WORLD ECONOMIC FORUM

COMMITTED TO IMPROVING THE STATE OF THE WORLD

Centre for the Fourth Industrial Revolution Network

for Global Technology Governance

May 2019

World Economic Forum
91-93 route de la Capite
CH-1223 Cologny/Geneva
Switzerland
Tel.: +41 (0)22 869 1212
Fax: +41 (0)22 786 2744
Email: contact@weforum.org
www.weforum.org

REF 040119 - 00058043

Contents


Precision Medicine and Policy Summit
PRECISION MEDICINE AND POLICY SUMMIT

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

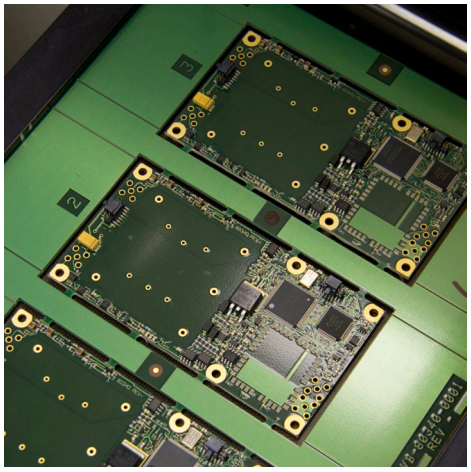
The World Economic Forum is the International Organization for Public-Private Cooperation. Established in 1971, the Forum engages leaders from government, business, academia and civil society to work together towards fulfilling its mission of improving the state of the world. Recognizing that no single 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 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.




WORLD ECONOMIC FORUM
COMMITTED TO IMPROVING THE STATE OF THE WORLD
Launch of the Centre for the Fourth Industrial Revolution India


2867
GMB
MODEL:428
5320


WORLD ECONOMIC FORUM
SCHWARZENEGGER

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. 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.

Headquartered in San Francisco, the Centre for the Fourth Industrial Revolution Network launched new hubs in China, India and Japan in 2018. In addition to these Forum-led centres, the network is establishing affiliate centres around the world that are managed and operated locally by governments and/or invited academic institutions. Host governments commit to supporting and advancing the development and deployment of pilot frameworks on topics aligned with projects launched by the network.

Organizations partnering with the network can send fellows to any of the four main hubs or affiliate centres, thereby creating a continuous exchange of insights and knowledge sharing throughout the network.

The network's portfolios of emerging technologies

The challenges and opportunities of the Fourth Industrial Revolution are global in scope, have cross-industry impact and require multistakeholder cooperation. Understanding that the world must act now to ensure that emerging technologies will help – and not harm – humankind in the future, the Centre for the Fourth Industrial Revolution Network is pioneering new approaches in the following key 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 technology 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 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.

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

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 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
- Reimagining the Regulator
- Data Marketplace for AI
- Teaching AI Ethics
- Responsible Limits on Facial Recognition Technology

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 transform 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:

- Redesigning Trust: Blockchain for Supply Chains
- Central Banks in the Age of Blockchain
- Unlocking Government Transparency
- Reimagining 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. This ever-growing deluge is driven by the rapidly expanding universe of connected devices via the internet of things (IoT), by breakthroughs in autonomous vehicles and drone technology, and the growing availability of genomic testing. That very data, in turn, is leveraged through machine learning to make artificial intelligence (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 more than 120 data privacy laws in place globally today, 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:

- Model AI Governance Framework
- Ethical Development, Deployment and Use of Technology
- Healthcare and Data Policy (Japan Centre)
- Trustworthy Data for the Common Good
- Designing Interoperable Frameworks for Data Flows
- Thinking Outside the Box: Fit for Purpose Consent
- Chief Data Officer Community

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 two overarching themes: TradeTech and Enabling E-Commerce. Projects include:

- Paying Without Cash: Accelerating the Digital Payment Transformation
- Global Trade Single Window with Blockchain
- 3D Printing and Trade Logistics

Drones and Tomorrow's Airspace

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

While drones provide an opportunity to transform business models and help address societal challenges around the globe, governments are struggling to find ways to encourage aerial innovations while maintaining public safety and confidence. Large companies and an increasing number of start-ups are hindered in their ability to invest in drones and expand their use. 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.

