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# STANDARDIZING THE FUTURE

## How Can the United States Navigate the Geopolitics of International Technology Standards?

Giulia Neaher | David A. Bray | Julian Mueller-Kaler | Benjamin Schatz

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# EXECUTIVE SUMMARY

Standards for data and technology represent a key part of the world's digital ecosystem, and as such, they can have significant implications for geopolitics. This report, published in partnership with the American Edge Project,[1] endeavors to study the geopolitical dynamics surrounding technology standards setting to better inform related US policy. The People's Republic of China recently initiated a systematic strategy to expand its involvement in standards setting for new technologies, in what many US policy makers view as an effort to dominate international standards and work against the United States and its allies. Such an effort could harm the integrity of the standards-setting process, resulting in less accessible or even less functional standards, and threaten the United States' position as a global technology leader. This work examines China's engagement with standards setting and asks the following questions: How is China's strategy for standards setting changing over time? Is there reason to worry that China may disproportionately impact the selection and enforcement of technological standards in the future? And what would that mean for US standards policy?

To study these questions, the Atlantic Council's GeoTech Center conducted extensive interviews with leading experts in standards setting, US-Sino relations, and technology policy, and collected a dataset studying the demographics of standards organizations' members.

Our research found that while the Chinese government is seeking to increase its sway over international standards developing organizations (SDOs), there is, at least currently, no cause for concern that China may exert unfair influence over them. Standards bodies have solid organizational integrity, which aims to ensure standards are chosen based on merit, not politics, and they have withstood past efforts by governments to influence their operations. Though US policy makers ought to maintain awareness of China's activities, they must also take SDOs' structural integrity and history into account as they design a strategy for future US engagement with standards organizations. To avoid making the same mistakes as China in seeking to gain technology leadership by influencing SDOs, US strategy should focus on increased government investment in US technology to support domestic innovation and the development of high-quality products suited to become the international standard.

## Key takeaways

- China recently released a new strategy for increased engagement with international technology standards-setting bodies to cement its status as a global economic and technological superpower.
- However, Chinese representation within standards bodies is far from reaching a disproportionate level, especially in comparison to the country's economic weight. The United States has a dominant presence in standards bodies, holding at least 50 percent of votes in eleven of the thirty-nine organizations evaluated by this paper. Moreover, such bodies are structurally sound and have been able to withstand pressure from individual governments in the past.
- Reasonable US policy to promote the setting of technically sound, cost-effective, and equitable standards should not focus on pushing out the Chinese or otherwise managing the structure and processes of standards bodies; **rather, Washington would do better to support the US technology sector and ensure that new technologies emerging from the United States are of the highest quality, since well-engineered products are the most likely to be selected for global use.**

1 The American Edge Project is a coalition dedicated to the proposition that American innovators are an essential part of US economic health, national security, and individual freedoms. The coalition and its members are dedicated to telling the story about the positive impact technology and innovation have on the United States' economy and businesses, particularly small ones, and how they enhance freedom of expression and the nation's overall security. Visit AmericanEdgeProject.org to learn more.

# INTRODUCTION

Data and technology standards represent one of the most important but least discussed elements of today's digital landscape. On any given day, each of us encounters standards multiple times, usually without even realizing it. For example, in doing the online crossword, you would use a standard QWERTY keyboard to fill out the puzzle; and just to view the puzzle, you would have to navigate the World Wide Web, brought to you by multiple standards at every layer of the OSI Model—Ethernet cable (physical layer), MAC addresses (data link layer), TCP/IP (transport and network layers), logging in with username and password (session layer), viewing a JPEG file (presentation layer), and HTTP (application layer).[2] Most people never consider the thousands of standards that must work in concert to display an interactive website, but it is important to know that standards provide a common and predictable set of rules for navigating technology.

## Anecdote 1. QWERTY

The QWERTY keyboard is one of the standards most visible to average users—it is used on virtually every computer and digital English keyboard. QWERTY is also one of the most entrenched standards, given that it has maintained its status as the dominant keyboard since its debut in 1874.[3] The initial inspiration behind QWERTY began with Christopher Latham Sholes, who aspired to create a mechanism that could automatically number book pages. Gradually, the goal changed to creating a machine that an individual could use to "...print his thoughts twice as fast as he can write them." While others have attempted to replace QWERTY with alternative designs such as the Dvorak Simplified Keyboard and electronic gadgets like Tap,[4] QWERTY has retained a hold on keyboard formatting due to the many costs of replacing the entire system and retraining people to use a new method. In the decade ahead, technologists are looking at new ways to improve the QWERTY keyboard or upgrade the current system. A particularly promising area is neural interfaces, which can predict a user's next word or action via machine learning. It should also be noted that the QWERTY keyboard works for Latin-script alphabets but not languages that employ alternatives, such as ideographic languages, and other scripts, such as right-to-left scripts.

3 Michelle Starr, "A Brief History of the QWERTY Keyboard," CNET, July 11, 2016, https://www.cnet.com/news/a-brief-history-of-the-qwerty-keyboard/.

4 Charanjeet Singh, "TAP Review: The Utopian Keyboard that Needs More Polishing," FossBytes, November 2, 2018, https://fossbytes.com/wearable-keyboard-tap-review/.

International standards-setting bodies, known as standards developing organizations (SDOs), are the main producers of such global data and technology standards. SDOs establish globally recognized standards by drafting and ratifying technical requirements for the performance of certain tasks and production of certain goods to ensure uniformity in engineering as well as in technological norms. Standards can cover anything from the measurements of a piece of lumber to high-level processes for the application of new technologies like artificial intelligence. The national and global adoption of these respective standards is necessary to ensure both competitiveness and collaboration within the world's business ecosystem. To put it simply: Data and technology standards ensure interoperability, cost-effectiveness, trust, and good engineering. In their absence, users and producers must find expensive ways to adapt to different technological norms across sectors, countries, and markets, thereby reducing the effectiveness, efficiency, and profitability of global products and services.

Good data and technology standards can significantly impact individual user experiences—for example, standardization is what allows a traveler to connect to cellular data networks around the world, or to plug in a USB (Universal Serial Bus) drive from one laptop to another of a completely different brand and model. Yet the impact of standards does not stop at the individual; standards also are key factors in economic markets and national research and development (R&D) efforts. In a world where geopolitical power is inextricably intertwined with factors like economic output, national wealth, and prestige, governments and regional economies benefit when nationally based companies create new technologies and data capabilities that become a global standard.

