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Global Agenda Council on Emerging Technologies[1]

A New Global Centre for Emerging Technology Intelligence

Context

Emerging technologies are critical to long-term global prosperity. They represent the innovation that adds necessary economic and social value to materials, products and processes. And they provide potential solutions to a wide range of pressing global challenges including energy generation and storage, health care, climate change, food security and access to clean water. Yet without better global cooperation on technology innovation, many potential emerging technologies will not mature to the point at which they can be used effectively.

Government and corporate decision-makers are foundering in a world dominated by rapid and unprecedented social and technological developments. They are limited in their ability to anticipate and respond to new developments and they lack the mechanisms necessary to work with non-traditional but increasingly influential stakeholder groups.

Proposal

The Global Centre for Emerging Technology Intelligence will directly address this need. A neutral, transparent and authoritative organization, the Centre's leaders and staff will work with decision-makers at the highest level in industry, government and other organizations in ensuring the best possible tools are available to support the successful and sustainable development and implementation of new technologies.

The mission of the Centre is to ensure that governments, businesses and other stakeholder organizations are equipped to make the most effective use of science and technology innovation in addressing the global challenges of the 21st Century.

Explanation/Rationale

Why a Global Centre for Emerging Technology Intelligence Is Necessary

Science and technology have been at the heart of economic growth, social prosperity and improvements in quality of life for close to ten thousand years. From the agricultural revolution to the information revolution, advances in society around the globe have been underpinned by new discoveries, and their innovative use in new products and processes. Nearly 250 years ago, the invention of the Spinning Jenny vastly increased speed with which cotton could be turned into yarn, revolutionizing the textile industry and helping usher in the industrial revolution. The discovery of penicillin in the early 1900's allowed previously fatal infections to be treated, opening the door to modern surgical procedures. In the mid twentieth century, the invention and subsequent development of the transistor initiated a technology revolution that is still driving economic and social growth. And more recently, innovations in global communication, social networking and information processing have begun to empower global communities in ways unimaginable a few years ago.

Yet despite the clear impact of these and other examples, the continued success of science and technology as an engine for economic and social growth is not guaranteed. Over the past few decades, global economic and social landscapes have shifted radically, leading to new thinking on how to tap into the potential offered by emerging technologies. A growing global population, coupled with a widespread desire for a first-world quality of life, is placing unprecedented demands on resources around the world. Humanity's actions are becoming uniquely entwined in environmental reactions, redefining our relationship with the planet on which we live and depend. And modern communications are making a mockery of geographical and institutional boundaries that have endured for hundreds and thousands of years. These three factors not only place new demands on how emerging technologies are used; they also rewrite the rules for using them effectively.

Recent attempts to introduce genetically modified foods into commerce in Europe provide a sobering lesson in how easy it is to mishandle emerging technologies. Despite little evidence to the contrary, apparent concerns over health and environmental impacts severely retarded the implementation of a technology that could save and improve millions of lives around the world. Yet these concerns were grounded in a backlash against corporate control that cut consumers out of the decision-making process. And through a socially-savvy media, people were galvanized to say "no" to "frankenfoods" – not because of the science and technology, but because of the way they were handled.

[1] The views expressed here do not necessarily reflect those of all the Council Members, nor do they represent an institutional position of the World Economic Forum or its Members.

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Missteps over the development of genetically modified foods are a prominent case among many where the trajectory of a technology has been dictated by social concerns as much as scientific evidence. It is becoming increasingly clear that hierarchical, evidence-based decision-making is not sufficient on its own to ensure the success of new technologies. In part, the situation is exacerbated by peer to peer global communications, where virtual groups can be informed about, motivated by and empowered to take action on emerging issues before institutional decision-makers are even aware there is an issue to respond to. We now live in a world where an incident in China, or the Middle East, can influence attitudes and actions in regions like Europe and the Americas in a matter of minutes through media like FaceBook and Twitter.

The impact on realizing the social and economic potential of new technologies is potentially profound. Established approaches to government and corporate policy-making founder in the new social order, and are limited in their ability to anticipate and guide new developments effectively. They lack the responsiveness, adaptability and foresight to anticipate hurdles to progress, or to work through partnership with non-traditional but increasingly influential stakeholder groups - including consumers.

Yet this disconnect between established policy mechanisms and new approaches to implementing emerging technologies is occurring at a point where future global prosperity is more dependent than ever on new science-based solutions to pressing problems.

Providing people with access to healthy food and clean water; managing climate change and its impacts; treating disease; generating and using energy wisely; coping with pollution—over the next fifty years, global challenges in these and similar areas will reach an unprecedented level. Without rapid and targeted advances in science and technology, humanity will not be able to face them without paying a large price. Now, perhaps more than at any time in history, we need the tools that science and technology provide to face an uncertain future. And just as the challenges are global in scope, so the solutions will need to be global in reach.

