



CONTROLLING THE GENIE OF EMERGING TECHNOLOGIES

SIX STEPS TO MITIGATE RISKS CREATED BY INNOVATION

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Innovation is vital to progress. Advances in science, and the new technologies flowing from them, have propelled economic and societal development throughout history. Emerging technologies today have the potential to further increase global prosperity and enable us to tackle major challenges.

But innovation also creates new risks. Understanding the hazards that can stem from new technologies is critical to avoiding potentially catastrophic consequences. The recent wave of cyberattacks exemplifies how new technologies can be exploited for malicious ends and create new global threats. Risk governance needs to keep pace with scientific advances. (See Exhibit 1.)

What is the next technology innovation that could create significant new threats? Synthetic biology and artificial intelligence are two examples of emerging technologies with the potential to deliver enormous benefits but also present significant challenges to government, industry, and society at large.

Take synthetic biology: Creating new organisms from DNA building blocks offers the potential to fight infectious disease, treat neurological disorders, alleviate food security, and expand biofuels. The flipside is that the genetic manipulation of organisms could also result in significant harm, through error or terror. The accidental leakage of synthesized organisms, perhaps in the form of unnatural microbes or plant mutations, could lead to unintended consequences, such as the rise of new diseases or a loss of biodiversity. Bio-terrorism threats could emerge from organized groups or lone individuals in the growing “bio-hacker” community, were they able to access synthetic biology inventions online or spread organisms of their own.

THE DOUBLE-EDGED SWORD OF ARTIFICIAL INTELLIGENCE

Artificial intelligence (AI) also presents a double-edged sword. Advances in AI can increase economic productivity, but at the same time, they may also result in large-scale structural unemployment, leading to serious social upheaval. AI developments raise new questions about accountability and liability: Who is to be held accountable for decisions made by self-driving cars, in cases where the choice is between harming a pedestrian versus a passenger? (See “Self-Driving Freight in the Fast Lane,” on page 88.)

We need to set a course for rigorous risk governance of emerging technologies

Similar challenges need to be confronted given the rapid growth of unmanned aircraft systems (or drones). (See “Commercial Drones,” on page 84.) Looking into the future, some have even posited that the achievement of “the Singularity,” the point at which machine brains surpass human intelligence, would present an existential threat to humanity.

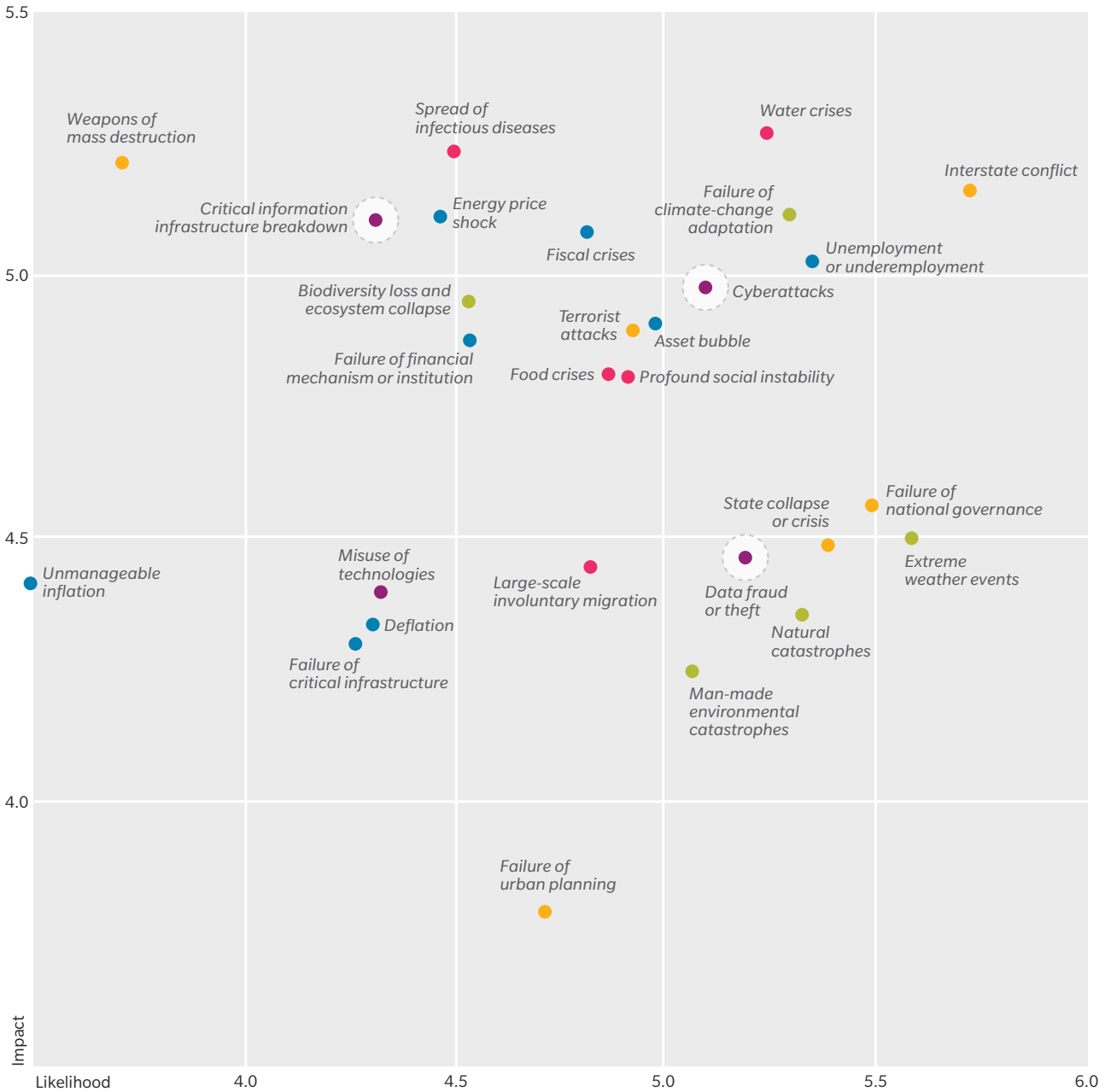
Risk governance for these and other emerging technologies is challenging. Many institutions and communities are engaged in research and development, and the pace of innovation is accelerating. National legal and regulatory frameworks are underdeveloped, so certain topics and techniques escape scrutiny by not