While historically Europe, the United States, and Japan have dominated the standards-setting ecosystem for technology and data, with the rise of new technology hubs around the world, more countries are seeking a seat at the table in today's SDOs. The People's Republic of China only entered the field in the late 1990s,[5] but it has steadily increased its scale of presence and participation ever since, in a trajectory that is coming under increasing scrutiny from the global community. The world has paid special attention to China's fifteen-year plan to increase its engagement in standards setting, released in 2020. The plan, called *China Standards 2035*, reflects the Chinese government's long-running view that standards are key to influencing technological markets and focuses on upcoming technologies and topics including artificial intelligence (AI) and digital privacy.

2 Abbreviations: OSI = Open Systems Interconnection; MAC = Media Access Control; TCP/IP = Transmission Control Protocol/Internet Protocol; JPEG = Joint Photographic Experts Group; HTTP = Hypertext Transfer Protocol.

5 John Seaman, "China and the New Geopolitics of Technical Standardization," French Institute of International Relations, January 27, 2020, https://www.ifri.org/en/publications/notes-de-lifri/china-and-new-geopolitics-technical-standardization.

> "First-class companies do standards. Second-tier companies do technology. Third-tier companies do products. (一流的企业做标准，二流的企业做技术，三流的企业做产品)."[6] (Standardization Administration of the People's Republic of China)

Critics of the policy have raised concerns that China may come to unfairly dominate SDOs—a concern underscored both by the country's sheer size in terms of human population and the tight relationship between its government and national companies. This Atlantic Council report explores the merit of such arguments and asks whether individuals participating in SDOs and the standards-setting process perceive China to be seeking an unfair advantage in the standards world. Furthermore, the authors look at the resiliency of SDOs and whether they are strong enough to withstand pressure from participating governments. To that end, this report's research explores the shifting demographics of SDO membership, along with SDO structure and history.

## Example: How Might Nation-State Actors Misuse or Abuse the Standards Development Process?

In interviews with subject-matter experts from law enforcement conducted as a part of this project, concerns were raised about how allegedly unaffiliated businesses might be influencing the standards process on behalf of the Chinese government—an example that presents one way in which governments could undermine the independence of SDOs.

In an era where SDOs are shaped by the interests of private companies, and the individuals ostensibly representing those companies, a number of interviewees raised questions about whether China—whose private sector and government have a close relationship[7]—might prompt its companies to represent government interests in standards setting. In 2021, Chinese regulators have reined in or muted certain Chinese tech company leaders, which has further increased such concerns.[8]

It is prudent to be cautious that any nation may misuse or abuse the standards development process by acting through third-party shell companies or individuals, tied through intermediaries back to a coordinating government, to harm the economic stability and development of other states. This is especially true given the significant value of standards produced by global SDOs to either grow or slow down national economies. Such actions might also involve other forms of swaying third-party companies, such as paying for fellowships or equipment.

Looking toward the future, SDOs may need to consider a more careful vetting of the pedigree and financial influences shaping participants in the standards development process. This would need to include both individuals, who may appear to be acting on behalf of a particular company when they are really acting on a government's behalf, as well as companies, which may seem to be independent when they in fact have close links, either financial or influential in nature, to a respective nation-state. One major question is whether SDOs are prepared to look more closely at their participants, or if the need for active members that help fund the SDOs will trump such closer scrutiny.

6 Carsten Stöcker, "Identity in a Multi-Polar World and China's 2035 Standards," Medium, January 5, 2021, https://medium.com/spherity/identity-in-a-multi-polar-world-and-chinas-2035-standards-66f14865b800.

7 Austin Carr and Coco Liu, "The China Model: What the Country's Tech Crackdown Is Really About," Bloomberg Businessweek, July 26, 2021, https://www.bloomberg.com/news/articles/2021-07-27/china-tech-crackdown-xi-charts-new-model-after-emulating-silicon-valley.

8 Blake Schmidt, Coco Liu, and Venus Feng, "The World's Billionaire Factory Shudders as China Cracks Down," BloombergQuint, last updated July 13, 2021, https://www.bloombergquint.com/china/the-world-s-billionaire-factory-shudders-as-china-cracks-down.

# THREE KEY STAKEHOLDERS IN STANDARDS SETTING

The standards world is inhabited by a variety of actors that participate in SDOs. These actors tend to fall into three broad categories—unaffiliated individuals, representatives of private companies, and government delegates. Incentives to have certain standards adopted vary by type of stakeholder and determine how participants from each category navigate standards setting.

## Unaffiliated individuals

Unaffiliated individuals participating in standards setting are, in most cases, engineers and academics with a genuine interest in standards and building connections to fellow industry experts.[9] Individuals benefit primarily from the networking opportunities that SDO participation provides and their enjoyment of standards setting in general. Some may also have individual patents, research papers, or interests that they want to see taken up by private sector representatives.

## Private sector representatives

Companies benefit enormously from the setting of common standards. If a company's product leads the way in setting a global data or technology norm, that product then increases in its interoperability and market size. Even companies that did not design an adopted standard can benefit from the interoperability provided by aligning with a global data or technology standard, thus gaining a larger market to sell products or services. It goes without saying that the company that owns the patent for the chosen technology usually profits the most, which incentivizes companies to try and create new technologies or data capabilities that can be candidates for standards later on.

## Government representatives

Leadership in the setting of global data and technology standards can also be of great benefit to individual governments. According to a 2020 report from the Institut Français des Relations Internationales (IFRI), standards often form a base on top of which other technologies will develop—in other words, future technologies are likely to be built on existing standards.[10] As a result, the setting of a standard can determine which developed or future technologies succeed in global markets. The economic benefits of owning the rights to an original standard and controlling the sale of licenses to the technology can therefore be immense for both private companies as well as the national economies of which they are a part.

When governments set regional and domestic standards in the hopes that private sector actors will simply adapt to local rules and that the international sphere will follow, they take on a significant risk that those do not happen, effectively isolating the country in question from international markets and norms and stifling economic growth and trade. The size of the country's market may help mitigate this effect, but policy makers still take on the risk of economic and political alienation.

