WORLD ECONOMIC FORUM

COMMITTED TO IMPROVING THE STATE OF THE WORLD

Centre for the Fourth Industrial Revolution Network

Centre for the Fourth Industrial Revolution Japan

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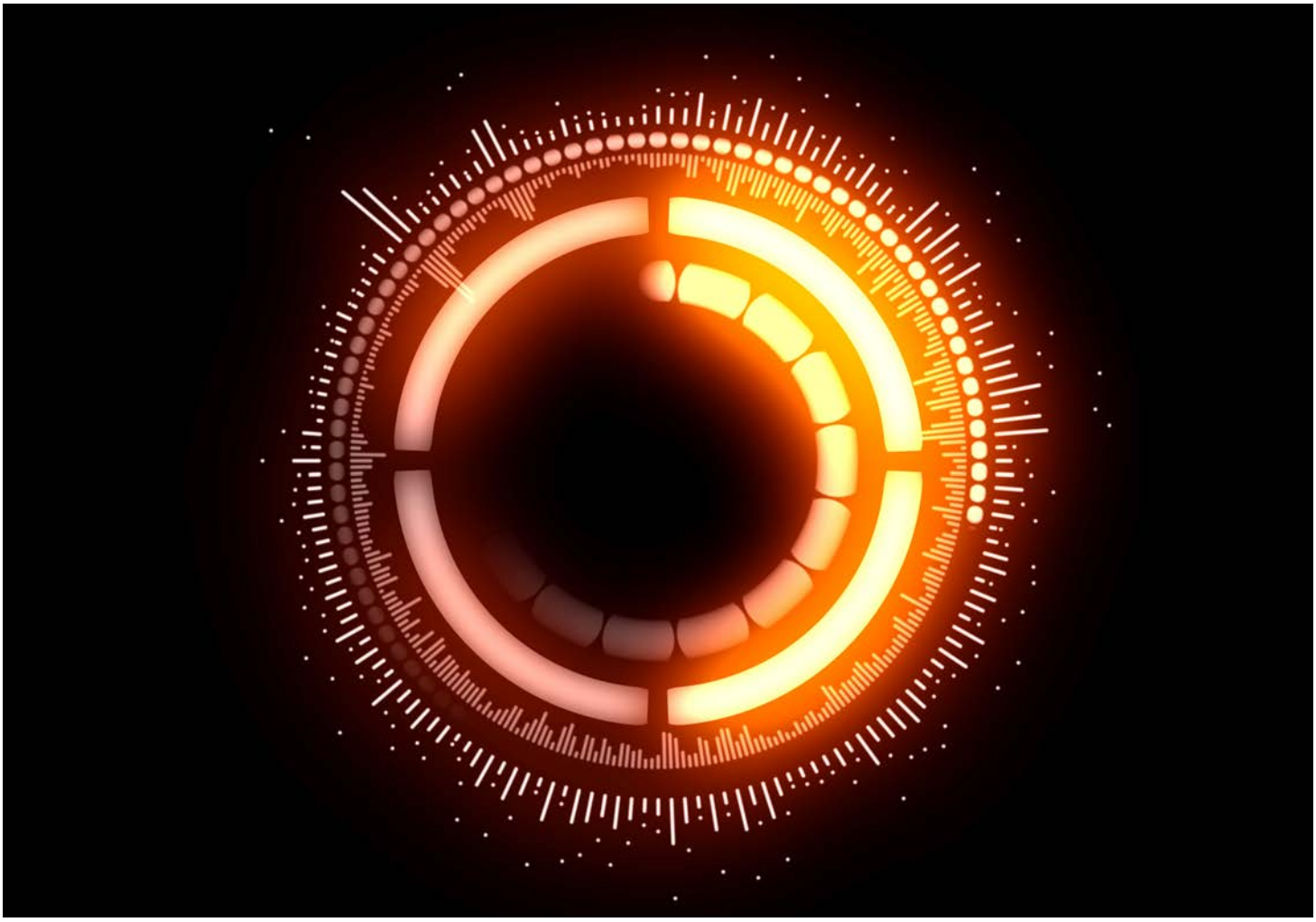

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the Fourth Industrial Revolution Japan

The World Economic Forum: Committed to improving the state of the world

The World Economic Forum is the International Organization for Public-Private Cooperation. Established in 1971, the Forum engages leaders from government, business, academia and civil society to work together towards fulfilling its mission of improving the state of the world. Recognizing that no single actor can address systemic issues on its own, the Forum provides a platform for all sectors of society to mobilize and amplify their efforts to create long-term, positive impact.