EXHIBIT 1: GLOBAL RISKS LANDSCAPE 2015

THE POTENTIAL IMPACT AND LIKELIHOOD OF GLOBAL RISKS OVER THE NEXT 10 YEARS

For the *Global Risks 2015* report (published by the World Economic Forum in collaboration with a group of partner organizations, including Marsh & McLennan Companies), 900 risk experts representing business, government, non-governmental organizations, research institutions, and the academic community selected, out of a group of 28 global risks, the ones that will be of greatest concern over the next 10 years. These pages summarize the results.

On the left lies the full gamut of risks. Note that three technological risks – cyberattacks, data fraud or theft, and critical information infrastructure breakdown – are among those considered to be of greatest concern.



Source: *Global Risks 2015*: Tenth edition, World Economic Forum and partners, including Marsh & McLennan Companies. Oliver Wyman is a division of Marsh & McLennan Companies

GLOBAL RISKS BY CATEGORY



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being specified. Institutions that are meant to provide oversight struggle to cope with advances that cross departmental jurisdictions and, short on resources, are often unable to assess risks with the rigor they demand.

At the international level, weaknesses also exist. For example, the Cartagena Protocol on Biosafety provides guidelines on the handling and transportation of living modified organisms, but not their development. The United Nations Convention on Biological Diversity addresses synthetic biology, but the resulting agreement is not legally binding. A current live concern is that large-scale international negotiations such as the Transatlantic Trade and Investment

Partnership (TTIP) may inhibit new governance proposals and influence global norms in pursuit of open markets and more streamlined regulation.

A WAY FORWARD

Is there a way forward, and if so, what is it? Realizing potential benefits from emerging technologies requires a willingness to accept risk. But this risk must also be managed, to avert disasters. Governance and control frameworks need to be reinvigorated, and accountability needs to be clearer. I recommend six actions:

Understanding the hazards that can stem from new technologies is critical

1. As emerging technologies affect more people than just the users of the technology, we need a more energetic dialogue around risk governance priorities that involves a broad range of stakeholders. Innovators, industry more broadly, governments, regulators, and the public must all be consulted to create greater buy-in and better considered regulation.
2. Research related to risk governance needs to be given a higher priority and more funding. Institutions responsible for oversight must have the capacity to explore areas of concern more deeply and to be able to engage effectively with innovators.
3. Broader disclosure standards are crucial to allow deeper risk assessment, determine controls, and build trust. We need to find the right balance between confidentiality and transparency. Intellectual property rights should not be used to restrict access to information needed for appropriate risk regulation. Producers should be more transparent, so that regulators can prepare effective regulation. Regulators should also be transparent, so that developers know as early as possible which kinds of applications will be prohibited.
4. We need to close regulatory gaps in those areas that present the greatest risk, and set out clear compliance and liability expectations. At the same time, regulation should become more adaptable to new developments. Regulatory systems should build in more intelligent decision gateways and evolve in the light of new knowledge or technological advances, which may lower risk in some areas and increase it in others.
5. International discussions between governing institutions need to move beyond principles to more binding protocols. This is critical for preventing the flow of emerging technology risks across borders, which is all too easy in today's global economy.
6. At the same time as we improve regulation, we need to promote a culture of responsibility around innovation – to encourage more self-policing among innovators and de-glamorize hackers. Deep commitment from the sector will help build and maintain a platform of trust vital for achieving the potential of scientific and technological advances.

Innovation must be encouraged, but we need to set a parallel course for rigorous risk governance of emerging technologies. It is much better to confront difficult issues now than endure an incident with disastrous consequences later. As we know all too well, history is littered with risk mitigation measures that proved ineffective because they were put in place too late.

John Drzik is President of Global Risks and Specialties at Marsh. Marsh, like Oliver Wyman, is a division of the Marsh & McLennan Companies, which contributed to the World Economic Forum's *Global Risks 2015* report.

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