While governments have more enforcement power than SDOs, they lack the stakeholder input on which the latter rely, often leading to the adoption of technologies and standards that are not favored by engineers and/or markets. As a result, new technologies and data capabilities preferred by governments may fail to gain significant market footholds. Domestically, even a government-backed technology can fall flat if users have no interest in purchasing it. Internationally, the effect is magnified—if one country adopts a standard in the hopes of setting a benchmark for the rest of the world, it will lack not only stakeholder consensus from international participants, but also the enforcement power it holds domestically.

Another path governments may choose to follow—one that critics are concerned China may decide to pursue—is to seek to increase influence over standards by packing SDOs with participants loyal to national interests over technical expertise. Proponents of that argument fear that Chinese members could form a voting bloc backing certain standards, effectively injecting nationalism into and harming the integrity of SDO processes.

## SDO Structures and Processes

Standards are very much shaped by the organizations and methods by which they are formed—different processes involve different stakeholders as well as interests, and organizational structures give varying weights to said influences. SDOs are far from the only structures for standards setting, though they are the highest profile and most influential.

Alternative models for standards setting include market-led, government-led, and open-source approaches. Market-led models follow the capitalist view that markets and consumers will naturally choose the best standard or product when left to their own devices. Unfortunately, there are significant issues with a market-led approach that prevent it from being the dominant method in standards setting. For one, when the market chooses a standard, the winner may not be the best from a technical perspective; factors like cost and convenience may promote the use of certain products over other, more technically sound technologies. A second issue arises when first movers gain an unfair advantage, sometimes even creating monopolies, in a market-driven approach. Overall, corporate interests—namely concerns over profits—tend to have undue influence over market-driven approaches to standards setting,

9 Interview with Nell Watson—Chair, ECPAIS (Ethics Certification Program for Autonomous and Intelligent Systems) Transparency Experts Focus Group, and Vice-Chair, P7001 Transparency of Autonomous Systems, IEEE— June 9, 2021.

10 Seaman, "China and the New Geopolitics of Technical Standardization."

excluding government and academic stakeholders that could help create a better engineered standard.[11]

Government-led standards, on the other hand, naturally overrepresent government interests. While such standards benefit from governments' ability to enforce and legislate—which can speed up the adoption of standards significantly and create more trust among producers and consumers that new standards will in fact become norms—critics argue that the government-led approach is also likely to be influenced by political factors, to the detriment of user-friendliness and interoperability. For example, governments may choose to set domestic standards that differ from international norms to protect local or national industries; and though such a policy may be successful domestically, it is likely to complicate relations with foreign companies, users, and governments. In a country with unique domestic standards, individual users encounter significant hurdles to interoperability when communicating with foreign contacts or traveling, while businesses and governments face higher barriers to market entry, which can diminish international trade and cooperation.

International standards organizations aim to address the shortcomings of market- and government-led approaches by bringing together political, economic, and other stakeholders to reach a technically sound consensus on standards with buy-in across sectors. Participants in international standards organizations include academics, manufacturers, corporate users, bureaucrats, and unaffiliated engineers representing the public interest. In requiring cross-sectoral consensus from all these participants, standards setting is likely to benefit a wider range of consumers. Voluntary adoption of standards is a product of this consensus process, as users with a say in the standards-setting process are more likely to benefit from the standard. For example, even if a stakeholder's ideal standard is not chosen, participation in negotiations around the standards can help build relationships within the organization and set up their other preferred standards for success.

A key product of this consensus model is the voluntary adoption of standards—when stakeholders buy into the standards-setting process, they almost always adopt the chosen standard to uphold the integrity of the SDO system. Voluntary adoption also reduces difficulties with enforcement and enactment of standards once they are set—the rules are essentially self-enforcing, since stakeholders must abide by standards to reap the benefits of the SDO model.[12]

## Anecdote 2. French Color TV

The three main video standards used worldwide for encoding color television are Phase Alternate Line (PAL), National Television Standards Committee (NTSC), and Sequential Couleur avec Memoire (SECAM). NTSC and PAL are the most common of the three—the former, developed in the United States, is used in countries that use 60 hertz (Hz) frequency for television, and the latter is the standard for countries that use 50 Hz. SECAM is a less-used alternative to PAL; it began to phase out of popularity in the late 2000s, as users began to convert over to digital video broadcasting (DVB). Today, all countries that still use SECAM are in the process of transitioning over to DVB technology, meaning that the former will soon become wholly obsolete.

SECAM was originally developed by a French company in the late 1950s and was officially adopted in France in 1967. The French government sought for years to make SECAM the global standard for color TV to support the country's television equipment manufacturing sector, mainly by encouraging former French colonies to adopt the technology. But despite an initial successful rollout of SECAM standards in several countries, most European states opted to use PAL, developed by West Germany around the same time, because it is relatively easier to edit and generally more interoperable. Even countries that initially adopted SECAM began to switch over to PAL. The primary reason for this switch was cost-effectiveness; SECAM video is difficult to edit in its analog state, and must often be edited in post-production using PAL, which made it far more cost-effective for most countries to use only PAL.

The SECAM story is a prime example of how political impetus alone is insufficient to make a standard the global norm. Technical concerns like cost-effectiveness, ease of use, and interoperability are key, and government power on its own cannot ensure that users or private companies will use standard that is less technically sound.

## SDO Stakeholders

Many stakeholders participate in SDOs to create consensus-based standards. Participants typically fall into one of five classes:

- Representatives from national standards bodies—e.g., the American National Standards Institute (ANSI) or the Standardization Administration of the People's Republic of China (SAC)
- National delegations
- Corporate representatives
- Representatives from civil society organizations
- Unaffiliated individuals who typically serve as members of an SDO's board, which ultimately approves standards—e.g., the Institute of Electrical and Electronics Engineers Standards Association (IEEE SA), the XMPP Standards Foundation (XSF)

In some cases, government agencies will participate in developing standards relevant to their operations. For example, standards related to space exploration, such as space data systems, are almost exclusively created by government space agencies such as the National Aeronautics and Space Administration. Most international SDOs have corporate and civil society members, although

11 Interview with Jonathan Coopersmith (Professor of History, Texas A&M University, and co-author with Joanne Yates and Craig N. Murphy of "Let's Thwart This Terrible Idea for Standards-Setting," *IEEE Spectrum,* March 31, 2021, https://spectrum.ieee.org/lets-thwart-this-terrible-idea-for-standards-setting), June 8, 2021.
12 Interview with Nell Watson, June 9, 2021.

the largest SDOs—including the International Organization for Standardization (ISO), the International Electrotechnical Commission (IEC), and the International Telecommunications Union (ITU)—accept only national standards bodies. Certain SDOs include multiple stakeholder categories in their membership. The 3rd Generation Partnership Project (3GPP), for instance, invites national standards bodies, corporations, and civil society organizations to participate in the standards-creating process.

