



GOVERNMENT OF
UNITED ARAB EMIRATES



مؤسسة دبي للمستقبل
Dubai Future Foundation



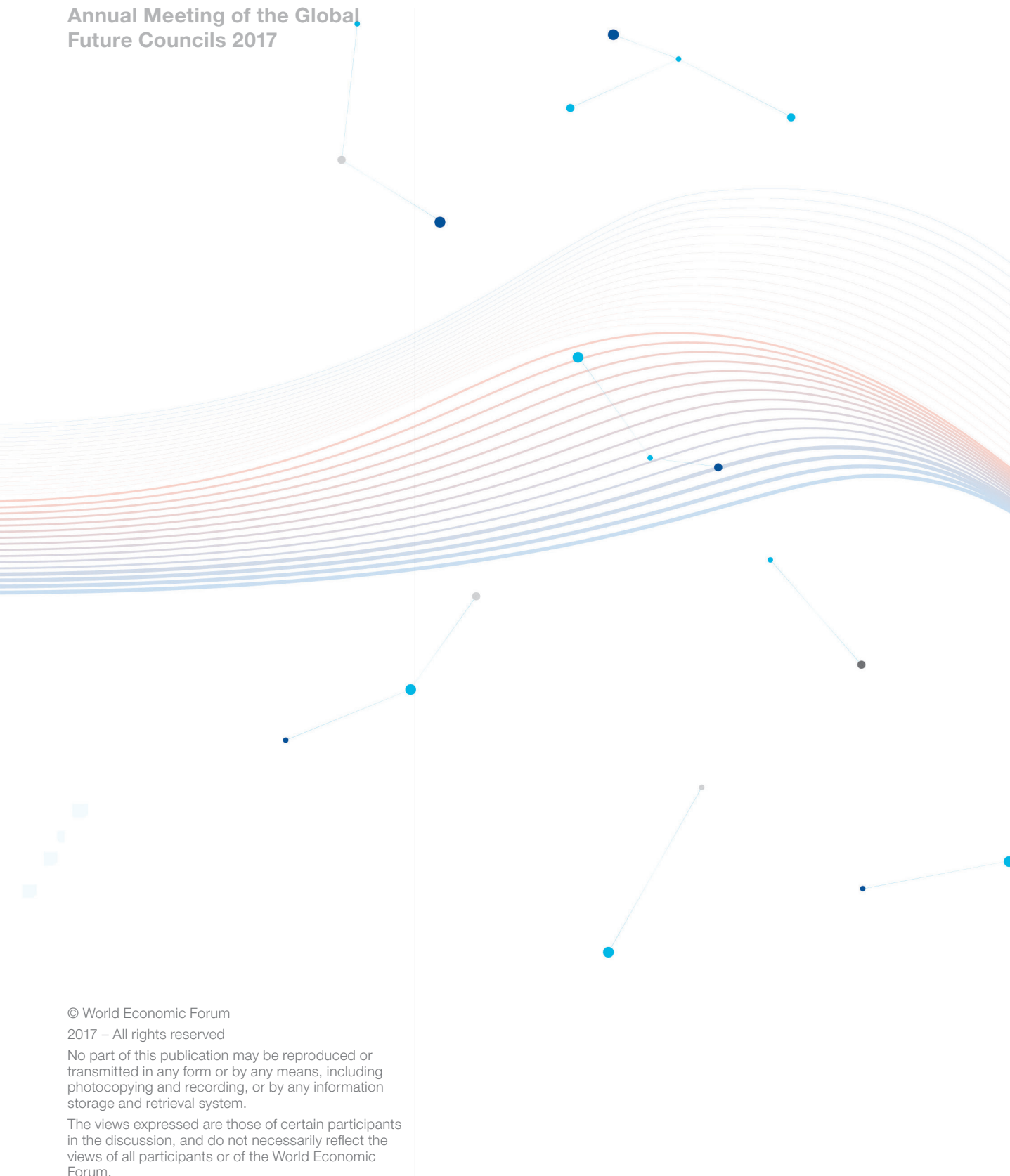
COMMITTED TO
IMPROVING THE STATE
OF THE WORLD

Annual Meeting of the Global Future Councils 2017

Dubai, United Arab Emirates 11-12 November



Annual Meeting of the Global Future Councils 2017



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Welcome message



Klaus Schwab
Founder and Executive
Chairman
World Economic Forum

We are living through anxious and uncertain times. While the Fourth Industrial Revolution holds great promise, it is also accelerating global complexity. Exponential technological change, the fracturing of political and social structures, and a resurgence of identity politics – all are making it increasingly difficult to address the global challenges that will define our collective future.

As a gathering of the world's foremost experts on the underlying dynamics of the Fourth Industrial Revolution, the Annual Meeting of the Global Future Councils presents a unique opportunity. Achieving progress requires renewed mobilization in order to strengthen our global systems and harness the positive force of technological change for the better. This can only be done by engaging with experts, and making the best research and analysis widely accessible in the interest of more-effective global collaboration.

However, it is not enough for this work to be limited to the realm of experts; the bold action needed to address global challenges, and harness technology, has to spring from all parts of society. The World Economic Forum has therefore taken the decision to make the collective intelligence of its networks, captured in the form of our Transformation Maps, available as a global public good. We want everyone to have access to this dynamic platform, which visually illustrates the systemic nature of the issues we face and provides a synthesis of related global research and analysis. This is our contribution to fight fake news.

I encourage you to champion this collective mobilization on our shared challenges, and trust that your work with your council and with the wider network will contribute to creating the shared future to which we all aspire.



Mohammed Abdulla Al Gergawi

Minister of Cabinet Affairs
and the Future of the United
Arab Emirates
Co-Chair of the Annual
Meeting of the Global Future
Councils

Our world today stands at a critical juncture – a fundamental transition of human society characterized by technological revolution, unprecedented opportunities but also challenges of a new technological era. At this crucial crossroads, countries embracing transformative change will emerge stronger and better adept at advancing the interests and well-being of their people. By harnessing relevant forces of change and focusing on the active roles of citizens and younger generation aspirations, exciting outcomes of the Fourth Industrial Revolution will be realized.

The Fourth Industrial Revolution is a clarion call to lead amid this global landscape for change. We need to be proactive to change, as adaptation is deeply rooted in our human DNA and story of evolution. Hence, we are uniquely positioned to champion the momentum of change across the global community. The United Arab Emirates' commitment to driving future progress is globally recognized. By virtue of achieving excellence, commitment to whole-of-society innovation as well as global role as convener, we envisage the UAE to be at the epicentre of exciting global transformation to spearhead the beneficial impact of the Fourth Industrial Revolution for all.

The journey, however, is a collaborative one which requires intense, focused and sustained efforts across our societies to share a common global vision and strategy and action concerted to build upon our respective advantages, address our vulnerabilities and answer the call of a joint future, towards which we collectively aspire.

I welcome you once again to this opportunity to help shape our common future at the Annual Meeting of the Global Future Councils and leave you with a thought from His Highness Sheikh Mohammed Bin Rashid Al Maktoum: The future belongs to those who can imagine it, design it and execute it.