The World Economic Forum and Japan have a long history together, with leaders from the Japanese government, industry and civil society participating regularly in the Forum's Annual Meeting in Davos-Klosters, Switzerland. The Forum's Representative Office in Tokyo, established in 2009, supports the Forum's work across all areas, particularly relations with the Japanese government and businesses as well as the Japanese public.

The Fourth Industrial Revolution

The First Industrial Revolution introduced the use of steam power to mechanize production. The Second Industrial Revolution saw a number of groundbreaking inventions in transport, telecommunications and manufacturing, including the use of electric power to generate mass production. The Third Industrial Revolution brought the internet and other technological innovations, which have ushered humanity into the digital era.

Today society is undergoing a Fourth Industrial Revolution, an age in which scientific and technological breakthroughs are disrupting industries, blurring geographical boundaries, challenging existing regulatory frameworks, and even redefining what it means to be human. Emerging technologies such as artificial intelligence (AI), blockchain, drones and precision medicine are swiftly changing lives and transforming businesses and societies, inevitably posing new risks and raising ethical concerns. How can society ensure that its policies, norms and standards are able to keep up with these rapidly evolving technologies?

Enter the Centre for the Fourth Industrial Revolution Network.

> **The Fourth Industrial Revolution is a big opportunity for Japan. We're determined to play a strong leadership role in the world.**
>
> **Prime Minister Shinzo Abe** in a message marking the opening of the Centre for the Fourth Industrial Revolution Japan in July 2018

Centre for the Fourth Industrial Revolution Network: Global hubs for public-private collaboration and impact

The Centre for the Fourth Industrial Revolution Network's vision is to help shape the development and application of emerging technologies, such as AI and blockchain, for the benefit of humanity.

The network's mission is to co-design, test and refine governance protocols and policy frameworks to maximize the benefits and minimize the risks of advanced science and technology.

In 2018, the network expanded from its headquarters in San Francisco to include new hubs in China, India and Japan. To accelerate impact and drive change, the network brings together governments, business organizations, dynamic start-ups, civil society, academia and international organizations from around the world to work together across nine emerging technology areas.

The network develops, implements and scales up agile and human-centred pilot projects that can be adopted by policy-makers, legislators and regulators worldwide.

"

In the end, it all comes down to people and values. We need to shape a future that works for all of us by putting people first and empowering them. In its most pessimistic, dehumanized form, the Fourth Industrial Revolution may indeed have the potential to "robotize" humanity and thus to deprive us of our heart and soul. But as a complement to the best parts of human nature—creativity, empathy, stewardship—it can also lift humanity into a new collective and moral consciousness based on a shared sense of destiny. It is incumbent on us all to make sure the latter prevails.

"

Klaus Schwab, Founder and Executive Chairman, World Economic Forum

Centre for the Fourth Industrial Revolution Japan

The Centre for the Fourth Industrial Revolution Japan was the first centre to be launched outside the United States. Founded in July 2018, it is a collaboration among the World Economic Forum, the Japanese Ministry of Economy, Trade and Industry and the Asia Pacific Initiative, a Japanese think tank. This unique joint-venture structure allows the centre to work closely with policy-makers to address governance issues that involve key regulatory reforms.

As the world's third largest economy, Japan has a natural leadership role to play in addressing important global challenges. Japanese society is at the leading edge of social transformations, such as an aging and shrinking population, that other countries will eventually face, and it will need to make full use of Fourth Industrial Revolution innovations to cope.

Already the Japanese government is seeking to spread the benefits of the digital revolution under an initiative it calls Society 5.0. By sharing its experiences and serving as a model, Japan aims to make a positive contribution to the world.

Based in Tokyo, the Centre for the Fourth Industrial Revolution Japan cooperates with other centres in the Forum's global network to design creative policy frameworks for improving the governance of emerging technologies, scale up their projects worldwide, and share findings and best practices. Its activities are grouped under three primary portfolios: autonomous and urban mobility; health data policy; and internet of things, robotics and smart cities.