Projects that fall under the Drones and Tomorrow's Airspace portfolio are grouped into the following impact areas:

- New Paradigms for Drone Regulation
- Drone Innovators Network
- Drone Delivery
- Aerial Imagery for Social Transformation
- Personal Aerial Mobility

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; artificial intelligence 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:

- Ocean Innovations for Sustainable Fishing
- Scaling Renewable Energy with Blockchain
- Environmental Data for Resilience

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 Roll-Out of Next-Generation Connectivity
- Forging a New Social Contract for Smart Cities

Precision Medicine

Many medical treatments have been developed using a one-size-fits-all approach, which can lead to ineffective treatments for specific individuals or populations. Precision medicine offers a more personalized and targeted approach to screening, diagnosing, treating and curing disease by considering genetic and environmental factors as well as patients' lifestyles. The technological advances of the Fourth Industrial Revolution – such as increased computing power, sophisticated digital platforms and large amounts of genetic and biological data – are facilitating this approach and providing an opportunity to improve outcomes and potentially lower costs. Government, industry, academics, civil society and patient groups need to collaborate to ensure that all 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-envisioning Clinical Trials
- Innovation in Pricing and Reimbursement
- Precision Pathology and Next-Generation Diagnostics
- Moving Genomics to the Clinic

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 Centre for the Fourth Industrial Revolution 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 c4ir@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:

- 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
- 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
- Increase their visibility as global leaders committed to using new technologies to benefit society
- Understand how human-centred design can be used to maximize the positive impact of innovative technologies
- Connect with leading innovators in the technology world:
  - Participate in the Annual Meeting of the New Champions, the premier Forum meeting devoted to science, technology and innovation held annually in China
  - Access the Forum's online platforms:
    - TopLink – the Forum's main digital platform for collaboration, knowledge sharing, events and communities
    - Transformation Maps – a unique, dynamic data visualization tool that uses AI to help identify relationships among the forces driving change today
  - Participate in meetings and workshops throughout the global network of centres

To learn more about business and government engagement opportunities, please contact c4ir@weforum.org.

Follow news and updates about the Centre on our website at http://wef.ch/sf and like our Fourth Industrial Revolution Facebook page at http://wef.ch/4irfb.

World Economic Forum Global Network

World Economic Forum Headquarters
91–93 route de la Capite
CH-1223 Cologny/Geneva, Switzerland
Tel.: +41 (0) 22 869 1212
Fax: +41 (0) 22 786 2744
contact@weforum.org
www.weforum.org

World Economic Forum LLC
350 Madison Avenue, 11th Floor
New York, NY 10017 USA
Tel.: +1 212 703 2300
Fax: +1 212 703 2399
Email: forumusa@weforum.org

Centre for the Fourth Industrial Revolution Network
1201 Ralston Avenue
The Presidio of San Francisco
San Francisco, California 94129 USA
Tel.: +1 415 704 8848
Email: c4ir@weforum.org

Centre for the Fourth Industrial Revolution China and World Economic Forum Beijing Representative Office
World Financial Centre
501-503, West Tower
No. 1 East 3rd Ring Middle Road
Chaoyang District
Beijing, 100020, China
Tel.: +86 10 6599 9500 / 88
Fax: +86 10 6599 9501
Email: c4irchina@weforum.org

Centre for the Fourth Industrial Revolution India
Reliance Corporate IT Park Ltd (Building 1)
5 TTC Industrial Area,
Thane Belapur Road
Ghansoli, Navi Mumbai, 400701, India
Email: c4irindia@weforum.org

Centre for the Fourth Industrial Revolution Japan and World Economic Forum Japan Office
ARK Mori Building East Wing,
37th Floor 1-12-32
Akasaka, Minato-ku, Tokyo, Japan
Tel.: +81 (0)3 5771 0067
Fax: +81 (0)3 5771 0068
Email: c4irjapan@weforum.org

WORLD ECONOMIC FORUM

COMMITTED TO IMPROVING THE STATE OF THE WORLD

The World Economic Forum, committed to improving the state of the world, is the International Organization for Public-Private Cooperation.

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