An agenda for the Network of Global Future Councils

Moving from the challenges of today to the opportunities of tomorrow

Will we be able to harness technology to produce enough food sustainably and preserve the global commons by 2030, allowing future generations to prosper? As intelligent machines are increasingly integrated to the workplace, how can we redesign labour markets to support inclusive societies while enabling the human workforce to realize its full potential? How can we transform current governance models to maximize the benefits while minimizing the risks of the Fourth Industrial Revolution?

When we initiated the Network of Global Future Councils last year, we were guided by the premise that facing these challenges while realizing the opportunities enabled by the Fourth Industrial Revolution demands more integrated thinking and a concerted effort to engage stakeholders from across society in discussions about the future.

It is clear where the journey needs to take us: towards the more inclusive, equitable and sustainable world laid out in the 2030 Agenda for Sustainable Development. Achieving these goals will require bold actions and new partnerships that allow all parties to scale and amplify their

collective impact. At the same time, the world will not stand idle until 2030, and the Fourth Industrial Revolution is set to not only bring about new possibilities to leapfrog, but also accentuate persisting inequalities and generate political dynamics that may make it even more difficult to create progress on shared global objectives.

In this context, the Network of Global Future Councils has an important role to play in advancing three core priorities.

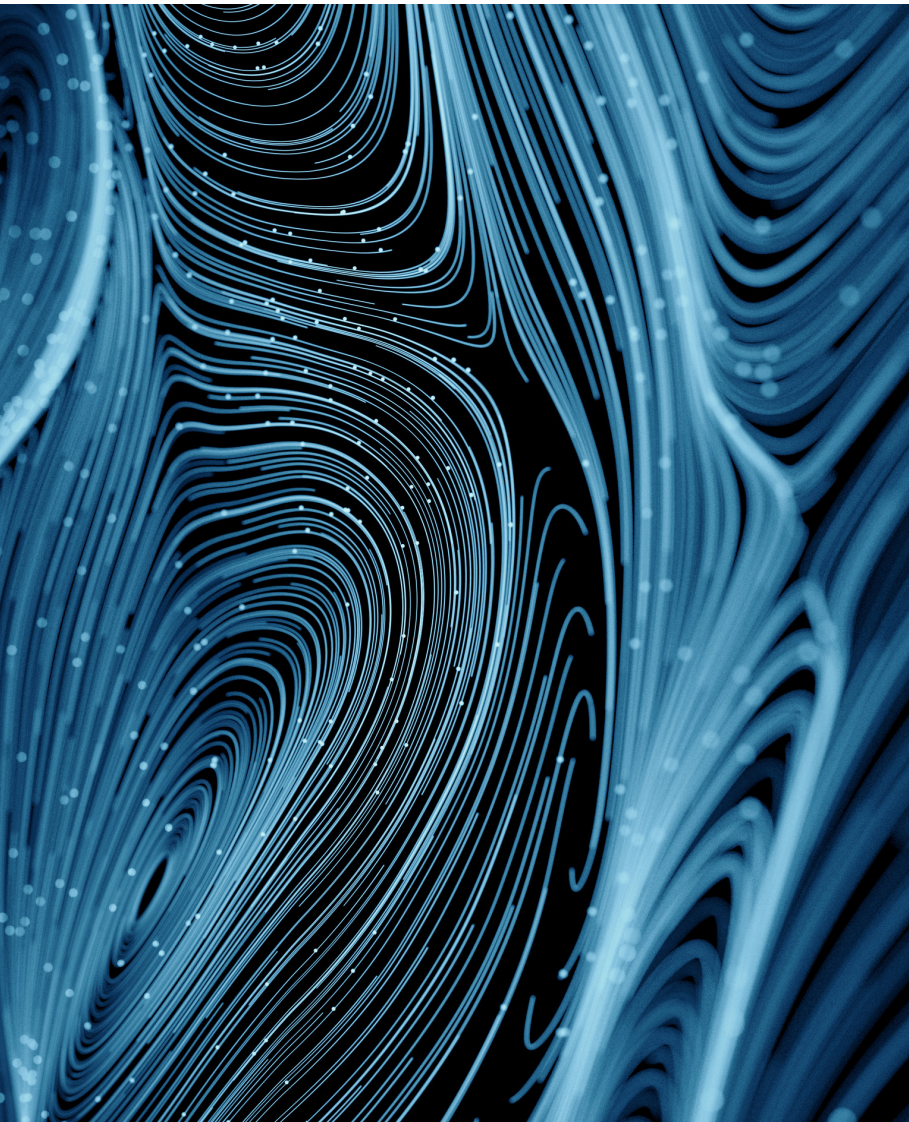
First, the ideas and knowledge of the 34 different councils that make up the network enable us to imagine how systems could work fundamentally differently and, by 2030, create a more sustainable and inclusive world. How do we increase the odds for this to happen? We need to ensure we successfully channel the collective wisdom that all of these different councils generate to create a whole that is more than the sum of its parts. This will allow us to support positive change across systems rather than achieving islands of progress in individual topic areas.

Second, it is crucial that we intelligently leverage the tremendous energy of innovation unlocked by the Fourth Industrial Revolution towards the things that improve the livelihoods of the greatest number of people. To make this happen, we need to ensure that the knowledge this network generates also creates momentum among the many organizations, groups and individuals working on a particular set of issues or potentially transformative technologies and allows them to build on each other to amplify their impact and reach.

Third, we need to ensure that a wider circle of people not only sees the benefits of this transformation, but also feel that they have an active stake and role in shaping it. The political impact of the Fourth Industrial Revolution may well prove to be one of the most challenging aspects to manage in the future. For instance, according to a recent Pew Research Center study on the impact of automation, 76% of Americans expect that “economic inequality will become much worse if robots and computers are able to perform many of the jobs that are currently done by humans.” A similar share (75%) anticipates that “the economy will not create

Stephan Mergenthaler

Head of Knowledge Networks and Analysis,
Member of the Executive Committee
World Economic Forum



many new, better-paying jobs for humans if this scenario becomes a reality.” While other reports, such as the Forum’s Global Shaper survey, indicate much more optimistic views on the impact of technology, experts at the vanguard of these trends have a particular responsibility to make responsible choices and engage with the concerns of the general public.

The task ahead, therefore, is this: Against the reactionary reductionism we see in much of the political discourse today, we need a renewed sense of progressive holism – a capacity to shift the focus of our societies to co-creating the future we want to achieve. This is the aspiration for the Network of Global Future Councils as we convene for the second time in the two-year term of 2016-2018.



See page 32 for more details on the cross-council sessions at the meeting and navigate the full programme on TopLink.

Facilitating transformative system change

Realizing the world we want in 2030

To state the obvious, 2030 is just over 12 years away. By this time, the Global Future Councils anticipate that the planet will be sustaining over 8.5 billion people, more mobile than ever before and many of them living into their nineties. Engaging with intelligent machines will be an unremarkable part of our daily working lives. We will have transformed the fundamental nature of our economies and infrastructure to have relegated carbon-based energy to the dustbin of history and found ways to make zero waste the norm.