While a broad set of stakeholders participates in standards creation, it is rare that all participants have equal authority and input in decision-making. International SDOs adopt different membership structures to define participant responsibilities and powers, and the categories of the members involved help guide what form a membership structure takes. For SDOs whose members are predominately corporations and civil society organizations, financial contributions to the standards organization typically determine a member's status; fifteen of the thirty-nine SDOs included in the report's dataset have adopted a tiered membership structure based on annual financial contributions. In this system, organizations that contribute large sums earn full membership privileges (e.g., full voting rights, ability to propose standards, ability to participate in working groups), while those that contribute modest amounts become "associate"[13] or "affiliate"[14] members, which typically may only observe working groups and lack full voting rights. By contrast, SDOs with national (i.e., members that represent either national standards bodies or countries) or individual representation will grant one vote to each country or individual, respectively.

Since participation in large SDOs is often voluntary and unpaid, participants tend to be genuinely invested in the SDO process and in setting technically sound standards. Another benefit of participation is the opportunity to network within the technology sector—SDOs have a certain convening power by nature of the diversity of their membership bases. Policy makers, academics, and private sector leaders can build relationships within their own sectors and across industries by engaging with the standards-setting procedures.

13 "Explore Our Members," The Eclipse Foundation, accessed August 26, 2021, https://www.eclipse.org/membership/exploreMembership.php.
14 "Member Companies," International Aerospace Quality Group, accessed August 26, 2021, https://iaqg.org/membership/member-companies/.

# MEMBERSHIP DATA AND REPORT METHODOLOGY

This report includes a dataset that measures, in thirty-nine international SDOs that develop technology-related standards, the participation of nine key countries: the United States, Germany, China, Japan, France, Italy, South Korea, the United Kingdom, and Canada. The first eight countries were selected based on the 2020 Report to Congress of the US-China Economic and Security Review Commission.[15] To measure participation, the dataset records the number of full voting members from the nine key countries in each SDO. For SDOs with corporate and civil society membership, a company's (or organization's) headquarters was taken as a proxy for national representation. The figures in the dataset are accurate as of July 2021 unless otherwise noted.

In addition, the dataset quantifies national representation in certain working groups, subcommittees, and research groups in specific SDOs. It measures the national representation of Internet Engineering Task Force (IETF) working group chairpersons; ISO technical committee and subcommittee secretariats; IEC technical committee and subcommittee secretariats; and ITU-Telecommunication Standardization Sector (ITU-T) and ITU-Telecom Development (ITU-D) study group rapporteurs.[16] In addition, the dataset captures eleven of twenty-two International Organization for Standardization and International Electrotechnical Commission joint technical committee (ISO/IEC JTC 1) subcommittees most relevant to emerging technologies like artificial intelligence, biometrics, and cybersecurity. For the eleven ISO/IEC JTC 1 subcommittees, the dataset quantifies national representation of the subcommittee secretariats, subcommittee working group conveners, and overall participation in working groups for subcommittees twenty-five and forty-one.[17]

In performing the analyses necessary for this report, the authors captured the following three variables for each SDO:

## 1. Membership type

For each international SDO analyzed, the dataset records its membership structure, which can fall under one of five categories: corporate and civil society representation, government agency representation, unaffiliated individuals, national standards body representation, and national delegations. Corporate and civil society representation reflects a majority of SDOs in the dataset, although some prominent SDOs opt to include other stakeholders in standards development. Individual government agencies, for instance, participate in standards making relevant to their scope of work: The Cybersecurity and Infrastructure Security Agency and the European Space Agency are members of the Alliance for Telecommunications Industry Solutions and the Consultative Committee for Space Data Systems, respectively. For SDOs where a board ultimately approves standards (e.g., IEEE SA, XSF), unaffiliated individuals are typically members. National standards body representation refers to international SDOs where entities such as ANSI or SAC are members. By contrast, national delegations apply exclusively to the ITU, where a country's head of state, head of government, or minister of foreign affairs may send one delegation to represent its interests.[18]

Membership type is determined by the set of stakeholders to which an SDO grants full voting authority. To code the variable, the authors sorted full voting members according to the five categories outlined above. The dataset alphabetically lists every category for which there is one or more full voting member.

## 2. Target technology

A target technology, corresponding to the primary technology (or technologies) for which the SDO develops standards, was identified for all thirty-nine organizations included in the dataset. Many SDOs, for instance, focus on telecommunication and chip design standards, although the largest SDOs—the IEC, IEEE SA, and ISO—develop standards for a wide range of technologies.

The target technology variable is coded according to the mission statement of each SDO.

## 3. Country

The dataset measures the number of votes in each SDO that can be tied most closely to one of the nine analyzed countries. The dataset records the number of votes only for the bodies that ultimately approve technical standards (e.g., Plenipotentiary Conference,[19] General Assembly,[20] Standards Board[21]). It does not reflect the entities that can vote in working groups, subcommittees, study groups, or equivalent subgroups—except for those noted above (e.g., IETF working group chairpersons, IEC technical committee secretariats).

