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EDITORIAL

Prospects and challenges: Introduction to the special issue on "Global governance of emerging technologies"

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"The past is never dead. It is not even past."

—William Faulkner (1951, p. 73)

Appealing for the global governance of emerging technologies contains two assumptions: one is that emerging technologies possess potential far-reaching effects, both of a desired positive nature and an unwanted negative sort. The second is that a pervasive and persistent discourse of uncertainty against risk (Beck, 1992) poses risk as "calculable" and "controllable" and therefore makes it seems less threatening than uncertainty, which in turn is defined as "incalculability and hence uncontrollability," and thus equates it with "danger" (Nowotny et al., 2001, pp. 33–34). Indeed, the development trajectories of emerging technologies are unknown, and so are their wide-ranging consequences, intended or unintended (Xue & Wang, 2021). These, combined with the bounded rationality of human beings, pose profound challenges for policymaking and demand cooperation at the global scale. For nations with deep-rooted traditions of long-term science and technology (S&T) planning, this challenge is even more daunting as the situation can change dramatically, and predictions can go significantly astray. In this sense, self-governance of the scientific community is far from sufficient for securing the outcomes and uses of emerging technologies in the public interest (Chubb et al., 2019; Kaiser & Moreno, 2012).

Meanwhile, amid the escalating global competition of S&T and innovation-driven economic development, the pursuit in emerging technologies has been arousing growing interests from scientists and capturing the attention of policymakers (Cao, 2021; Gao et al., 2019; Yu et al., 2021). Take synthetic biology as an example. Anticipating the tremendous benefits as well as potential safety and security

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concerns associated with it, many countries have invested lavishly (Gómez-Tatay & Hernández-Andreu, 2019; Kuzma et al., 2018). Similarly, over 60 international reports on human heritable germline editing were published during the period of 2015–2018 (Brokowski, 2018). In the artificial intelligence domain, the war for talent and investment has been raging among world leaders (Jobin et al., 2019; Liu et al., 2022; Savage, 2020). Yet the academic discussion on emerging technology governance is still in its early stages. Our knowledge about the global coordination of governing emerging state-of-the-art technologies remains very limited. This is interesting given that emerging technologies offer unprecedented opportunities for scientific discovery as well as bringing enormous challenges to human beings (Tang, 2021).

To fill some of the gaps in the literature, *Global Public Policy and Governance* launched this Special Issue, "Global governance of emerging technologies: prospects and challenges." It includes four articles plus a book review. The contributors consist of both promising young researchers and established scholars working on different specialties: law; public policy; science, technology, and society; and S&T policy. Each article focuses on one specific domain of emerging technologies to investigate the issue of governance on both national and international agendas. Combined, their findings shed some light on the challenges, tangible solutions, and prospects for governing emerging technologies globally.

The central statement of the first article, "Governing emerging technologies—looking forward with horizon scanning and looking back with technology audits," is that for better and adaptive policy making and implementation, governing emerging technologies needs both looking forward (i.e., anticipatory governance) and looking backward (i.e., technology audit). In this paper, Henry T. Greely starts with four stages of policy responses to new technologies: initial recognition of possible new tech, preliminary assessment, policy making on adoption and regulation, and monitoring the actual effects of new technologies. Among them, he identifies a research gap in the extant scholarly discussion: less attention paid to stages one (prediction) and four (monitoring). Greely then purposefully selects the illustrating case of human germline genome editing and proposes establishing and motivating a Horizon Scanning Group and Technology Audit Group for better governance. Greely argues that as human beings rather than Tralfamadorians (Vonnegut, 1969), our inability to make accurate predictions suggests that governing new technologies requires both a precautionary forward-looking approach and a backward-auditing mechanism. This echoes Collingridge's dilemma justifying the idea of having professional groups of both horizon scanning and tech auditing (Collingridge, 1980). Greely does not stop with bold suggestions; he also notes that making the proposal operational across various technological domains and regulatory agencies and making practice nimble with different scales and levels of governance are the keys to achieving effective global governance (Chubb et al., 2019).