Children who are now just entering school will just have reached adulthood. It is a striking parallel for me. For we are looking at a period of rapid evolution in which we need the planet as a whole, every system it hosts and every society that depends on it to undergo the equivalent physical and psychological metamorphosis as that which a child makes into adulthood.

What will it take for us to make this change? First, just as the best physicians understand the human system as a whole, so

will we need to comprehend and appreciate the interdependency of life and all the systems that sustain it; for instance, the impact that the mass production of one crop has on the food system and on the environmental drivers of human mobility.

Second, we need to build systems of our own to support the collective purpose and action needed to change things from the way they are (carbon-based energy) to a new paradigm (carbon-free energy). It is in these kinds of systems that we are most interested: ones that enable us to build and influence networks of change at the intersection of geographies, cultures, generations and occupations.

To do this, we need to articulate a viable and compelling theory of change as well as to engage people in the very practical and technical means of achieving it. It is not enough to master policy and regulation, however hard that will be; we need to engage millions of people in an authentic narrative about the future we wish

to build. This means mobilizing people around a call to action – focusing everyone on an outcome that is challenging but attainable if we work together. And this means doing so in a way that engages our emotions and imagination so that it motivates us to invest the significant amount of time needed to achieve it.

This is systems leadership. It casts aside obsessions of power and territorial control. In the place of zero-sum games and survival of the fittest, systems leadership places emphasis on enabling and connection, on listening and reflection and, most importantly, on learning and intellectual generosity.

It is also a task that demands a new kind of platform – one not based on transactional efficiency at scale or a social network based on hyper-targeted consumerism, but one that is designed and built to enable human connection, learning, iteration and reciprocation across the many silos of expertise, language, age, race and religion that otherwise divide us.

Gemma Mortensen

Co-Founder, More In Common, United Kingdom

John Hagel III

Co-Chairman, Center for the Edge, Deloitte, USA




It would be easy to conclude that we have neither the time nor the wherewithal to invest in both the design and invention of the platforms of the future or the significant inner work that we must do as individuals to ensure that we are ready – morally and dispositionally – to put ourselves at the service of the great challenge and opportunity of our time. The contrary is true: it is not until we invest in a generation of systems leaders and a new generation of the platforms to support them that we will even begin to make progress towards the society we wish to see by 2030 or beyond.



The Global Future Council on Platforms and Systems is exploring the approaches required to fully harness the potential of platforms and systems in addressing the challenges and seizing the opportunities of the Fourth Industrial Revolution. Connect with the council's Co-Chairs Gemma Mortensen and John Hagel to explore these issues in more detail.





The global economy we want to create by 2030 and how we can do it

Diana Farrell

Global Future Council on Economic Progress

The global economy we want to create by 2030 and how we can do it

Why do we need a Global Future Council on Economic Progress?

A puzzle has come into focus in the last 15 to 20 years: to what extent do growth and inclusiveness go together, or come at the expense of each other? Historically, we've assumed that if you get the growth, the inclusiveness will follow; but there are increasing doubts about whether that remains true, at least in some parts of the world.

Those doubts especially pertain to the effects of the Fourth Industrial Revolution on jobs. From self-driving vehicles to home-care robots, machines will become capable of performing tasks ever more efficiently than humans. Is that wonderful, because it takes people out of menial work? Or is it terrible, because it takes them out of work altogether?

We have to assume that further robotization is a given, so the question becomes how we articulate a vision for channelling it in a productive way.



Image: REUTERS/Danish Siddiqui

What are some of the trends that are putting pressure on social inclusion?

We are seeing the impact of long-discussed trends such as demographic changes challenging the sustainability of safety nets, and climate change exacerbating the difficulties of managing scarce resources – including the most basic resources, like clean air, fresh water and energy.

And something is happening politically, which it is crucial that we understand how to address.

People around the world are rejecting the technocratic, managerial approach to politics: there is a deep distrust and anger about political capture, manifesting in many different forms.

Social media is also proving to be a double-edged sword. It has been a boon for social inclusion in some ways, with previously marginalized groups such as LGBT connecting to amplify their voice. But increasingly, people who are physical neighbours can inhabit divergent realities online.



“If we get it right, we will have an economic model in which labour and capital inputs are channelled to drive real productivity growth and innovation in a context that enables everyone to participate.”

Diana Farrell

Chief Executive Officer and President, JPMorgan Chase Institute, USA

How can we amplify the potential of technology to bring people together?

Angela Duckworth, who wrote the book *Grit: The Power of Passion and Perseverance*, has some promising ideas about engaging citizens. We are still in the early stages of figuring this out, but I do believe that the root causes of many of our biggest problems are behavioural – and if we can get on top of ways to shape behaviour, a lot becomes possible.

I anticipate loose coalitions of people, whether organized through social media or other non-state players, becoming ever more important in determining

policy outcomes – along, of course, with the established key players such as governments, Fortune 500 companies and big NGOs.

Where can you imagine we will be by 2030?

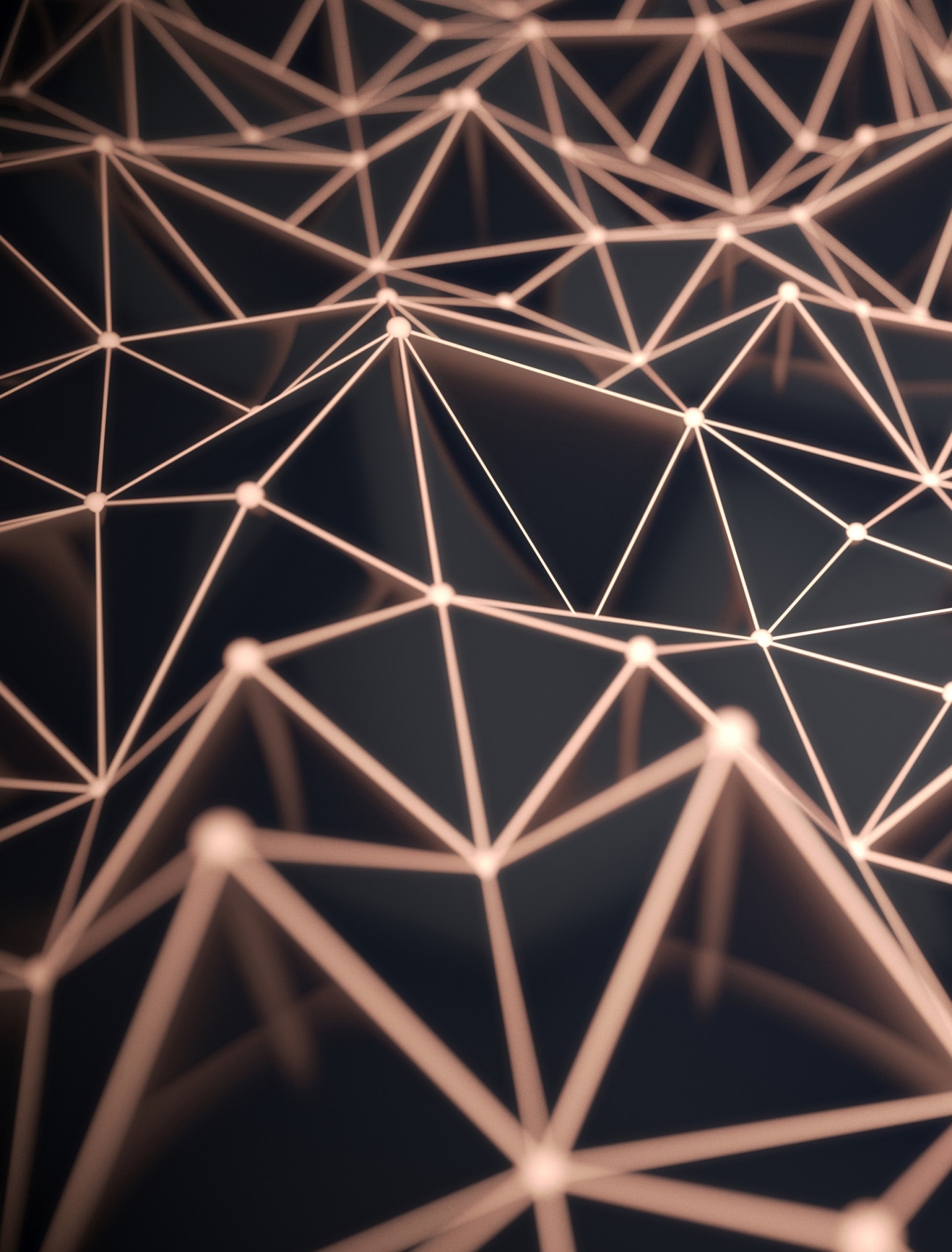
If we get it right, we will have an economic model in which labour and capital inputs are channelled to drive real productivity growth and innovation in a context that enables everyone to participate, including older demographics. Our political systems will have recaptured trust and credibility, and we will have a new understanding of the social contract. We'll have