Portfolios of emerging technologies

The Centre for the Fourth Industrial Revolution Network runs projects focused on the following emerging technology portfolios:

1 Artificial Intelligence and Machine Learning

2 Autonomous and Urban Mobility

3 Blockchain and Distributed Ledger Technology

4 Data Policy

5 Digital Trade

6 Drones and Tomorrow's Airspace

7 Fourth Industrial Revolution for the Earth

8 Internet of Things, Robotics and Smart Cities

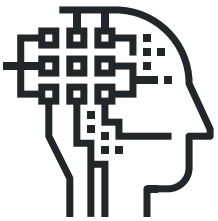
9 Precision Medicine

These portfolios are led by internationally-renowned experts who are full-time employees at the Centre for the Fourth Industrial Revolution Network headquarters in San Francisco. Each of these portfolios encompasses several projects focusing on specific policy and governance gaps. The experts work alongside fellows from government, business, civil society and academia to build creative policy frameworks and protocols for governing the most important emerging technologies that are driving transformation today.

Of the nine portfolios listed above, the Centre for the Fourth Industrial Revolution Japan will initially pilot local projects in the following three areas:

Autonomous and Urban Mobility

Health Data Policy



IoT, Robotics and Smart Cities

For more information on any of these portfolio areas, please contact Chizuru Suga at c4irjapan@weforum.org.

Projects follow the same four-phase methodology used across the global Centre for the Fourth Industrial Revolution Network:

Opportunity Mapping
(scoping phase)

phase **1**

Landscape review of existing efforts; specify government and industry needs; identify project focus areas

Framework Development

phase **2**

For each focus area selected in the scoping phase, identify the policy or governance changes most likely to achieve systemic change; co-design governance protocols and policy frameworks

Prototype, Test and Iterate

phase **3**

Execute short pilot projects with government and industry partners to test governance protocols and policy frameworks; collect key lessons from pilot projects and improve policies/protocols based on findings

Scale up

phase **4**

Globally disseminate the updated protocols and frameworks from successful pilot projects and support international adoption

Artificial Intelligence and Machine Learning

Artificial intelligence (AI) is the software engine that drives the Fourth Industrial Revolution. Its impact can already be seen in homes, businesses and political processes. In its embodied form of robots, it will soon be driving cars, stocking warehouses and caring for the young and elderly. It holds the promise of solving some of the most pressing issues facing society, but also presents challenges such as inscrutable “black box” algorithms, unethical use of data and potential job displacement. As rapid advances in machine learning (ML) increase the scope and scale of AI’s deployment across all aspects of daily life, and as the technology itself can learn and change on its own, multistakeholder collaboration is required to optimize accountability, transparency, privacy and impartiality to create trust.

The Artificial Intelligence and Machine Learning (AI/ML) portfolio aims to support the development of policy frameworks and governance protocols to accelerate the societal benefits and mitigate the risks of AI and ML. Projects include:

- Empowering AI leadership
- Unlocking public-sector AI
- Generation AI: Standards for protecting children
- Re-imagining the regulator
- Data marketplace for AI
- Teaching responsible AI
- The ethics switch

Autonomous and Urban Mobility

Autonomous vehicles (AV) have the potential to improve road safety, decrease pollution levels, reduce congestion and transform the design of cities. With the proper parameters in place, AVs can be safer, more efficient and more economical than vehicles today. However, transitioning to autonomous vehicles involves a disruptive shift that is bound to reshape public and private transportation systems, leaving many players behind if they fail to keep pace with emerging technologies. Collaboration among business and government leaders is needed to jointly identify the best strategies for accelerating the adoption of autonomous mobility in a safe, clean and inclusive manner.

The Autonomous and Urban Mobility portfolio seeks to advance leading-edge thinking and drive adoption of innovative solutions based on autonomous vehicles and their impact on urban mobility. It provides a platform for city and business leaders to work together to understand and pilot autonomous and shared vehicle fleets. Projects will focus on areas including safety regulations; societal benefits, equality and access; infrastructure readiness; shaping urban mobility choices; and data governance and security.

Blockchain and Distributed Ledger Technology

Blockchain, an early-stage technology that enables the decentralized and secure storage and transfer of information, has the potential to be a powerful tool for tracking and transactions that can minimize friction, reduce corruption, increase trust and empower users. Cryptocurrencies built on distributed ledger technologies (DLT), despite still being in their infancy, have emerged as potential gateways to new wealth creation and disrupters across financial markets. Other revolutionary use cases are being explored in almost every sector, ranging from energy to shipping to media.

DLT has the potential to upend entire systems, but it also faces challenges, including lack of interoperability, security threats, centralization of power and unwillingness to experiment due to recent overhype. By taking a systemic and inclusive approach to this technology, it is possible to ensure that everyone—from the most marginalized members of society to the most powerful—benefits from its transformative potential.

