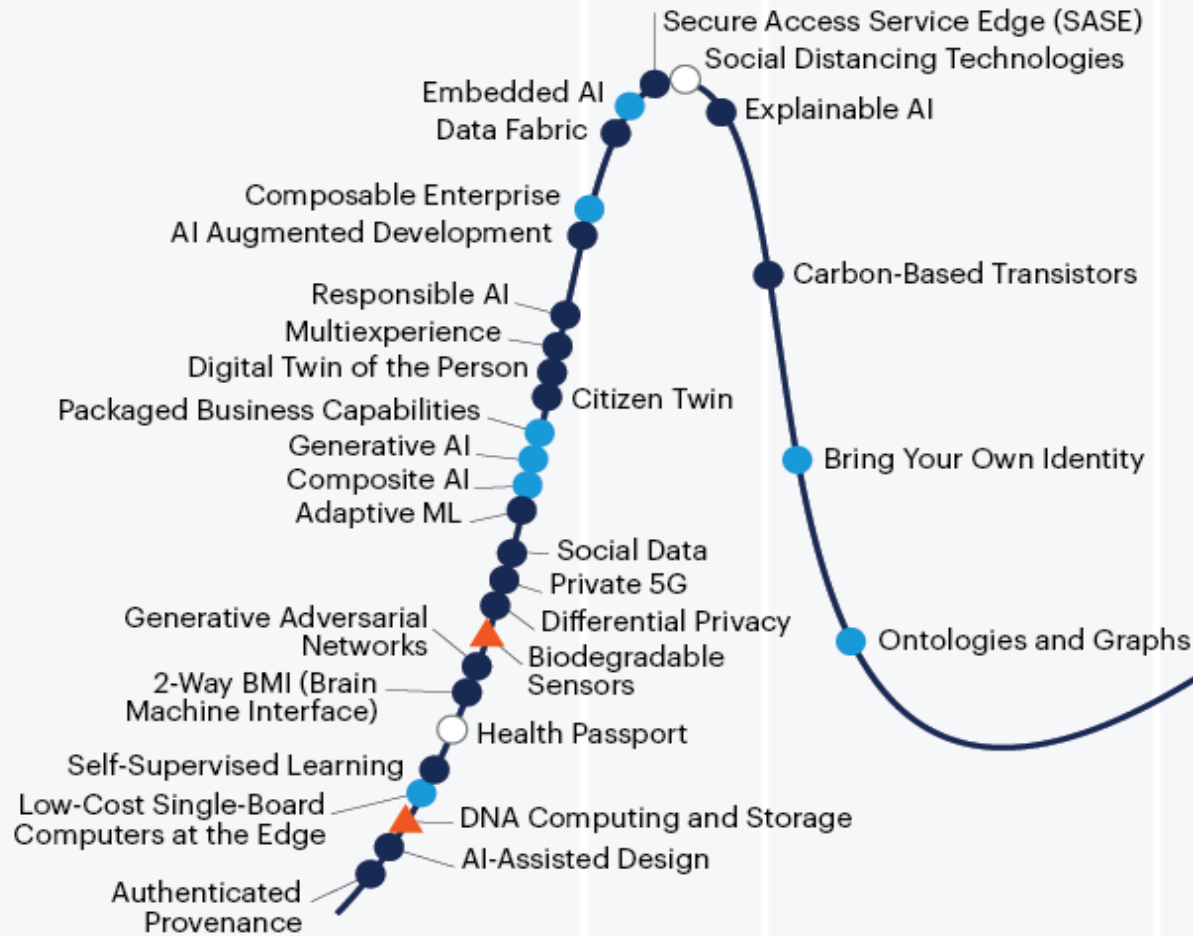
Physical and  
virtual  
spaces/objects  
integrated  
seamlessly



○ less than 2 years   ● 2 to 5 years   ● 5 to 10 years   ▲ more than 10 years   ⊗ obsolete before plateau