sustainable economic growth, with the surplus accruing to a much wider base, whether that's through redistribution or some other innovative mechanisms to promote inclusion.

If we get it wrong, the danger is that we end up threatening our economic system rather than fixing it, and the global economy does not deliver on its promise.



Read the full version of this interview and more analysis by the Global Future Council on Economic Progress at wef.ch/gfc





This is how we'll make things in 2030

Subra Suresh
Global Future Council on Production

This is how we'll make things in 2030

Can you explain the critical role of manufacturing and production systems and why it is so important to discuss their future?

The World Economic Forum Annual Meeting 2016 had the theme “Mastering the Fourth Industrial Revolution”. The distinguishing feature of this revolution is the unique convergence of the physical and the biological. So, we have areas like artificial intelligence, machine learning, robotics, computing, mobile technology; they are transforming manufacturing.

It's important that we look at how that impacts employment, how that impacts the disparity between the wealthy, and the middle class, and the lower economic parts of society. Every time we have an intentional use of a technology there are unintended consequences. If we rely exclusively on robots and artificial intelligence, is there a possibility we will cede control to machines? Will we be able to react and correct in a timely fashion so that unintended consequences don't outweigh the intended benefits?



Image: REUTERS/Ben Gruber

Can you describe the impact of emerging technologies on production systems?

Emerging technologies will lead to much more customization, for example 3D printing, advanced additive manufacturing. Then there is data. For an average flight of a Dreamliner, Boeing generates about 1 terabyte of data. The question is, how do you use that information? Can you fix problems in real time?

The other area is healthcare. For a hip or knee implant, we can make a 3D printed part and embed sensors, so it can monitor the gait of the patient. If it is not

usual for that patient, the sensors can immediately transmit some information to his or her doctor. The question is: who has access to this data and what will they do with it?

The last point: General Electric has just established an advanced manufacturing prototype facility in Pittsburgh where they can do what they have been doing using conventional techniques in half the time for half the cost. So then the question of pricing and economics comes up. Will this make things cheaper, or will it make it more expensive because there is so much R&D effort involved?



“There is a broad feeling that, as automated systems become more and more prevalent, there will inevitably be some negative impact on employment.”

Subra Suresh

President-Designate, Nanyang Technological University, Singapore

How will changes in production systems affect job creation? What can be done to counteract any negative impacts of change?

There is a broad feeling that, as automated systems become more and more prevalent, there will inevitably be some negative impact on employment. What is the impact on the minimum wage? What is the impact on unionization and negotiating ability for workers? Will policy be driven more by profit, or will it be driven by technology, or will it be driven equally by social welfare?

With increasing globalization, even if countries close their

borders, individual citizens of the world can engage in commerce across borders.

What will the world's production systems look like by 2030?

It will be much more customized. If you want to buy a car you could choose the material for the body, you can have your choice of engines, you could customize whether it's totally driverless or a partially driverless, self-parking car. There will be a whole range of customization even for items that are mass-produced.


Culturally, the Baby-Boomer generation is very different from Generation X, Generation Y and

especially the Millennial generation, which according to many experts doesn't want to own things, whether it's owning a car or a house. What does that mean for the future of consumerism, which will invariably affect production?

If robots and driverless cars and, in the future, driverless aircraft, trains and other systems, come into existence will that be better for senior citizens, or worse? If children don't take care of their parents, will robots assist senior living?



Read the full version of this interview and more analysis by the Global Future Council on Production at wef.ch/gfc



By 2030, this is what computers will be able to do

Justine Cassell
Global Future Council on Computing

By 2030, this is what computers will be able to do

How is computing changing? What are the forces driving those changes?

Some of the ways that computing is changing now are that it is moving into the fabrics in our clothing and into our very bodies. We are now in the process of refining prosthetics that not only help people reach for something but, in reaching, those prosthetics now send a message back to the brain. The first prosthetics were able quite miraculously to take a message from the brain and use it to control the world. But imagine how astounding it is if that prosthetic also tells the brain that it has grasped something. That really changes the way we think of what it means to be human, if our very brains are impacted by the movement of a piece of metal at the edge of our hands.

How could developments in computing affect industry, governments and society?

First of all, there's really a disruption of all industry sectors. Everything from the information



Image: REUTERS/Shannon Stapleton

and entertainment sectors, that can imagine ads that understand your emotions when you look at them using machine learning; to manufacturing, where the robots on a production line can learn in real time as a function of what they perceive. Imagine a robot arm in a factory that automatically remanufactures itself when the object that it is putting into boxes changes shape. Every sector is changing and even the lines between industry sectors are becoming blurred, as 3D printing and machine learning come together, for example; as manufacturing and information; or manufacturing and the body come together.

What needs to be done to ensure that their benefits are maximized and the associated risks kept under control?

If you think about the future of computing as a convergence of the biological, the physical and the digital (and the post-digital quantum), using as examples 3D printing, biotechnology, robotics for prosthetics, the internet of things, autonomous vehicles, other kinds of artificial intelligence, you can see the extent of how life will change. We need to make sure that these developments benefit all of society, not just the wealthiest members who might want these



“We’re going to see the increasing infusing of computing into all aspects of our lives ... [and] an increasing sense of responsibility on the part of technologists to ensure that those developments are for good.”