The vote attribution is simple for SDOs with members from national standards bodies, national delegations, or government agencies: The dataset records the number of votes granted to national entities. For SDOs with corporate and civil society memberships, the dataset logs the number of votes assigned to companies or organizations headquartered in each analyzed country. However, headquarter location is not a perfect reflection of a national government's

15 U.S.-China Economic and Security Review Commission, 2020 Annual Report to Congress, 2020, 587.
16 Complete data on ITU-R study group rapporteurs were not available.
17 Overall participation was unavailable for all other relevant subcommittees.
18 International Telecommunication Union, Collection of the Basic Texts of the International Telecommunication Union Adopted by the Plenipotentiary Conference, 2019, https://www.itu.int/pub/S-CONF-PLEN-2019.
19 "Plenipotentiary Conferences," International Telecommunication Union, accessed August 26, 2021, https://www.itu.int:443/en/history/Pages/PlenipotentiaryConferences.aspx?conf=4.9.
20 "ISO - Structure and Governance," International Organization for Standardization, accessed August 26, 2021, https://www.iso.org/structure.html.
21 "About - IEEE SA Standards Board," IEEE SA Standards Board, accessed August 26, 2021, https://standards.ieee.org/about/sasb/index.html.

influence in a corporation or organization, so the report's authors would caution against making direct comparisons among SDOs with national, corporate, and civil society memberships. Instead, readers should use the membership-type variable so that they can ensure they are making comparisons only among SDOs with similar members. Lastly, the location an individual is currently residing is used for SDOs where individuals are members.

Based on these raw numbers, the dataset calculates the percent of votes each of the nine countries possesses (relative to the total number of votes, which includes entities from countries not analyzed in the dataset).

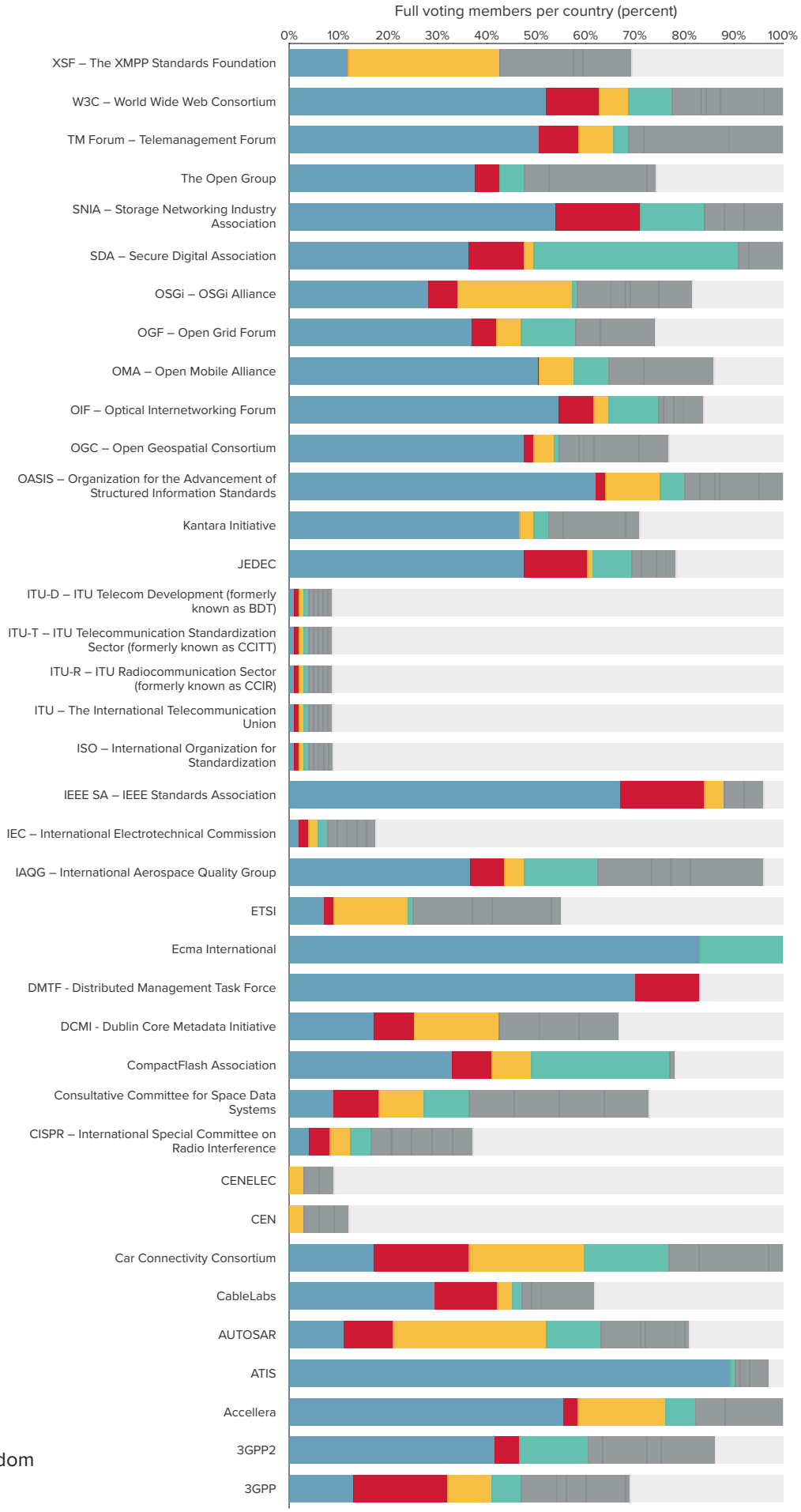
## Report Findings and Conclusions

The United States dominates most international SDOs. Of the thirty-nine SDOs included in this report's dataset, the United States has at least 50 percent of votes in eleven bodies. None of the other eight countries analyzed in the dataset have 50 percent representation in a *single* body (see Figure 1). US presence is the greatest in the most well-established SDOs. In the IEEE Standards Association, for instance, 67 percent of the Standards Board members, who ultimately approve IEEE standards, are American. In other words, the United States possesses a supermajority for a consensus-driven process in a leading SDO, endowing the United States great potential to influence international standards.

# Figure 1. National Representation in International SDOs

*Note:* Historically dominant countries in standards setting are highlighted.

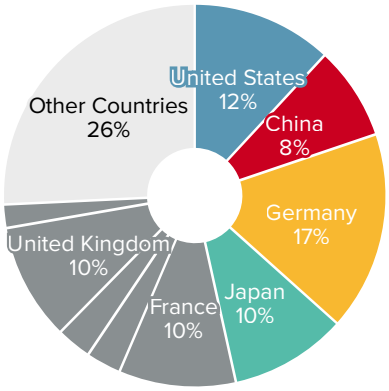
The United States also holds significant representation in key SDO subgroups: 56 percent of the IETF working group chairs and 45 percent of relevant ISO/IEC JTC 1 subcommittee secretariats are American, respectively. If any one country is overrepresented in SDOs relative to its population and economic power, it is Germany, which has a significant presence on technical committees within the ISO (see Figures 2 and 3).