In emerging areas such as nanotechnology, synthetic biology and geoengineering, there is growing awareness that a new paradigm is needed if the technologies are to be developed effectively—one that predicts and avoids potential hurdles, develops and implements new technologies in partnership with multiple stakeholders, identifies and addresses possible health and environmental impacts before they occur, and responds rapidly to new developments. Yet there is a gaping chasm between the knowledge that a different approach to policy-making is needed, and an understanding of what this new approach should look like.

This is the gap that the Global Centre for Emerging Technology Intelligence will fill. Working with decision-makers at the highest level in industry, government and other organizations, it will aim to ensure that decision-makers have the best possible tools at their disposal to ensure the successful and sustainable development and implementation of new technologies.

The Goals of a Global Centre for Emerging Technology Intelligence

- **Be an authoritative and neutral source of intelligence on emerging technologies and the opportunities and challenges they raise**
  The Centre will work towards becoming the premier go-to source of information on emerging technologies for decision-makers, the media and the public. This will be achieved through developing a global network of experts on emerging technology policy, potential and risks, building in-house expertise, producing high value/high impact products and working closely with the media. The Centre will also promote accessibility, inclusiveness and strategic partnerships in an attempt to bridge divides that can characteristic advance technologies.

- **Provide timely information on emerging opportunities and challenges**
  The Centre will develop in-house expertise in identifying, evaluating and assessing new opportunities and challenges related to emerging technologies. Assessments of emerging issues will be published and made publicly available on a regular basis.

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- **Bring senior stakeholders together to identify emerging issues**
  The Centre will bring high-level experts and decision-makers together on an annual basis to identify emerging issues and inform a rolling two-year programme of targeted projects.

- **Publish targeted research, analysis and recommendations**
  Based on a two-year strategic plan, the Centre will publish analyses and recommendations on key emerging technology issues.

The Impact of a Global Centre for Emerging Technology Intelligence

Many emerging technologies result in a polarized debate between those who have a vested interest in developing the technology (academics seeking funding, early investors, consultants seeking to develop new markets) and those wishing to maintain the status quo (technology-suspicious NGO's, conservative religious organizations or consumers who are distrustful of technology). Instead of a rational debate about the benefits and risks, new technologies are presented as either having the ability to usher in a techno utopia or the potential to destroy the world. For policy-makers and businesses alike, the clear perspective they need on benefits and challenges ends up buried by an avalanche of poorly informed opinion.

The most significant impact of the Centre will be to provide clear, impartial, understandable intelligence on emerging technologies that will allow decisions on technology policy and deployment to be taken earlier, and to be based on science fact not science fiction. This will lead to:

- Awareness of and clarity on emerging technology policy opportunities and challenges
- Informed and responsive decisions on emerging technologies
- Faster and more effective technology transfer
- Increased use of evidence-based and socially responsible decision-making
- Better-informed investors and the use of new investment models
- Sustainable emerging technology-based solutions
- Socially responsive emerging technologies
- Responsive and relevant oversight
- Effective use of emerging technologies in addressing global challenges

Activities

At the heart of the Centre's activities is an annual meeting of high level decision-makers and thought leaders from government, industry, academia and civil society, brought together to explore needs, barriers and solutions to developing and using emerging technology.

The outcome of this meeting will be a series of actions that are specific, relevant, have the support of key stakeholders, have a measurable impact, and are implementable within a 12-24 month time period.

Examples of possible actions include evaluating the social and economic potential of specific emerging technologies within different economies, developing new approaches to technology transfer, providing horizon scanning assessments of emerging technologies, developing new partnership models for technology development and implementation, and implementing innovative new ways to stimulate the use of emerging technologies in addressing global challenges.

Next Steps

Year One
1. Establish and implement the governance structure for the Centre
2. Establish a communication and engagement infrastructure.
3. Engage with relevant bodies (governmental, NGO, regulatory, scientific etc) on a global and regional basis
4. Host a first Centre for Emerging Technologies Intelligence Retreat
5. Develop a two-year action plan based on the recommendations and conclusions of the Retreat

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Year Two
1. Implement the action plan arising from Retreat, focusing specifically on horizon scanning, analysis and communication
2. Engage with governmental, NGO, regulatory, scientific, etc.) on a global and regional basis
3. Host second Centre for Emerging Technologies Intelligence Retreat
4. Review and develop the two-year action plan based on the recommendations and conclusions of the Retreat