# Hype Cycle for Emerging Technologies, 2020

Expectations



Innovation Trigger

Peak of Inflated Expectations

Trough of Disillusionment

Slope of Enlightenment

Plateau of Productivity

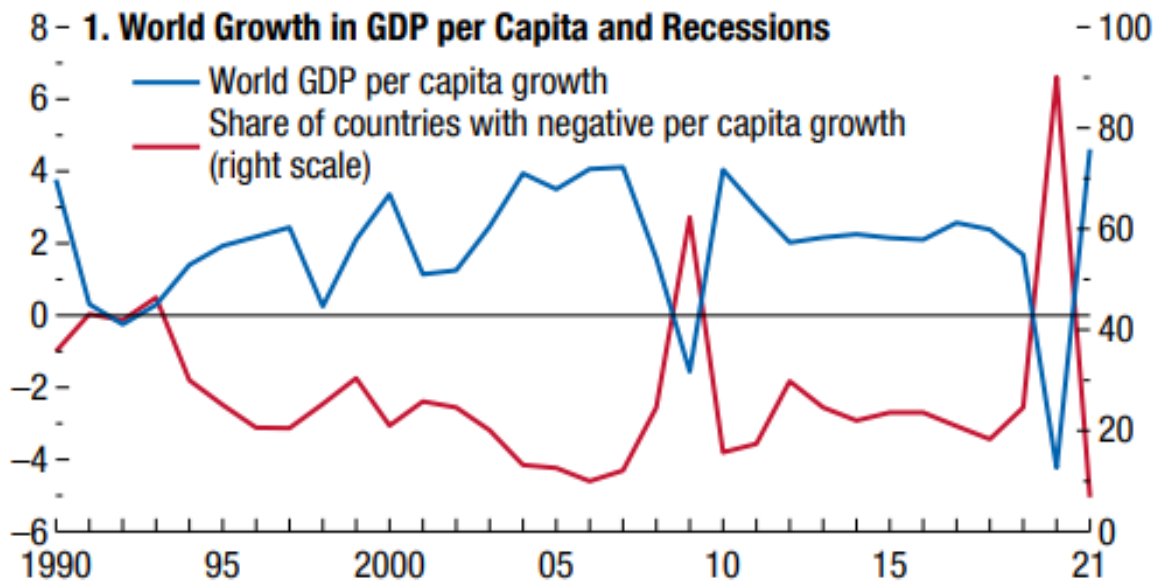


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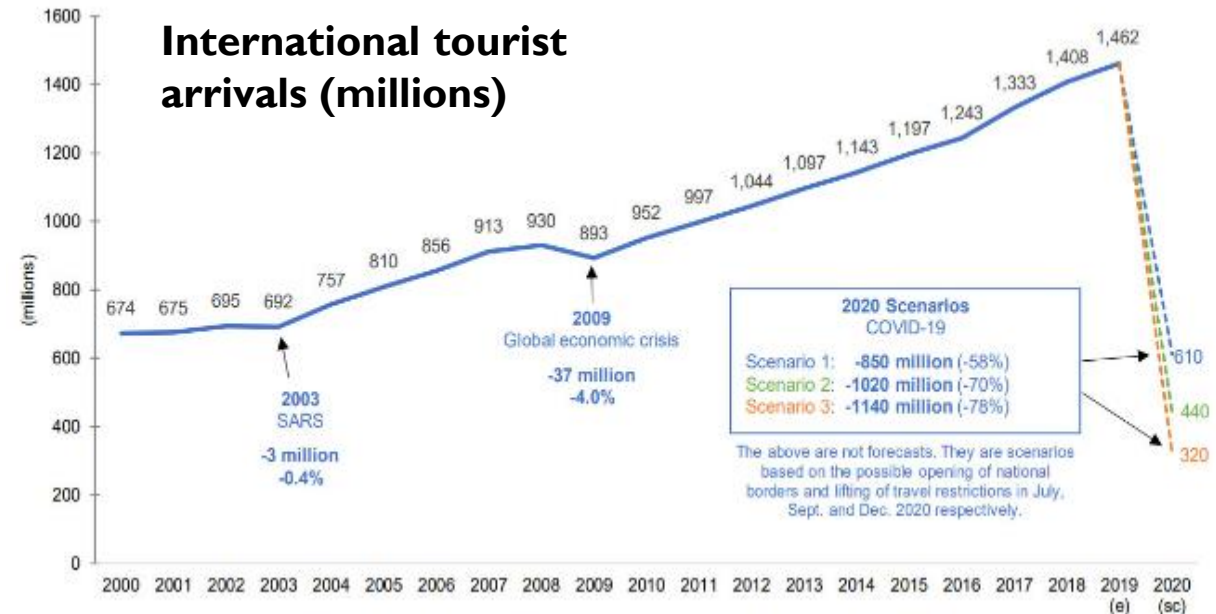