Projects include:

- Interoperability, integrity, and inclusion: Blockchain for supply chains
- Central banks in the age of blockchain
- Unlocking transparency
- Re-imagining data ownership and economic models in the token economy

Data Policy

Data is the oxygen that fuels the fire of the Fourth Industrial Revolution. More data is being generated than ever before, with the global volume of data predicted to double between 2018 and 2022, and then double again between 2022 and 2025. The ever-growing deluge of data is driven by the rapidly expanding universe of connected devices via the internet of things (IoT) and by breakthroughs in autonomous vehicles, drone technology and the growing availability of genomic testing. That very data, in turn, is leveraged through machine learning to make AI possible and to power advances in precision medicine, diagnostics and predictive analytics used across industries.

Although an unprecedented amount of data flows across borders and devices, the regulatory environment for data protection remains fractured. With over 120 data privacy laws in place globally today and several new and stringent regulatory measures recently passed or put into effect in 2018, there is more uncertainty than ever.

As data is increasingly generated and collected globally, businesses require clearer and more practical data policies, while policy-makers need better tools to develop future-oriented and agile frameworks for data regulation that will allow for innovation but protect individual privacy. The Data Policy portfolio focuses on maximizing the humanitarian and beneficial uses of data while seeking to develop practical solutions using a multistakeholder approach to policy-making. Projects include:

- Data policy toolkit
- General Data Protection Regulation (GDPR) for the Fourth Industrial Revolution
- Chief data officer community
- Trustworthy data for the common good

Digital Trade

The Fourth Industrial Revolution – driven by rapid technological change and digitalization – has already had a profound impact on global trade, economic growth and social progress. Cross-border e-commerce has generated trillions of dollars in economic activity in recent years and continues to accelerate. The ability of data to move across borders underpins new business models, boosting global GDP by 10% in the last decade alone. It has enabled the use of blockchain technology for good, such as increasing efficiency and transparency in international trade. However, digital trade barriers including outdated regulations, fragmented governance and strict data localization policies could potentially hamper these gains. At the same time, policy-makers must balance societal concerns in the digital commercial space while stakeholders need to navigate divergent national responses.

The Digital Trade portfolio contains projects that fall under one of three overarching themes: enabling e-commerce, TradeTech, and cross-border data flows. Projects include:

- Paying without cash: Accelerating the digital payment transformation
- Trade single window with blockchain application
- 3D printing
- Cross-border data flows: Global approach with a regional focus

Drones and Tomorrow's Airspace

Unmanned aircraft systems, commonly referred to as drones, are democratizing the sky and enabling new participants in aviation. Drones already have the ability to increase crop yields, make dangerous jobs safe and act as a lifeline for remote populations. Longer term, autonomously piloted systems have the potential to revolutionize how people and goods are transported.

Although drones have the potential to transform business models and tackle societal challenges around the globe, governments are struggling to find ways to encourage innovation while maintaining public safety and confidence. Large companies, as well as a growing start-up ecosystem, are hindered in their ability to invest and expand. Enabling millions of manned and unmanned aircraft to fly concurrently will also require new types of airspace management, physical infrastructure, and privacy and data ownership policies. Laying the right policy foundation and platforms for industry cooperation today, both through smart government regulation and industry-driven standards, will accelerate the adoption of new use cases and business models once the enabling technology and infrastructure are mature.

Projects that fall under the Drones and Tomorrow's Airspace portfolio include:

- New paradigms for drone regulation
- Drone Innovators Network
- Drones for government services
- Re-imagining aircraft certification
- Medicine from the sky

Fourth Industrial Revolution for the Earth

Society's well-being is closely intertwined with the environment. From local communities to the global commons, the environment provides natural resources that fuel the growth of industries and economies, and influences public issues as diverse as health, natural disaster response and recovery, and food and energy security. With the planet increasingly under stress, environmental issues such as climate change, biodiversity and ocean health constitute some of the most urgent challenges of our time.

The technologies of the Fourth Industrial Revolution offer new tools for enabling better stewardship of the Earth. Among these are innovative data collection and analysis tools such as small satellites; robotic platforms for air, land and water; novel sensors; AI; and genetic sequencing. In combination, these offer potentially transformative opportunities for managing our environmental future.