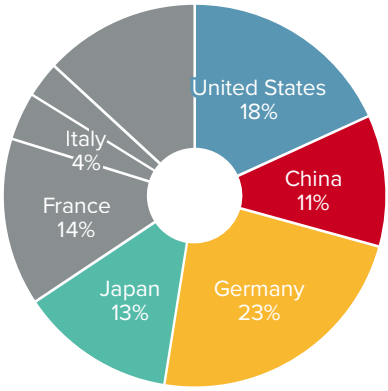
# Figure 2.
# Subgroups of Select International SDOs

Note: Historically dominant countries in standards setting are highlighted.

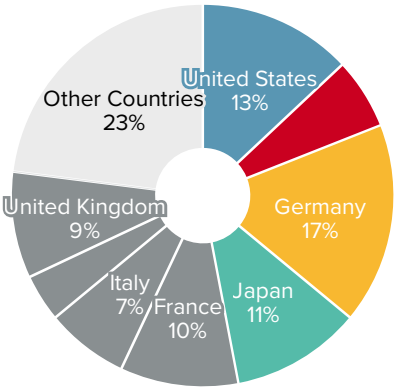
**ISO Technical Committee and Subcommittee Secretariats 2021**



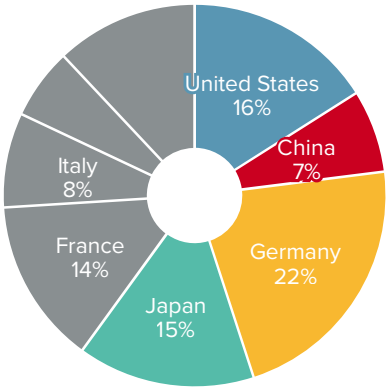

**ISO Technical Committee Secretariats 2020**



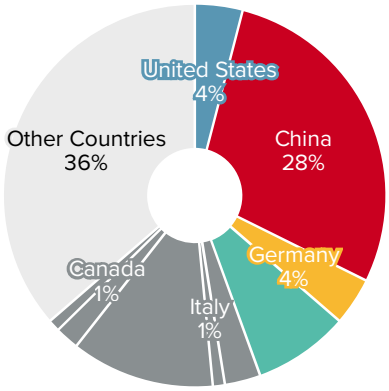

**IEC Technical Committee and Subcommittee Secretariats 2021**




**IEC Technical Committee Secretariats 2020**




**ITU-T Study Group Rapporteurs**

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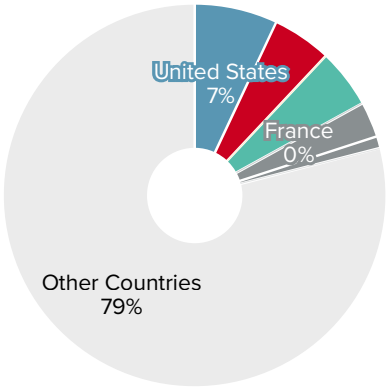
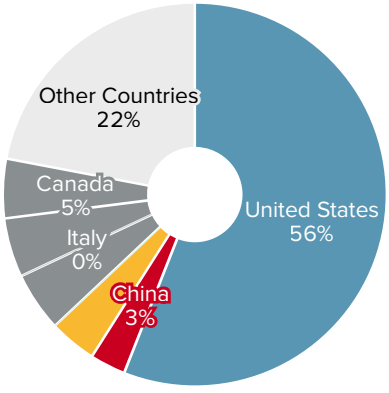
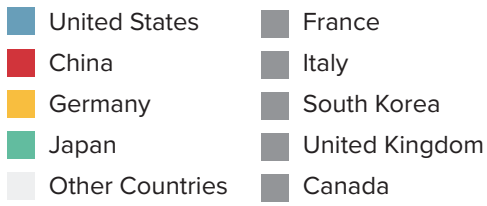