# COVID-19 Impacts

- Global growth 2020 projected at -3.0% (as of April), -5.2% (as of June), -4.4% (as of Oct)
  - Plus, end of mass tourism as we know it



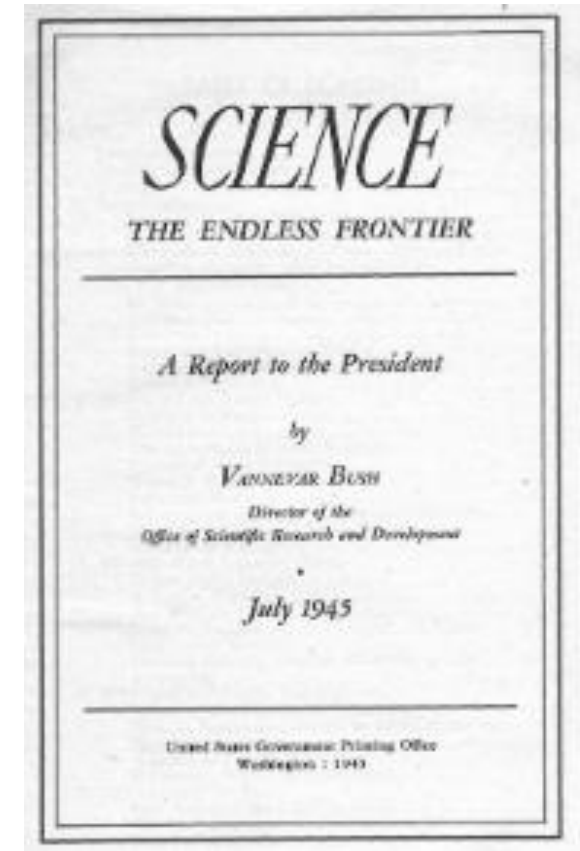
Source: IMF (2020), World Economic Outlook (April)



Source: World Tourism Organization (UNWTO)

# COVID-19 Accelerating 4IR

- Just as World War II dawned the age of science and technology, COVID-19 has triggered a great pivot towards the age of the Fourth Industrial Revolution (4IR).
- With manufacturing, transportation, tourism, and other economic pillars have come to a grinding halt, the 4IR innovations have been thrust forward to keep the whole machinery that moves the world economy by
  - Keeping supply chains open
  - Ensuring that people and businesses stay connected
  - Creating apps that keep us safe
  - Accelerating drug discovery and developing vaccines
  - ...