Justine Cassell

Associate Dean, Technology, Strategy and Impact, School of Computer Science, Carnegie Mellon University, USA

prosthetics, but every person who needs them.

Some of our first questions in the council will be: How do we establish governance for equitable innovation? How do we foster the equitable benefits of these technologies for every person in every nation? Is top-down governance the right model for controlling the use of these technologies, or is bottom-up ethical education of those who engage in the development of the technologies and their distribution a better way to think about how to ensure equitable use?

What will computing look like in 2030?

We have no idea yet because change is happening so quickly. We know that quantum computing – the introduction of physics into the field of computer science – is going to be extremely important; that computers are going to become really very tiny, the size of an atom. That’s going to make a huge difference; nano-computing, very small computers that you might swallow inside a pill and that will then learn about your illness and set about curing it; that brings together biological computing as well, where we can print parts of the body. So I think

we’re going to see the increasing infusing of computing into all aspects of our lives. If our council has its way, we’re going to see an increasing sense of responsibility on the part of technologists to ensure that those developments are for good.



Read the full version of this interview and more analysis by the Global Future Council on Computing at wef.ch/gfc



This is what artificial intelligence will look like in 2030

Mary Cummings

Global Future Council on Artificial
Intelligence and Robotics

This is what artificial intelligence will look like in 2030

Why should the world care about AI and robotics?

Artificial intelligence and robotics are showing up in every part of life, from driving to the cellphones we use, how our data is managed in the world and how our homes are going to be built in the future. So given its ubiquity, it really is important to start addressing the strengths and limitations of artificial intelligence.

What do you see as the ethical implications of AI and robotics?

We need to be sure that the decision logic that we programme into systems is what we perceive to be ethical and then, of course, that the sensors can actually detect the world as it is. So we're nowhere near letting robots release weapons because their ability to detect a target with a high degree of certainty is not good.

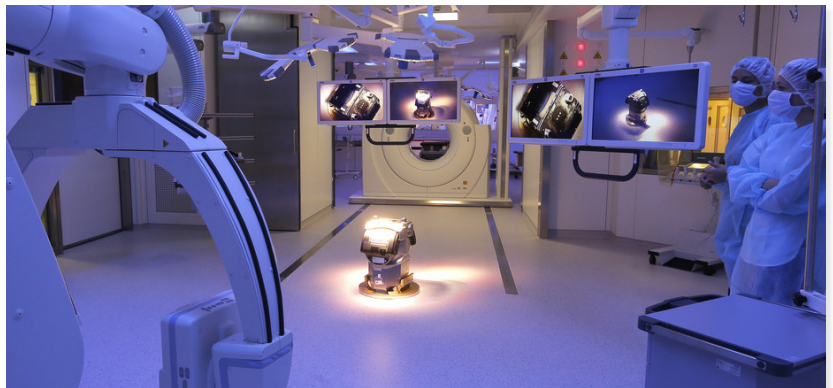


Image: REUTERS/Vincent Kessler

There is a lot of argument right now concerning driverless cars, about how Google has programmed an algorithm to hit a building before it hits a person. It is interesting to think about this idea of utilitarianism; should we go for the greater good, or should we work from the respect for persons approach? Why is it that a pedestrian gets a higher priority than me having to be slammed into a building? I think humans actually can live with the fact that we can be killed by another human driving a car, but we cross some imaginary boundary when we think that it's a computer that decides to take our life over another life.

To what extent are regulations and governance keeping pace with new technologies? What more needs to be done?

In the United States, the regulatory agencies have, in general, not kept pace with the technology. It's becoming even more of a problem now because the government can't hire people who understand how these systems operate under the hood because the systems are largely software-driven.



“Artificially intelligent systems never perform the same way twice, even under the exact same conditions, so how do we test that? How do we know there are any guarantees of safety?”

Mary Cummings

Director, Humans and Autonomy Lab, Duke University, USA

The regulatory environment is going to become more and more contentious. For physics-based systems, like a new physical bomb, we can test that; we understand what the mechanisms are, we can have inspection teams go in. But with software, it is actually very difficult to understand whether or not code is safe and how it works. These artificially intelligent systems never perform the same way twice, even under the exact same conditions, so how do we test that? How do we know there are any guarantees of safety? This is going to become a thornier issue as we go forward.

Where will we be in 2030? How will robotics and AI have changed our lives?

We'll see more technology in terms of smart homes that understand your behaviour and change the heat and do various tasks around the home. You'll see medicine improve. You will see limited driverless car markets that provide some local transport options.

We will live in an improved world but we're also going to have to start grappling with the issues of job displacement, if more and more taxi drivers lose their jobs, if more and more manufacturing

technologies go over to 3D printers and robotics. We're going to see a global shift in low-wage, low-skilled jobs. So in 2030, we're going to have a much bigger debate on what we do with people who need retraining. In concert with that, you're going to see companies held hostage by the need to have hard-to-find roboticists and PhDs in artificial intelligence attend to, maintain and fix these systems.



Read the full version of this interview and more analysis by the Global Future Council on Artificial Intelligence and Robotics at wef.ch/gfc





How youth view 2030

A world of imperfection
and possibilities

The Global Shapers Survey

How youth view 2030

A world of imperfection and possibilities

31,000 respondents from **186** countries and territories.*
This is what they have to say ...

Technology will have a strong impact on our jobs and careers

63% think that the part of their life that will be the **most affected by technology** is their **job and career**

We embrace the positive impact of technology

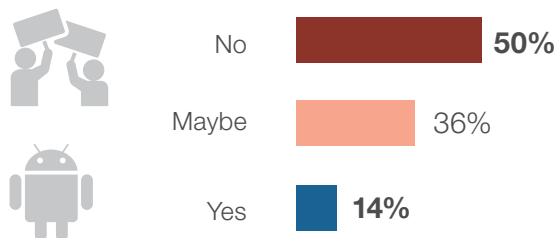
79% of young people say that technology is **creating jobs** rather than destroying jobs



Robots will not take over humans...

Only **3%** strongly agree that they would **trust** decisions made by **robots** on their behalf. In fact, only **14%** would **give** rights to **humanoid robots**.

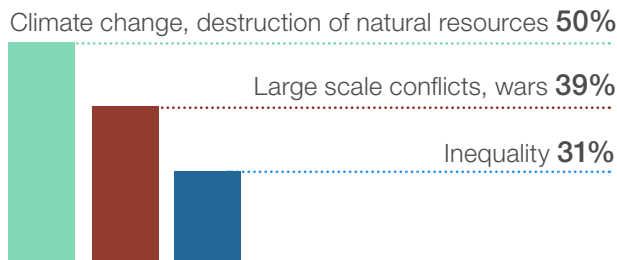
I would support rights for humanoid robots.



Only **24%** of youth would be willing to have an **implant in their brain** or under **their skin** to increase their **capabilities**.