Year Three
1. Implement the action plan arising from Retreat, focusing specifically on horizon scanning, analysis and communication
2. Host third Centre for Emerging Technologies Intelligence Retreat
3. Review and develop the two-year action plan based on the recommendations and conclusions of the Retreat
4. Ramp up communication and outreach programme, based on the first two years' work of the Centre
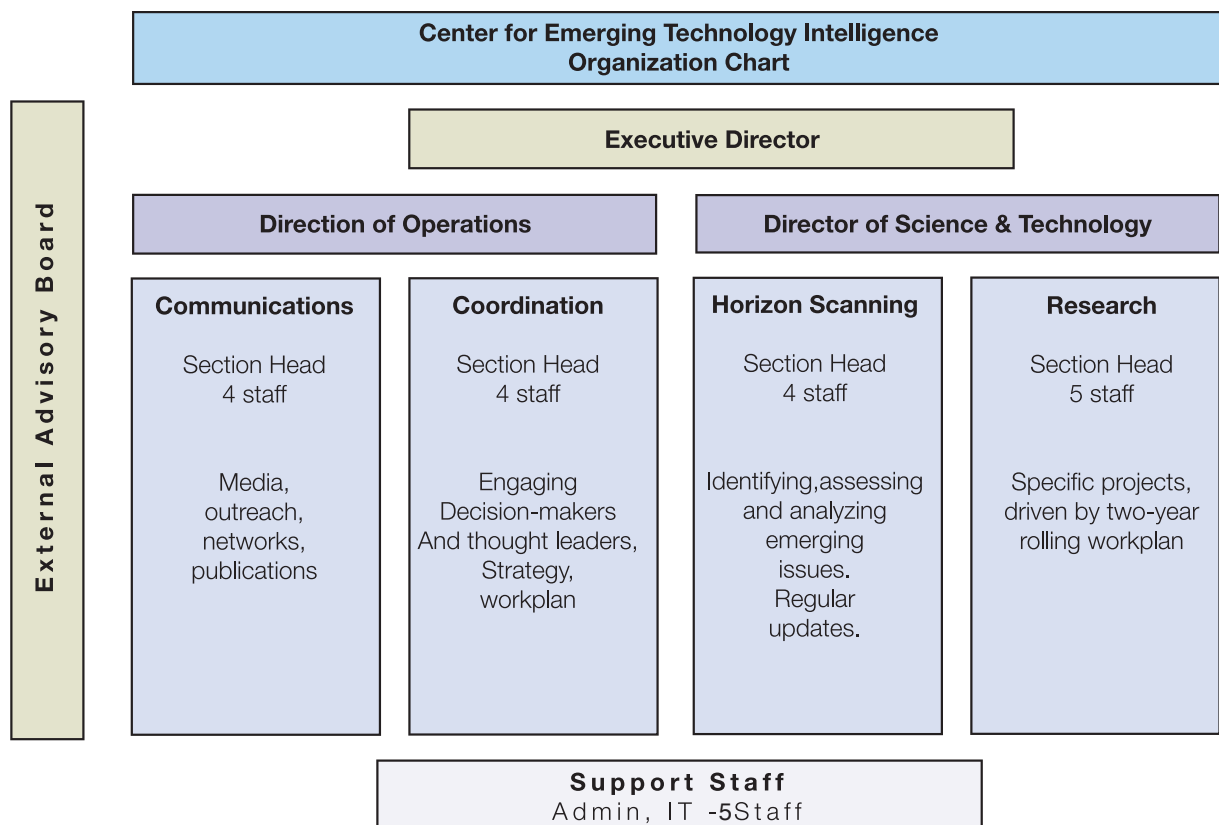
Management
The Centre will be managed by an Executive Director, supported by a Director of Operations and a Director of Science and Technology. The activities of the Centre will be grouped into four areas,
1. **Communications** – ensuring that the work of the Centre is widely disseminated, building and maintaining networks in the science, business, government and NGO communities and managing publications and electronic information.
2. **Coordination** – managing the annual Centre for Emerging Technologies Intelligence retreat, developing work plans, ensuring targets and budgets are met, managing databases and web sites and developing the overall strategy of the management of the Centre.
3. **Horizon Scanning** – identifying, assessing and analyzing issues surrounding emerging technologies, and providing regular updates to all other departments as well as to partners and stakeholders.
4. **Research** – In depth analysis and specific projects driven by the Centre's two-year work-plan.