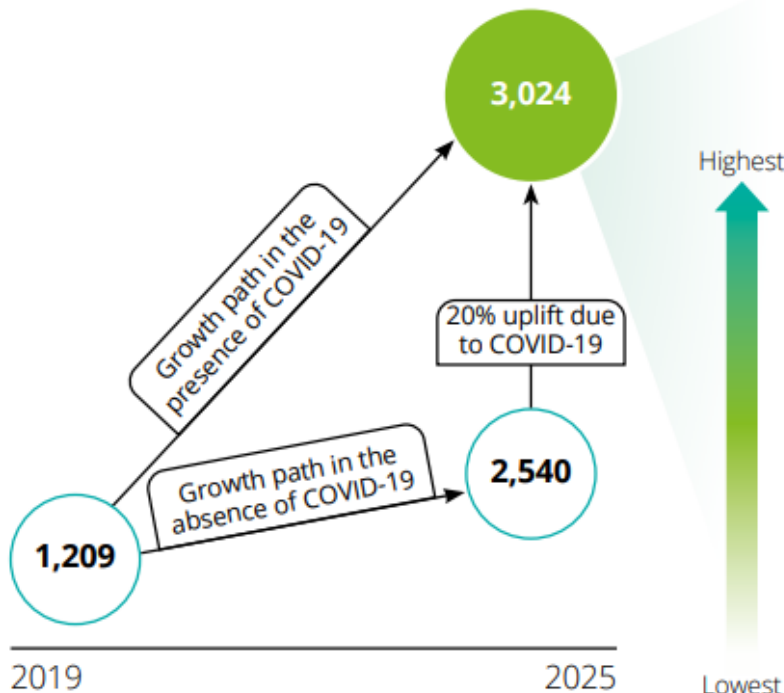


# COVID-19 Accelerating 4IR

- Rise of non-contact, contactless, untact, ontact, hybridtact ... economy

## 1 APAC "At-Home" consumption market size (2019-2025)

in \$US Billions



## 2 Breakdown of 'At Home' consumption by category

"At-Home" consumption size by 2025 (USD'B)		"At-Home" consumption growth by 2025 (CAGR'20-'25)		"At-Home" consumption uplift due to COVID-19 (increase in estimated CAGR '20-'25 due to COVID vis-à-vis without COVID)	
Consumer Products	2,316	Financial Services	52%	Financial Services	+20%
Leisure & Recreation	299	Health	23%	Health	+9%
Education	192	Consumer Products	17%	Leisure & Recreation	+4%
Health	101	Leisure & Recreation	15%	Education	+3%
F&B	96	Education	13%	Consumer Products	+3%
Financial Services	20	F&B	10%	F&B	+3%