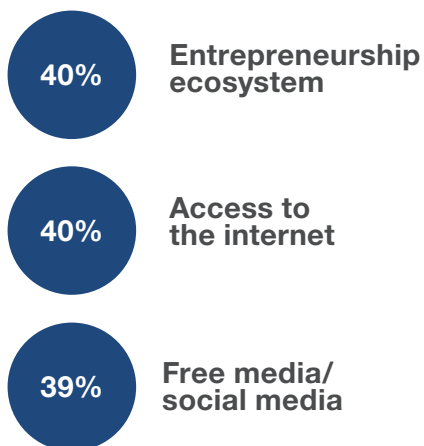
It is time to take our **responsibilities** and act against **climate change!**

50% of young people say that the most **critical issue** to solve is **climate change**



Over **91%** think that **humans are responsible** for climate change

Here is how to empower the young generation



We want to make the world a better place

Over **54%** of young people think that it is **very important** or **extremely important** that their country takes part in addressing **other countries' issues**.



Making the world a better place is the job of **individuals** (34% of votes) and **governments** (29% of votes)

* The World Economic Forum Global Shapers Survey is a yearly initiative to empower the voice of young people across the world. The study explores young people's perceptions of key issues and trends in the global landscape (see www.shaperssurvey.org).

The Network of Global Future Councils

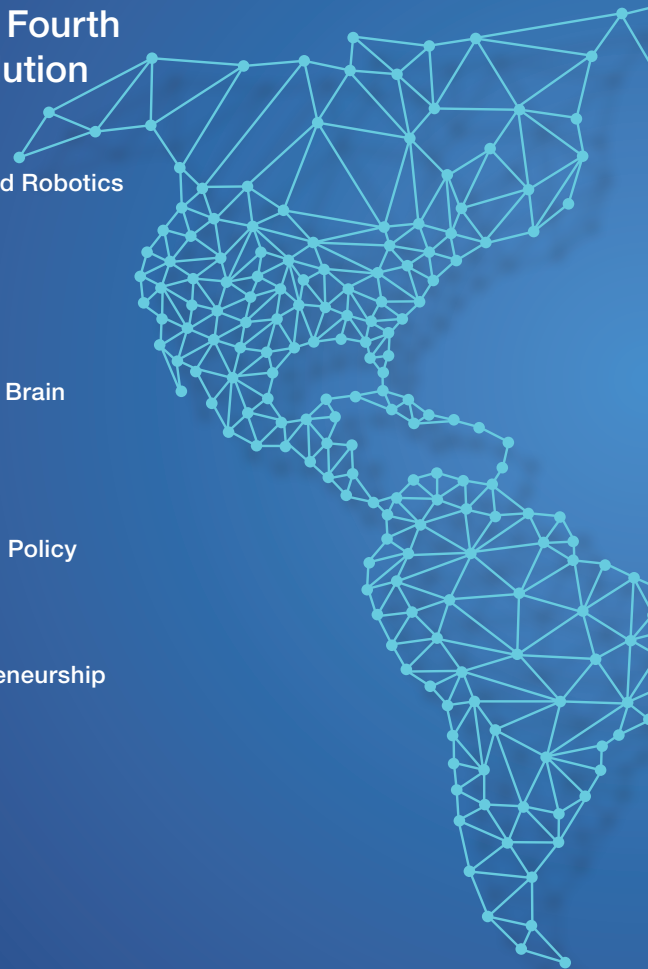
A global network exploring the future of:

Global Systems

Consumption
Economic Progress
Education, Gender and Work
Energy
Environment and Natural Resource Security
Financial and Monetary Systems
Global Food Security and Agriculture
Health and Healthcare
Information and Entertainment
International Trade and Investment
Digital Economy and Society
Long Term Investing, Infrastructure and Development
Mobility
Production
Cities and Urbanization
Humanitarian System
International Governance, Public-Private Cooperation and Sustainable Development
International Security
Migration
Regional Governance
The Fourth Industrial Revolution

Enablers of the Fourth Industrial Revolution

Advanced Materials
Artificial Intelligence and Robotics
Blockchain
Biotechnologies
Computing
Cybersecurity
Neurotechnologies and Brain Science
Space Technologies
Behavioural Sciences
Technology, Values and Policy
Human Enhancement
Human Rights
Innovation and Entrepreneurship
Platforms and Systems



850 members from **74** countries



Vision 2030: A common agenda

Connecting the councils



Ubiquitous Information in 2030

We see a world where ubiquitous information is the new normal. How can we get to a sustainable flow of information and content that will inform, entertain and educate while empowering more prosperous and inclusive economies and societies?



Food Sustainability in 2030

We see a world where we will need to meet the basic nutritional needs of a global population of 8.5 billion. How can technologies ensure that we feed everyone without destroying the environment?



Intelligent Workplaces in 2030

We see a world where intelligent machines will be increasingly integrated in the workplace. How can we redesign labour markets to support inclusive societies while enabling the human workforce to realize its full potential?



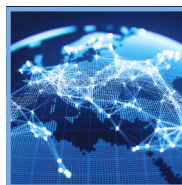
People and Mobility in 2030

We see a world where large-scale human mobility will be increasingly commonplace due to demographic, technological and climate changes. How can we manage human mobility at scale so that it can benefit both people on the move, their places of origin and their destination?



Investment and Infrastructure in 2030

We see a world where the widespread adoption of autonomous transport and additive manufacturing will transform infrastructure needs. How can long-term finance support this large-scale system change in infrastructure?



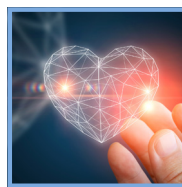
Global Commons in 2030

We see a world where the imperative to preserve and protect the Earth's natural capital while decoupling socio-economic growth from natural resource use is increasingly urgent. How can Fourth Industrial Revolution technologies help address the threats to our global commons?



Energy in 2030

We see a world where decarbonization is at the centre of the energy system. How can technologies and infrastructure needs accompany and accelerate this transition?



Healthy Living in 2030

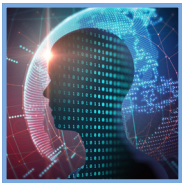
We see a world where personalized medicine and technologies for human enhancement will push average life expectancy beyond 90 years. How can we make sure that we not only live longer but also better and avoid new disparities?

Vision 2030 highlights 10 key areas of convergence between the workstreams across the Network of Global Future Councils. It sets an ambitious common agenda channelling the collective brainpower of the network on issues where collaboration and new technologies could significantly reshape global systems for the better.



Agile Governance in 2030

We see a world where innovative, agile and inclusive governance models are indispensable. How can we transform current governance models to maximize the benefits while minimizing the risks of the Fourth Industrial Revolution?



Ethics and Values in 2030

We see a world where the need for an agreed set of shared values that will guide the development and use of technology is crucial. What values should guide us in making responsible choices not only in the development of technology, but also in the use of technology as a force for good?

During the meeting, members of the network will have the opportunity to further develop this framework to propose actionable recommendations for decision-makers today, with dedicated cross-council sessions for each of these 10 areas:



Articulate and elaborate on the vision narrative

Saturday 11 November 14.00 - 16.00



Identify pathways and barriers to reach this possible future

Saturday 11 November 16.30 - 18.30



Propose actionable recommendations

Sunday 12 November 08.30 - 10.30

Core group only

Beyond the meeting

Annual Meeting in Davos



Use TopLink to navigate the full programme and connect with council members on other themes during the meeting.