Table 1 Organization Chart

The Centre will be overseen by an External Advisory Board to ensure appropriate governance. The External Advisory Board

Center for Emerging Technology Intelligence
Organization Chart

External Advisory Board	Executive Director	
	Direction of Operations	**Director of Science & Technology**

	Communications	Coordination	Horizon Scanning	Research
	Section Head 4 staff	Section Head 4 staff	Section Head 4 staff	Section Head 5 staff
	Media, outreach, networks, publications	Engaging Decision-makers And thought leaders, Strategy, workplan	Identifying,assessing and analyzing emerging issues. Regular updates.	Specific projects, driven by two-year rolling workplan

Support Staff
Admin, IT -5Staff

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will be drawn from a wide range of stakeholders, governments, industry, financial institutions and academics, and is a core part of the Centre's remit to be both neutral and technology-agnostic.

While the role of the External Advisory Board will be purely advisory, the centre will also appoint a board of trustees in order to ensure that the Centre is immune to any political or business interests. The chair of the board of the trustees will also sit on the Centre's management board.

Defining the Scope of the Centre

Everyone has their own list of urgent global problems that need to be addressed, and the number of emerging technologies is as much a matter of nomenclature as new science. As such the number of possible interactions is almost infinite. To avoid a diffuse and ineffectual focus, the Centre will work with partners and stakeholders to ensure the most pressing and relevant issues are addressed.

As a starting point it is proposed that the Centre will concentrate on two areas of emerging technology; one that is already finding its way into consumer products and industry across the globe, and another that although in its early stages is expected to raise a wide range of moral, ethical and legal issues. These two focus-technologies come under the broad banners of 'nanotechnologies' and 'synthetic biology.'

Other emerging technologies and related issues will be added to the overall scope of the Centre as appropriate and following recommendations from the annual retreat. In addition, the Centre will develop horizon-scanning functions that identify and, if necessary, pursue rising emerging technologies-based issues deemed to be of significance.

Staffing

Initial staff will consist of an interim Executive Director, a Director of Science and Technology, two analysts and an administrative assistant. These will be supplemented by other managerial staff within six months.

Staffing will rise to ten full time equivalent (FTE) staff within the first year and reach twenty six FTE by the end of year three. As the Centre will be aiming to recruit the best and most effective staff, some of which will require a period to transition from existing commitments, it is envisaged that a number of post will be filled on a part time or pro rata basis during the first year of operation.

A number of other functions such as IT, public engagement and events may be outsourced to local partners depending on location.

Location

The location of the Centre is still to be negotiated. The location requirements are for good transport infrastructure, including access to major air routes, and the ability to attract staff of the highest calibre. The location will also have a significant effect on the overall budget.

Funding

An indicative budget for the first three years is given below based on international salaries and benefits, anticipated travel and infrastructure requirements (office space, IT etc).

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Table 2 Annual Budget (US$'000)

	Year 1	Year 2	Year 3	Total
Staff Costs	$4,574	$5,543	$17,359	$7,241
Travel	$851	$973	$1,062	$2,886
Infrastructure	$373	$373	$373	$1,118
Total	**$5,798**	**$6,888**	**$8,676**	**$21,362**

Table 3 Staffing

Staff Numbers	Year 1	Year 2	Year 3
Directors	**2**	**3**	**3**
Other	8	18	23
Total	**10**	**21**	**26**

Table 4 Travel Budget (US$ '000)

	Year 1	Year 2	Year 3
Annual Retreat	$250	$250	$250
External Advisory Board	$50	$50	$50
Directors	$185	$185	$185
Other Staff	$86	$168	$228
Total	**$571**	**$653**	**$713**

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List of Members

Chair: **Christopher B. Murray,** Richard Perry University Professor of Chemistry and Materials Science, University of Pennsylvania, USA

Gabriel Aeppli, Director, London Centre for Nanotechnology, United Kingdom

Bai Chunli, Vice-President, Chinese Academy of Sciences, People's Republic of China

Giovanni De Micheli, Professor and Director, Institute of Electrical Engineering and of the Integrated Systems Centre, Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland

Christoph Gerber, Director, Scientific Communication, National Center of Competence in Research 'NCCR' Nanoscale Science, University of Basel, Switzerland

Tim Harper, Chief Executive Officer and President, Cientifica, United Kingdom

Annabelle Hett, Head, Swiss Re Centre for Global Dialogue, Swiss Re, Switzerland

Thembela Hillie, Principal Research Scientist, Nanoscience Research Group, South Africa

Rüdiger Iden, Senior Vice-President, Polymer Physics, BASF, Germany

Raghunath A. Mashelkar, President and Bhatnagar Fellow, National Chemical Laboratory, India

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Andrew D. Maynard, Director, Risk Science Center, University of Michigan School of Public Health, USA

Matthew M. Nordan, Vice-President, Venrock, USA

James Wilsdon, Director, Science Policy Centre, Royal Society, United Kingdom

Jackie Y. Ying, Executive Director, Institute of Bioengineering and Nanotechnology, Singapore