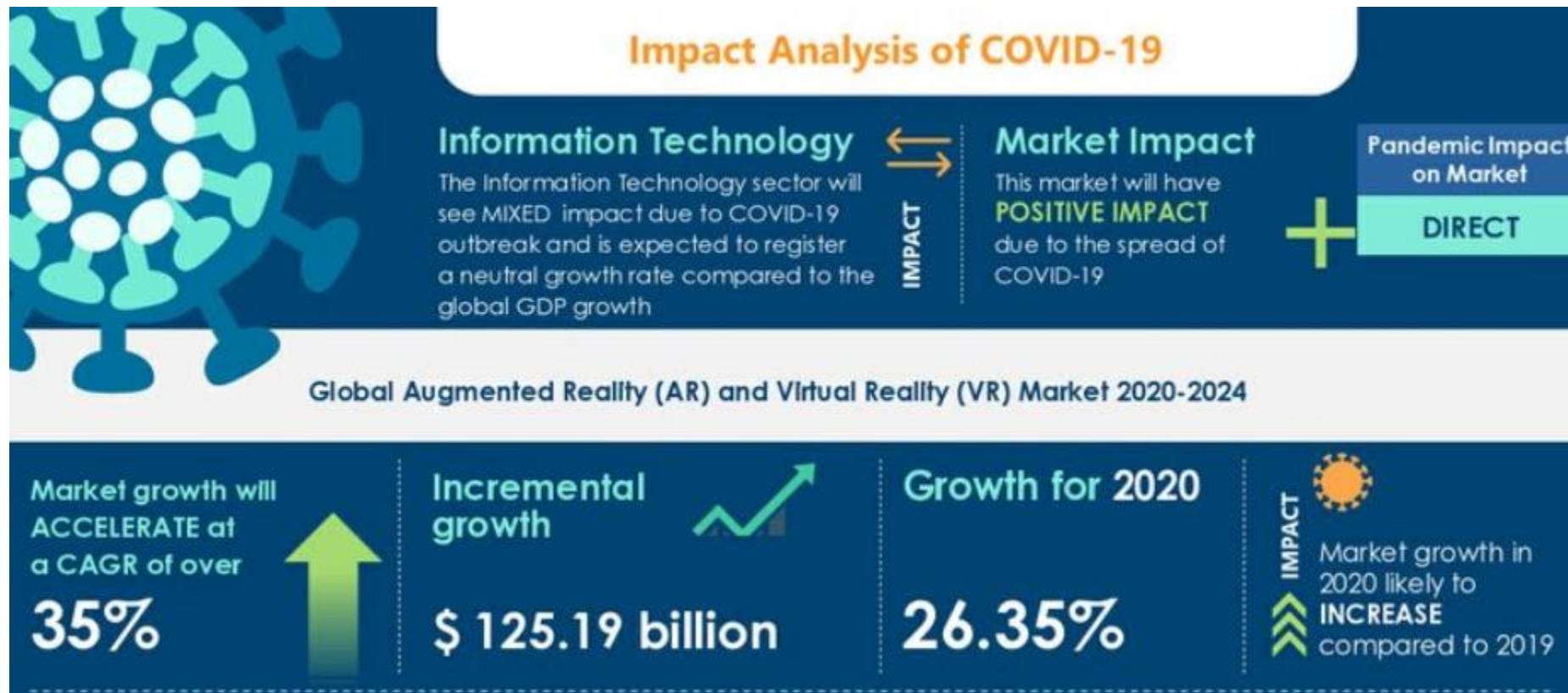


<https://www.futuretravelexperience.com/>



# Example: AR/VR

- Projected impacts of COVID-19 on the global AR/VR market



# Example: AR/VR

- VR in accelerated use for virtual tours in lockdowns and beyond
  - No more just gimmick but a valid form of alternative tourism



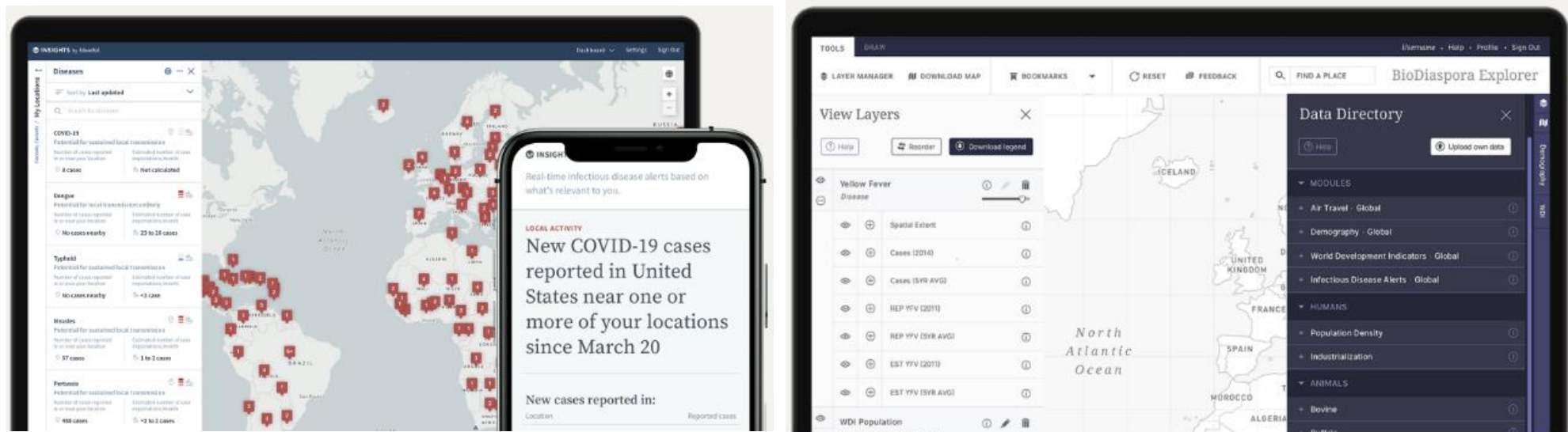
<http://www.businesskorea.co.kr>



<https://news.mt.co.kr>

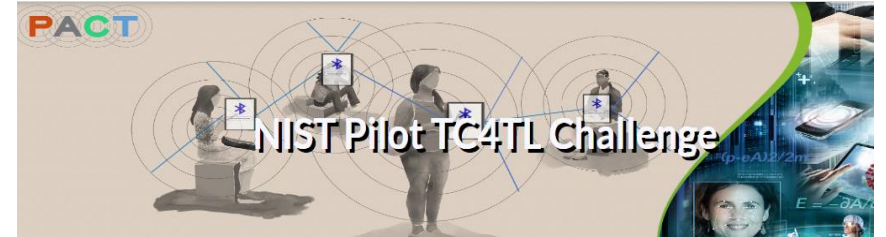
# Example: Artificial Intelligence

- BlueDot providing a cloud-based GIS platform integrating more than 100 diverse datasets, including global air travel and near real-time disease surveillance