The Fourth Industrial Revolution for the Earth's portfolio of projects includes:

- Scaling up renewable energy with blockchain
- Ocean innovations for healthy oceans
- Environmental data from Fourth Industrial Revolution tech

Internet of Things, Robotics and Smart Cities

There are more connected devices in the world today than humans. These devices, commonly known as the internet of things (IoT), come in infinite forms, from smart building technologies, which monitor and manage energy usage, to connected vehicles, which help anticipate and avoid potential collisions. By 2020, the number of IoT devices is projected to exceed 20 billion, fuelled by continued technological advances and the plummeting costs of computing, storage and connectivity. As IoT technologies continue to spread to all aspects of day-to-day life, and even become embedded in the human body, questions about data ownership, accuracy and privacy protection take on greater importance. Similarly, in an interconnected world where electric grids, public infrastructure, vehicles, homes and workplaces are capable of being accessed and controlled remotely, the vulnerability to cyberattacks and the potential for these security breaches to cause serious harm are unprecedented.

Projects within the Internet of Things, Robotics and Smart Cities portfolio include:

- Creating market incentives for a secure IoT
- Accelerating the impact of IoT technologies
- Building trust in consumer IoT
- Unlocking the shared value of IoT data
- Enabling an inclusive 5G roll-out

Precision Medicine

Many drugs and medical treatments have been developed using a “one size fits all” approach, which can lead to ineffective treatments for specific people or populations. Precision medicine offers the opportunity to tailor disease treatment to a specific person, by taking into account their genetic and biological make-up, the environment in which they live, and how they live their life. Fourth Industrial Revolution technological advances – such as increased computational capacity, sophisticated digital information platforms and large amounts of genetic and biological data – are changing the players involved and the way in which health and healthcare systems function. A more tailored approach to screening, diagnostics, treatment and cure can improve outcomes and potentially lower costs. Government, industry, academics, civil society and patient groups need to collaborate to ensure that the whole of society is able to benefit from rapid advances in technology and precision medicine.

The Precision Medicine portfolio includes the following projects:

- Breaking barriers to health data
- Leapfrogging with precision medicine
- Re-visioning clinical trials
- Enabling access through innovation in pricing and reimbursement

Global Fourth Industrial Revolution Councils

The network of Global Fourth Industrial Revolution Councils is a global community of leaders from technology start-ups, corporations, government, academia and civil society who are committed to shaping the trajectory of emerging technologies for the greater good. Currently the six Global Fourth Industrial Revolution Councils are:

Global Artificial Intelligence Council
Global Internet of Things Council
Global Blockchain Council
Global Autonomous and Urban Mobility Council
Global Drones and Aerial Mobility Council
Global Precision Medicine Council

Each council uses its collective knowledge and expertise to:

- Identify governance gaps in public policy or the private sector that would benefit from the Centre for the Fourth Industrial Revolution Network's multistakeholder approach to the governance of emerging technologies
- Create tangible impact by providing strategic guidance and feedback on the innovative policy experiments being carried out throughout the Centre for the Fourth Industrial Revolution Network
- Serve as early adopters and ambassadors of the Network's pioneering work by piloting Fourth Industrial Revolution projects or identifying potential partners for implementation
- Contribute thought leadership to Forum publications and videos and also through the Forum's digital media channels

Participation is by invitation only. Please send an email to c4irjapan@weforum.org for more information.

How do I engage? Your role in shaping a better world

Participation in the centre's projects is reserved for those with an interest in shaping Fourth Industrial Revolution norms and principles.

By joining the Centre for the Fourth Industrial Revolution Network, governments, companies and academic institutions can:

1. Be at the forefront of the Fourth Industrial Revolution by co-designing policy and governance protocols that accelerate the societal benefits of cutting-edge technologies while mitigating their negative impact. Governments, academic institutions and businesses will be able to send relevant staff to the centre as full- or part-time fellows
2. Work with governments and companies around the world to develop a better understanding of emerging technologies and their implications, and to pilot new frameworks for enabling faster adoption of technological innovations
3. Increase their visibility as global leaders committed to using new technologies to benefit society
4. Understand how human-centred design can be used to maximize the positive impact of innovative technologies
5. Connect with leading innovators in the technology world:
    a. Participate in the Annual Meeting of the New Champions, the premier Forum meeting devoted to science, technology and innovation held annually in China
    b. Access the Forum's online platforms:
        i. TopLink – the Forum's main digital platform for collaboration, knowledge sharing, events and communities
        ii. Transformation Maps – a unique, dynamic data visualization tool that uses AI to help identify relationships among the forces driving change today
    c. Participate in meetings and workshops throughout the global network of centres

To learn more about business and government engagement opportunities, please contact Chizuru Suga at c4irjapan@weforum.org.

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The Forum engages the foremost political, business and other leaders of society to shape global, regional and industry agendas.