**IETF Working Group Chairpersons**

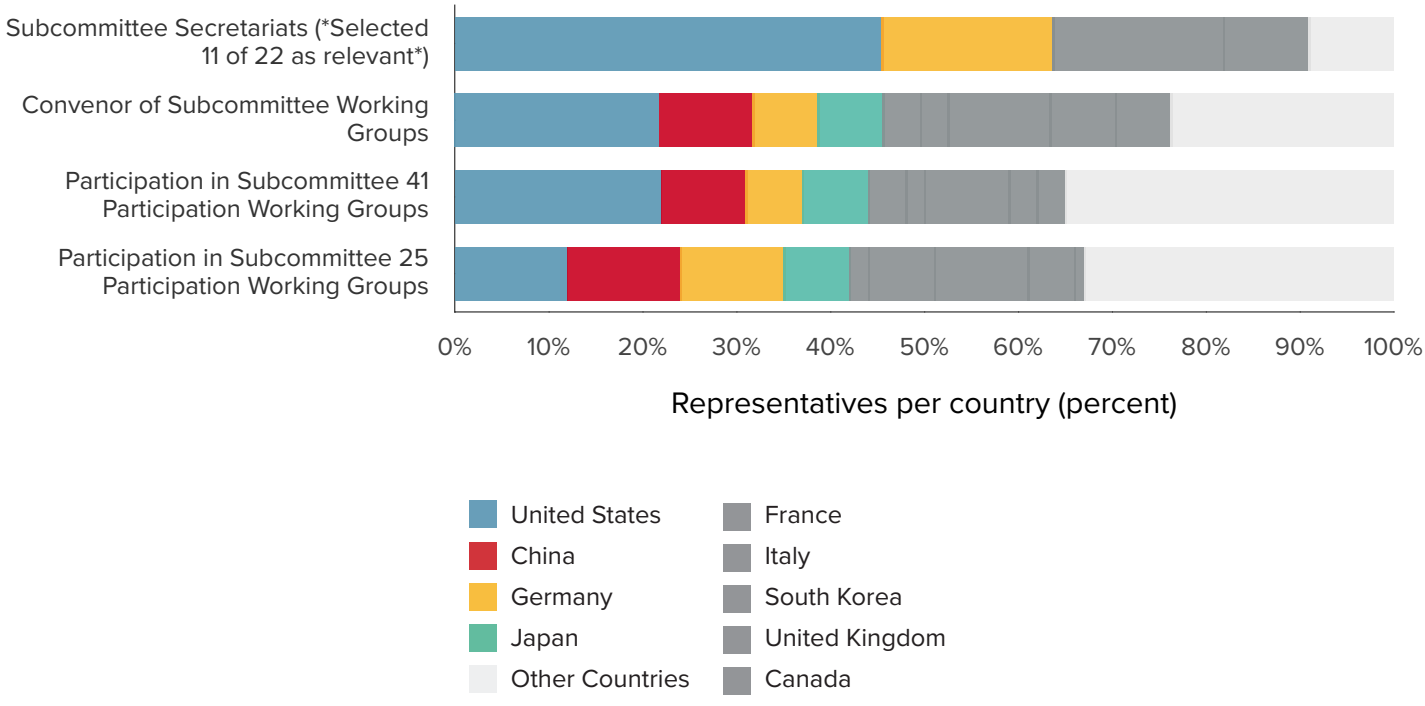


# Figure 3.
# Subgroups of Select ISO/IEC JTC 1 Subcommittees

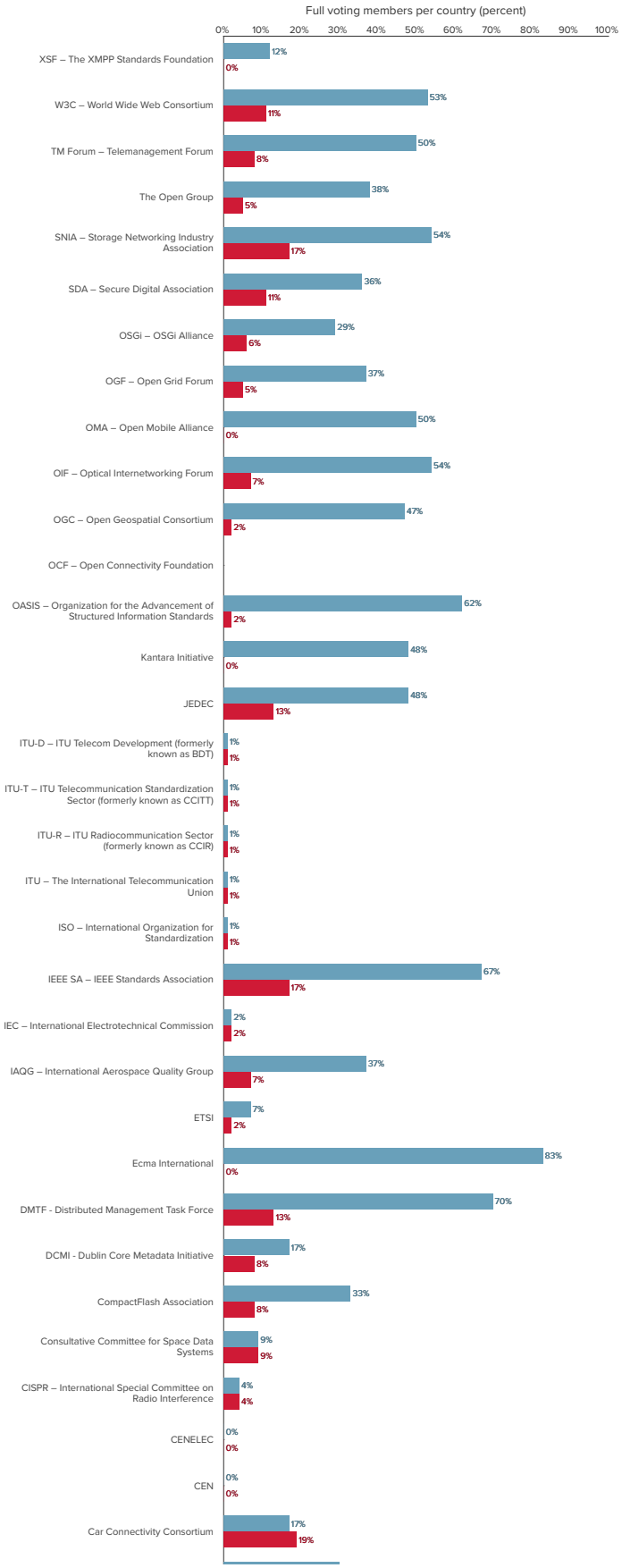
Note: Historically dominant countries in standards setting are highlighted.

In most international SDOs, China has significantly less representation than the United States (Figure 4). Whereas Germany and the United Kingdom are usually represented at levels just below the United States, China's representation is roughly equivalent to that of France or Japan, and often just a few percent more than either. In fact, China has no representation in two of the thirty-nine SDOs included in the dataset; China also holds no relevant ISO/IEC JTC 1 subcommittee secretariats. Nevertheless, the People's Republic does hold significant representation in certain SDOs. Two bodies claim more Chinese membership than US: the 3GPP (19 percent China versus 13 percent United States) and Car Connectivity Consortium (19 percent China versus 17 percent United States). Chinese representation is greatest, however, with Rapporteurs to ITU-T Study Groups (28 percent China versus 4 percent United States). China represents over 10 percent of members in ten organizations, of which 3GPP, the IEEE SA, and World Wide Web Consortium are most notable.



## Figure 4.
## US and Chinese Representation in International SDOs

In other words, the dataset indicates that China is currently not overrepresented in standards bodies, particularly given the size of its economy. In conducting background research for this report, the Atlantic Council interviewed several SDO members and standards experts, who largely concurred on this point. Interviewees from organizations including ANSI, IEEE, and OGC all indicated that China is far from dominating SDO membership. However, a few questions remain, including the following: Is China's representation in SDOs increasing? And if so, what does that mean for the United States and its allies?