# Example: Machine Learning



- Machine learning to improve the performance of Bluetooth signals as proximity detector by analyzing patterns in Bluetooth signals and data from other phone sensors
- NIST+MIT **TC4TL** Challenge (April~August 2020)
  - Current approaches use Bluetooth Low Energy (BLE) signals for automated exposure notification to detect if a person has been too close for too long (**TC4TL**) to an infected individual.
  - However, the received signal strength indicator (RSSI) value of Bluetooth is a very noisy estimator, as it can be dramatically affected in real-world conditions (e.g., location of phones, body positions, physical barriers, etc.).
  - Many research organizations are collecting Bluetooth handshake data and other phone sensor data (e.g., accelerometer, gyroscope, proximity).
  - “The best hope for a solution to this difficult and important problem is to leverage the world-wide research community with common tasks, data, and success metrics that allow for the exchange of and building on collective ideas and approaches.” (<https://tc4tlchallenge.nist.gov/>)

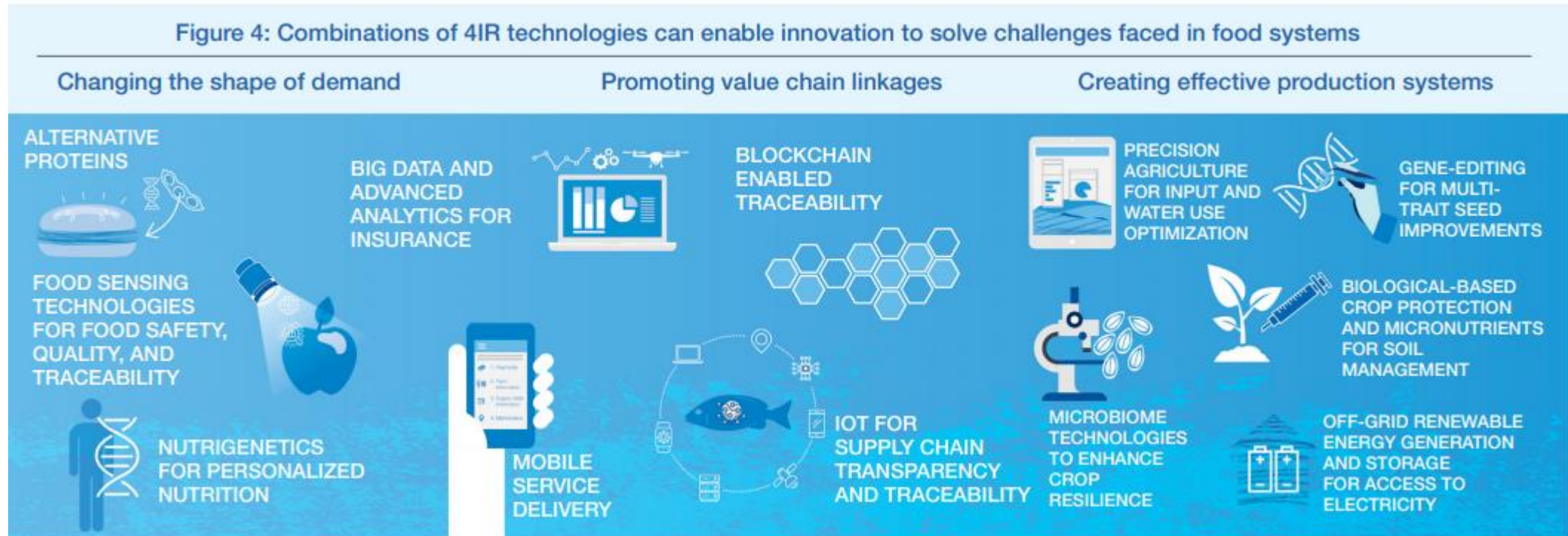


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# 4IR for Inclusive Growth

- Innovations with a purpose
  - “Transformative Twelve”