The second article, "Global digital governance: Paradigm shift and an analytical framework," by Shaowei Chen and Kai Jia, represents an effort to (re)conceptualize a framework of global digital governance. The ubiquitous use of the Internet, and especially the rising significance of mega digital platforms, has been intensifying the tensions between different stakeholders, especially between platforms and

regulators, non-government organizations, and users who have shown declining trust toward digital technology, within a state, and between sovereign states and global governance bodies. Therefore, according to the authors, there is not only an urgent and acute demand but also a necessity for the governing regime to move away from a *laissez-faire* accommodation to the institution toward more regulations and control. As a result, the focus of global digital governance is no longer merely innovation and free speech but privacy, competition, taxation, and democracy, all of which largely had been ignored. Characterized by laws and regulations, this new paradigm of governance also has rendered the European Union, formerly a secondary player in the game of innovation, powerful and influential. The authors further develop an "issue-actor-mechanism" framework for global digital governance, in which governance goes beyond the issue of national sovereignty, includes multiple stakeholders, and entails both formal and informal mechanisms.

In the third article, "Implementing responsible research and innovation: A case study of U.S. biotechnology oversight," Jennifer Kuzma aims to address two crucial issues of governing emerging technologies through the lens of U.S. biotechnology oversight. The first one comprises factors inhibiting the implementation of responsible research and innovation (RRI), while the second involves tangible solutions for getting RRI to function well. Drawing insights from three policy process theories—a multiple streams approach, punctuated equilibrium theory, and advocacy coalition framework—Kuzma explores RRI implementation barriers from macro-, meso-, and micro levels. She argues that institutionalizing RRI for emerging technologies demands the support of funding from the public sector. But this alone is insufficient. Taking the macro-level socioeconomic and political forces into consideration, she proposes six strategies to place and prioritize, if possible, RRI on the policy agenda setting for the U.S. biotechnology innovation system, which also has implications for the U.S. and other countries in dealing with the governance of emerging technologies in general.

Probably the hottest among emerging technologies, artificial intelligence (AI) has drawn enormous attention from the scientific and policy communities, which have taken a variety of approaches to assessing the technology's advantages and benefits and to debating its possible challenges. In the fourth article, "Emerging technology for economic competitiveness or societal challenges? Framing purpose in artificial intelligence policy," Inga Ulnicane studies AI from the two frames of technology policy: economic competitiveness and societal challenges. Through a careful examination of AI strategies, reports, and policy papers produced by national governments, international organizations, consultancies, and think tanks in the European Union and the United States from 2016 and 2018, she finds evidence of both convergence and divergence between the two frames of technology policy pertaining to AI and points out that the policy documents should be more explicit.

Not only must technology governance coevolve with new contexts (i.e., new technologies and globalization), so must public administration theories. Zooming in on public value theory, Hong Mei and Yueping Zheng write a review of *Public Value and the Digital Economy*, by Usman W. Chohan, whom they say is the first to apply the public value theory to the study of the digital economy. The digital economy must engage various stakeholders—politicians, civil society, and the private

sector—to co-create value, while the introduction of (virtual) public managers into the process seems to be critical. While the reviewers agree with Chohan that in the pandemic-catalyzed "digital present" public managers must deploy the "value-seeking imagination," they also tackle the limitations of the book, especially ambiguous definitions of "public value," a lack of empirical evidence to deliberate the digital economy's ability to co-create value, and the generalization of the findings from developed countries to those of emerging economies that have been on a rapidly rising trajectory in developing the digital economy despite their different political, cultural, and social institutions. The review fits nicely into the Special Issue as a complement to its theme.

Indeed, the global governance of emerging technologies faces great challenges on numerous fronts. In addition to their impacts and uncertainty, technologies themselves have raised legal, ethical, political, and economic questions, which also matter a great deal for effective international cooperation in their governance. Falkner and Jaspers (2012) argue that decisions about whether to rely on existing laws, regulations, and codes or promulgate new regulations versus whether to opt for a technology-focused regulatory system or reckon on sector-based or product-specific regulatory regimes must be made at the national level. Beyond national boundaries, other important elements shaping the discourse of global technology governance include political conflicts, national R&D preferences, various risk perceptions, different extents of market maturity, and competing societal values. Engaging technologically less-developed countries, strengthening governance capacity building in anticipatory governance (Guston, 2014; Nelson et al., 2021) and technology auditing, and promoting trust among diverse stakeholders globally are key factors to achieving effective and sustainable global governance of emerging technologies for socially desirable outcomes.

In summary, determining how to ensure that agreed-upon terms and codes are deployed in an unbiased manner and how to translate these principles into operational practices in and across different contexts yields additional directions for future research. Yet emerging technologies are moving targets (Rotole et al., 2015), and so is the global governance of these technologies.

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Declarations

Conflict of interest The authors declare that they have no conflicts of interest to report.

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