Recommended reading

A range of books, articles and white papers by members of the Global Future Councils and from the World Economic Forum further explore the impact of the Fourth Industrial Revolution on global systems.

Books

Scale

Geoffrey West, *Global Future Council on the Future of Cities and Urbanization*

Machine, Platform, Crowd: Harnessing Our Digital Future

Erik Brynjolfsson, *Global Future Council on Education, Gender and Work*
Andrew McAfee, *Global Future Council on Production*

Platform Revolution: How Networked Markets are Transforming the Economy and How to Make Them Work for You
Sangeet Paul Choudary, *Global Future Council on Platforms and Systems*

The City of Tomorrow: Sensors, Networks, Hackers, and the Future of Urban Life

Carlo Ratti, *Global Future Council on Cities and Urbanization*

Machine Ethics and Robot Ethics (The Library of Essays on the Ethics of Emerging Technologies)

Wendell Wallach, *Global Future Council on Technology, Values and Policy*

Between Debt and the Devil: Money, Credit and Fixing Global Finance
Adair Turner, *Global Future Council on Economic Progress*

Edge of Chaos: Why Democracy Is Failing to Deliver Economic Growth—and How to Fix (forthcoming 2018)

Dambisa Moyo, *Global Future Council on Economic Progress*

Articles

What is the role of government in the digital age?

Yasar Jarrar, *Global Future Council on Regional Governance*

Why the middle class can be a weapon against climate change

Homi Kharas, *Global Future Council on International Governance*

This isn't sci-fi: A space-based sharing economy powered by nano-satellites could save humanity

Carsten Stöcker, *Global Future Council on Blockchain*

How leaders can restore faith in the system

Ngairé Woods, *Global Future Council on Technology, Values and Policy*

What nature teaches us about managing risk

William Saito, *Global Future Council on Mobility*

Five reasons not to give up on global trade

Arancha González Laya and Peter Draper, *Global Future Council on International Trade*

Can the digital economy ever be sustainable?

Fung Mei-Lin, *Global Future Council on Digital Economy and Society*

How satellite surveillance is hauling in illegal fishers

Jeff Tarr and Will Marshall, *Global Future Council on Space Technologies*

Pay people a decent wage. The economy can afford it

Sharan Burrow, *Global Future Council on Production*

Only 11% of architects and engineers are women. Let's build a new pipeline for female talent

Naadiya Moosajee, *Global Future Council on Education, Gender and Work*

Five reasons the future of brain enhancement is digital, pervasive and (hopefully) bright

Alvaro Fernandez, *Global Future Council on Human Enhancement*

Technology can help us to save our oceans. Here are three reasons why
Jim Leape, *Global Future Council on Environment and Natural Resource Security*

Additional articles can be found at <https://weforum.org/agenda>

White papers

Realizing Human Potential in the Fourth Industrial Revolution: An Agenda for Leaders to Shape the Future of Education, Gender and Work

Accelerating Gender Parity: A Toolkit

The Future of Humanitarian Response

Value in Healthcare: Laying the Foundation for Health System Transformation

We'll Live to 100 – How Can We Afford It?

Shaping the Future of Production: Four Contrasting Perspectives in 2030



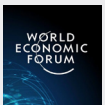









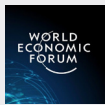



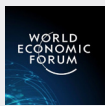

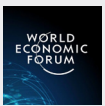

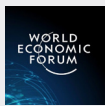

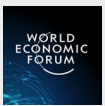





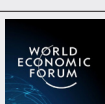

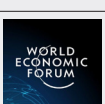









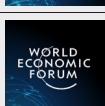

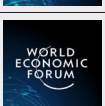

Shaping the Future of Global Food Systems: A Scenarios Analysis

Additional white papers can be found at <https://weforum.org/reports>

Recommended listening

A glimpse into the future: The podcast series of the Global Future Councils

wef.ch/gfcpodcast

| | | | |
|---|---|--|---|
|  Advanced materials Bernard Meyerson |  |  Quantum computing, energy and health Jeremy O'Brien |  |
|  AI and decision-making Bob Goodson |  |  Widespread artificial intelligence Stuart Russell |  |
|  Computing Justine Cassell |  |  Environment and natural resource security Jim Leape and Celine Herweijer |  |
|  Technology and governments Toomas Hendrik Ilves |  |  Specialized robots development and integration Alex Wyatt |  |
|  Cybersecurity Alan D. Cohn |  |  Technology, values and policy Wendell Wallach |  |
|  Autonomous systems Missy Cummings |  |  Migration Khalid Koser, Ratna Omidvar and Yasmina Filali |  |
|  Brain sciences P. Murali Doraiswamy |  |  Neuroeconomics and new neurotechnologies Michael Platt, Nitish Thakor and Neal Kassell |  |
|  Blockchain Jamie Smith |  |  Humanitarian system Peter Maurer |  |
|  Personalized and precision medicine Andre Goy |  |  Digital economy Arun Mohan Sukumar, Marietje Schaake and Richard Soley |  |
|  Robots, society and employment Illah Nourbakhsh |  |  Innovation and entrepreneurship Geoff Mulgan |  |
|  Neurotechnology Tan Le |  |  Global digital evolution Bhaskar Chakravorti |  |

Would you like to be featured in our next podcast? Contact gfc@weforum.org to discuss further.

Mapping global transformations

The collective intelligence of the World Economic Forum and its networks – now accessible to the global public

A public version of the World Economic Forum's dynamic knowledge tool – the Transformation Maps – is being launched at the Annual Meeting of the Global Future Councils 2017. To date, Transformation Maps have only been accessible to the World Economic Forum community. The Forum is now making the wealth of expert knowledge embedded in its networks accessible as a global public good. We encourage you to use the Transformation Maps in your work and share them with your communities.

wef.ch/knowledge





Corruption

Global Issue

Feed Summary

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- Translate to English
- View page source
- Inspect

CORRUPTION ! STOP BESHOWS!



...cash. But cash-based
...evasion and create other costs,
... theft. Not only is the economy impacted,
... disadvantaged populations. For example, merchants
... Bill billion on theft of cash, but the merchants that
... and prop" enterprises. Reducing cash-based
... ; while also improving financial

Unlocking the potential of the Fourth Industrial Revolution

Emerging technologies inevitably have both merits and risks. As with previous technological revolutions, the risks are easier to anticipate (such as impact on jobs). But, the positive impact of the Fourth Industrial Revolution is less clear. Adding to these risks are the strains put on governments. Policies and governance creation was not designed to be as agile as emerging technologies and society need them to be.

For example, according to some estimates, 1.2 billion people lack access to electricity, while many more suffer from supply that is of poor quality. Access to energy is fundamental to improving quality of life. Reliable and secure energy sources underpin many development objectives, although energy flows are difficult to track and new energy markets can be expensive to build. Blockchain could potentially streamline this process.