Source: WEF (2018), Innovation with a Purpose: The role of technology innovation in accelerating food systems transformation





# 4IR Moonshots for SDGs

- 4IR for global goals platform aiming to facilitate the application of advanced technologies in pursuit of achieving SDGs
  - More than 70% of the Global Goals targets could be enabled by already-deployed technology applications through the analysis of 300 4IR technology applications.
- 4IR moonshots for SDGs assessed in terms of transformational impact, adoption potential, and technology centrality

Table 2: Fourth Industrial Revolution-enabled moonshots for the Global Goals

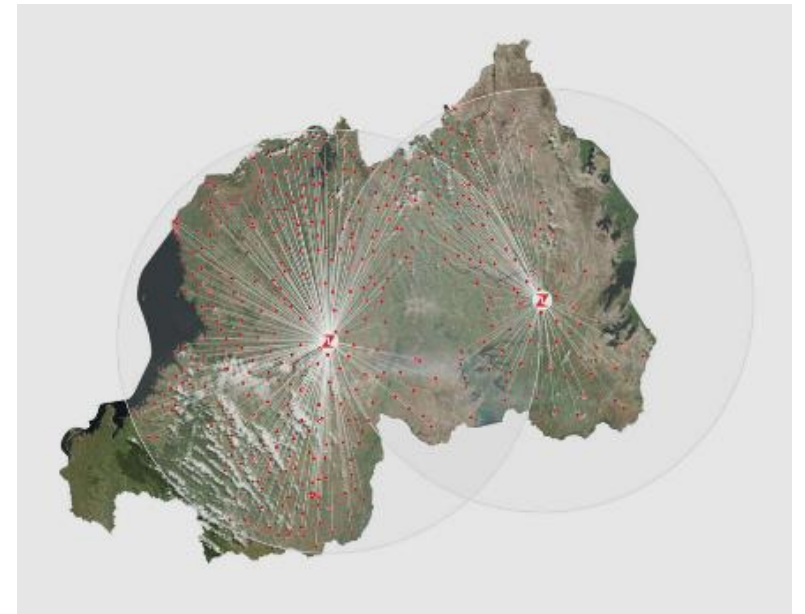
		THE MOONSHOTS		
	Quantum-computing-determined optimal carbon capture material		Ultra-high-speed, zero-emissions long-haul transport, including underground, surface, aviation, shipping and drones	
	4IR-enabled deployable nuclear fusion using AI to predict disruptions that halt feasibility		Zero-waste advanced materials for clean energy and advanced waste heat capture and conversion	
	Advanced materials for generation of low-cost and zero-emissions gaseous fuels, incl. ammonia and hydrogen		Quantum-enabled extreme efficiency data centres and supercomputers	
	Genetic rescue and genome modification for endangered and extinct species and resilience		4IR-enabled internet connectivity for all (drones, satellites)	
	Attracting and removing micropollutants (synthetic biology)		Quantum cryptography for the prevention of cyberattacks on AI/quantum computers	
	Low-zero emissions and ultra-low-cost desalination technology using advanced materials		AI-enabled privacy-protected, public good digital health platform collating healthcare data, sensors, wearables and genomic data	
	End-to-end automated, connected and optimized food and fibre system, incl. elimination of spoilage, loss and waste		AI-enabled development of new antibiotics to address microbial resistance to current antibiotics	
	Low-cost, low-GHG emissions synthetic proteins (AI and synthetic biology)		4IR-enabled "access to care" digital technologies, distribution and delivery systems	
	Advanced materials for durability of energy-intensive products and materials		Decoding well-being and longevity using AI and sensors for personalized health maps and sequenced genomes and phenotypic data	
	Zero-emissions chemicals, steel, aluminium, cement using advanced materials and/or biotech (e.g. biocement)		Gene editing (e.g. CRISPR) to tackle human diseases driven by gene mutation	

Source: PwC Research

Source: WEF & PwC (2020), Unlocking Technology for the Global Goals

# Example: Drones in Rwanda

- Rwanda being first country to have national scale drone delivery
  - As of May 2019, more than 60% of blood deliveries in Rwanda outside its capital city use Zipline drones
- Partnered with VEF C4IR in 2017 to design and adopt a framework of performance-based regulations (PBR) for all classes of drones
  - Cabinet approving the framework in 2018, setting a new standard for open, accountable, and risk-based access to airspace
  - New businesses emerging for infrastructure inspections, agricultural and pest spraying, surveys of crops and land tilting, etc. using drones



Map of Zipline service area in Rwanda

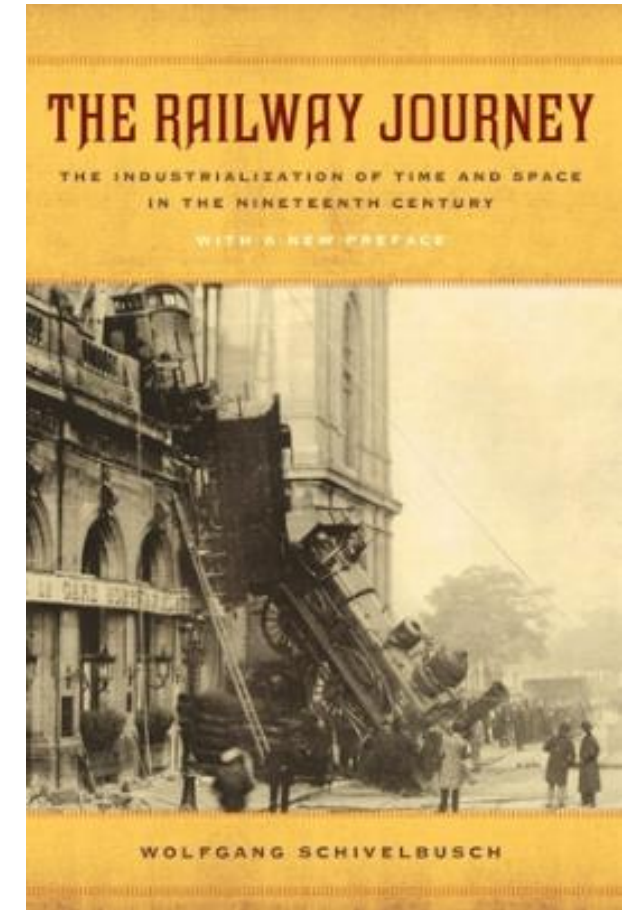
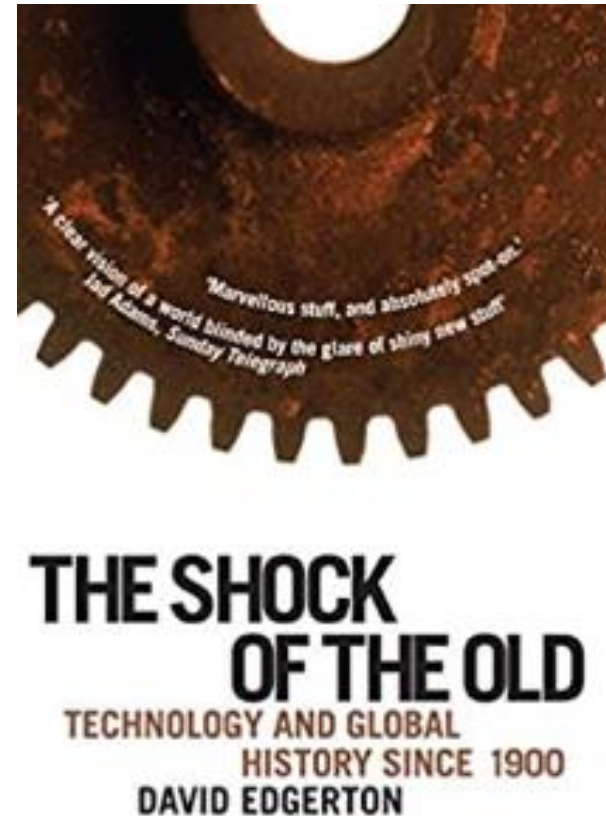


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# When Technologies Matter?

- Not when and how a technology is invented, but **how it is used and by whom**
- Technologies annihilating space and time, while recreating them
- How to leverage technologies to build back better?



Thank You!  
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KPC4IR

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