Policy governing emerging technologies like blockchain is currently piecemeal: some areas are regulated heavily, others hardly at all. Often, mechanisms allowing for policy-makers to interact with people at the cutting edge of research simply do not exist, as they intersect areas that

present challenges for regulatory remit. The extent to which the benefits are maximized and risks mitigated depends on the quality of governance protocols – policies, norms, standards and incentives that shape the development and deployment of these technologies.

Technology regulation developed in silos risks inconsistent applications and unintended consequences. There is a need for a global and trusted space where the world's leading technology companies, dynamic start-ups, policy-makers, international organizations, regulators, business organizations, academia and civil society can collaborate.

The Center for the Fourth Industrial Revolution will develop the agile policy norms and partnerships needed to stimulate the enormous potential of science and technology, deliver rapid growth and generate sustainable, positive impact for all.

It aims to enable the effective deployment of innovation across economic, social and political spheres by developing, piloting and scaling global norms, principles, frameworks and partnerships. Center projects will

all feature a strong science or technology component, strive to generate impact across industries and national borders, and engage multiple stakeholders.

The current projects based at the Center for the Fourth Industrial Revolution include:

Artificial intelligence and machine learning

Exponential increases in computing power and data, and the associated advances in deep learning and neural networks, are creating new opportunities for the application of artificial intelligence across sectors – from medicine, to criminal justice, to manufacturing, to finance. In many ways, these advances are fundamentally changing industries, communities, and even what it means to be human. To accelerate the social and economic benefits of these technologies and address the uneven access to these benefits across society, as well as the many complex questions arising about bias, trust and culpability, this effort will convene diverse stakeholders to develop policy and governance frameworks that will be piloted by governments and other partners around the world. One initial effort is the



Forum's Digital Protocol Network on Artificial Intelligence. *Linked to the Forum's System Initiative on Shaping the Future of Digital Economy and Society*

Digital trade and cross-border data flows

Policy frameworks need to be updated to respond to the opportunities and challenges offered by digital trade, which is nowadays a component of nearly all trade. The Center is catalysing an international multistakeholder effort to develop common norms for the formulation of national policy priorities on the treatment of cross-border data flows, data localization and associated issues. It will partner with national governments to run pilot projects for advancing these norms and iterate based on lessons from implementation. The Center is also supporting Forum-wide case studies and projects with national governments, civil society and the private sector geared towards improving the enabling environment for e-commerce at

both global and local levels. This includes advancing roadmaps for action for regional digital markets where appropriate and exploring cross-regional best practices. *Linked to the Forum's System Initiatives on Shaping the Future of Digital Economy and Society, and the Future of International Trade and Investment*

Blockchain and distributed ledger technology

Blockchain technology has the potential to transform a range of domains from financial and logistical, to governmental and humanitarian. However, unlocking this potential will require engagement by regulatory and public policy voices. By engaging regulatory, legal, technology, commercial, civil society and domain experts, this project will consider the needs of a range of blockchain use cases, exploring where informal governance cooperation and/or new partnerships could facilitate the technology's contribution to progress on specific societal

challenges. These efforts will reveal high-priority blockchain governance needs that cut across multiple applications, allowing the World Economic Forum to drive impact by convening multistakeholder dialogues to develop protocols and frameworks to fill these gaps, and then pilot these products with partner governments. *This is a cross-System Initiative project*

Precision medicine

This effort will explore the opportunities and risks that personalized medicine – and the related effects of big data on health – presents to individuals and society, and then engage with stakeholders to develop protocols and governance frameworks that can ensure the benefits accrue broadly across society and minimize the downside risks. *Linked to the Forum's System Initiative on Shaping the Future of Health and Healthcare*

Internet of things (IoT) and connected devices

Advances in sensor technology, miniaturization, wireless connectivity, and increased data storage and battery capacity have enabled almost any object to become data-generating “things” that can capture and transmit information and, increasingly, interact with their environment. Connected devices are driving disruption across industries, as well as raising new concerns about privacy, security and interoperability. This effort will convene stakeholders to develop and pilot governance frameworks that aim to accelerate the opportunities presented by IoT and address the associated challenges. One initial effort is the Digital Protocol Network on the Industrial Internet of Things (IIoT),

which is building an initial IIoT safety and security framework. *Linked to the Forum’s System Initiative on Shaping the Future of Digital Economy and Society*

Autonomous vehicles

Fully self-driving automobiles are at a critical juncture in their development, with test fleets operating on public roads and citizen trust increasing. Technology is rapidly advancing in crucial areas such as sensors, laser scanners, radar, GPS, image-processing, intelligent algorithms, and AI processing speed. But governments are struggling to keep up and enable the far-reaching benefits of this technology, from reducing traffic and carbon emissions to increasing productivity and mobility options, while grappling

with complex questions of safety and unintended social consequences. This effort will convene stakeholders to develop and pilot governance frameworks and tools that will accelerate the adoption of this technology in ways the benefit society. It will incorporate insights from and build on the Forum’s partnership with the City of Boston on urban mobility. *Linked to the Forum’s System Initiative on Shaping the Future of Mobility*

The future of drones and tomorrow’s airspace

Advances in technology, platforms, availability and affordability have allowed civilian use of unmanned aerial systems to eclipse military use, challenging the response of both regulators and raising issues about human



rights and privacy. The increasing accessibility and flexibility of drones provides opportunities for a wide variety of commercial sectors, as well for humanitarian relief, agriculture, environmental and wildlife conservation, law enforcement, media coverage and scientific research. Policy-makers have been forced to play catch-up, with legislation sparse and uneven, but growing. This reality poses fresh challenges and opportunities to national governments, local municipalities, businesses and individual actors. This effort will convene stakeholders to identify gaps and roadblocks, then develop and pilot governance frameworks and tools that will accelerate the adoption of this technology in ways that benefit society. *Linked to the Forum's System Initiative on Shaping the Future of Mobility*

Fourth Industrial Revolution and the Earth

This effort will look at the potential for harnessing the Fourth Industrial Revolution to improve the global environmental commons, with a particular focus on oceans. Leveraging the extensive US West Coast oceans research and foundation community, it will suggest where further public-private cooperation can help advance the global oceans agenda through an innovative Oceans Initiative to be housed at the Center. In support of the UN Sustainable Development Goals summit on Oceans in June 2017, the effort will focus initially on harnessing the Fourth Industrial Revolution to help governments, companies and NGOs address illegal,

unreported and unregulated fishing – and then broaden into a more comprehensive platform on improving the oceans. *Linked to the Forum's System Initiative on Shaping the Future of Environment and Natural Resource Security*



Flow of engagement

Annual Meeting of the Global Future Councils 2017

Dubai, United Arab Emirates
11-12 November



Develop future scenarios

World Economic Forum Annual Meeting 2018

Davos-Klosters, Switzerland
23-26 January



A global compass to set your year in the right direction

Regional Meetings



Localize your compass

World Economic Forum Annual Meeting of the New Champions 2018

Tianjin, People's Republic of China



Survey the innovation horizon





WORLD ECONOMIC FORUM

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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.

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