# CHINA'S SDO STRATEGY AND ITS IMPLICATIONS FOR THE REST OF THE WORLD

The Chinese government has published a number of plans and white papers outlining its strategy for dominating technology markets and standards, the most influential of which focus on artificial intelligence and other emerging technologies. Broadly, these plans aim to cement China's status as a global technology superpower and ensure that the People's Republic has a seat at the table as new global rules are set for technology, data, and innovation. Many in China hold the view that, when SDOs and other technology regulation instruments were developed in the late twentieth century, China was not yet sufficiently established as a world superpower to demand that it be included and its interests be represented, and as a result was left out of the rule-setting process. This time around, as the development and use of new technologies like AI, 5G (fifth generation wireless technology), the Internet of Things, and more increase around the world, the country undoubtedly wants to be at the center of the action.

## Example: Artificial Intelligence

Artificial intelligence (AI) is an area of particular interest—China's 2018 white paper focused on AI standardization exclusively. China's AI standards strategy has three main goals, all of which work toward the broader aim of cementing China's status as a global technology superpower. First, better standards will increase interoperability for AI technologies, expanding the Chinese market share; second, if Chinese companies design AI standards, China will be perceived as a greater competitor globally and will reap the financial benefits that come with standards setting; and third, China wants to be on the cutting edge of AI and other new technologies due to the perception that the West has always dominated internet rules and standards.[22]

22 Jeffrey Ding, Paul Triolo, and Samm Sacks, "Chinese Interests Take a Big Seat at the AI Governance Table," New America, June 20, 2018, http://newamerica.org/cybersecurity-initiative/

The *China Standards 2035* plan works toward the same goals as the country's 2018 AI strategy by setting several targets for China's standards policy in the coming fifteen years. The two core propositions in the plan are to increase the quantity of both Chinese-owned international standards and Chinese representatives in leadership and rapporteur positions at top SDOs. In other words, China's plan focuses principally on increasing its involvement in standards setting by expanding its presence within SDOs. This has sparked concern from many in the United States and around the world who fear that government pressure may harm the integrity of standards-setting processes and unfairly politicize standards to the detriment of companies, consumers, and other countries.[23]

However, this concern is premised on the belief that China's strategy to increase its involvement in SDOs will work—and given the history, structures, and processes underpinning standards setting outlined in this paper, merely increasing membership and standards proposals will not result in Chinese domination. The structural integrity of SDOs is sound and has been proven time and time again; recall the example of France's failed effort to push its own color television standard through SDOs, or the fact that standards must be approved and voluntarily adopted by governments, companies, and engineers around the world.

Moreover, China is—per the dataset included with this report—currently not overrepresented in standards bodies, and an increase in membership will not translate into overrepresentation for some time. The United States and its allies, especially European countries, continue to dominate SDO membership and leadership. Overrepresentation is difficult for any one country in the SDO world in any event, given that large economies tend to have correspondingly large says in standards setting. The participants that produce the most standards and have the biggest markets—historically, the United States and Europe—are the most represented. As China continues to grow its economy and technology sector, it will naturally increase its engagement with standards setting. In other words, it is highly unlikely that increased membership in SDOs and/or increases in the volume of proposals to make Chinese-owned technology the standard would be sufficient to ensure Chinese dominance over SDOs.

Meanwhile, the United States is taking a more hands-off approach to standards by relying on the private sector to independently drive innovation rather than investing to the same extent as the Chinese government. Per this paper's dataset, the United States holds a strong position across many SDOs, and accordingly is not increasing SDO involvement either. Many in the US policy and technology spheres are concerned by this more relaxed approach, with some advocating for increased government involvement to match that of China.

However, the Chinese approach with respect to SDOs is ill-informed at best and ineffective at worst—the processes behind standards setting and adoption generally ensure that standards that are more technologically sound and cost-effective receive greater stakeholder buy-in and are more successful. That is, standards organizations favor technological viability and user buy-in above all. Packing standards bodies is a waste of resources that could be better directed to improving domestic capacity for high-quality technology and innovation. If the United States is concerned about losing its foothold in technology standards, a better question to ask might be the following: How can the United States ensure that US owned and developed technologies are the best engineered, most cost-effective, and most user-friendly?

23 Taken from interviews with former law enforcement professionals involved with international standards setting. June-August 2021.

# POSSIBLE FUTURE SCENARIOS: LOOKING AHEAD

Irrespective of the competitiveness of US products and services, it is without a doubt that China's rise over the last three decades has been meteoric. Once a minor, dismissible actor in innovation and technology, the country has become one of the world leaders in telecommunications, space, and artificial intelligence. As such, it will (and should) have a say in setting respective governance measures. Many in Washington have come to interpret these developments as a "glass half empty" reality, given that it inevitably means the People's Republic will have significant influence over global politics, too. However, such a new world also presents opportunities to the United States to coordinate new international guardrails in the technology sector that could improve the country's competitiveness and promote its own interests. After all, as the world becomes ever more interconnected, the United States will also become more vulnerable to technology-enabled threats—see, for example, the SolarWinds hack, Colonial Pipeline attack, and various other cyber-related offenses. Recognizing this trajectory, and based on today's reality, the following scenarios are opportunities to broaden the horizon and think about alternative futures, the United States' place in them, and how best to cope with a more powerful China that is poised to see its economic and geopolitical influence grow even further over the upcoming decades.

## 1. Respect China's growing influence due to its economic status and find a balance of interest.

If the past is any indication, then it is hard to imagine a world without a rising power that challenges the status quo. China has built rivaling institutions whenever it has felt it had no adequate place in existing ones (e.g., the Asian Infrastructure Investment Bank, World Bank). Some argue that it would be fatal to make that same mistake in standardization bodies, as China's economic leverage continues to grow worldwide. Already today, 128 countries are more economically dependent on China than they are on the United States.[24]

In this future, the United States accepts China's peer competitor status and finds a balance of interest. In the ITU, for example, the United Nations agency responsible for allocating communications frequencies, China currently relies on support from the countries that benefit most from Chinese investment. A similar dynamic operates in this scenario, in which the People's Republic uses such support to shape the world of digital governance. China seeks to further the idea of "cybersovereignty," which postulates that cyberspace should be governed differently across countries to comply with each's domestic laws, rather than be an open, multi-stakeholder platform as championed by the United States and its allies.[25] The United States recognizes that China has attained the level of a peer competitor, while acknowledging that Western countries simply can no longer set standards and norms while promoting their desires in every corner of the world.

## 2. Use international alliances to constrain China within international organizations.

Many countries share the United States' concern about the lack of access to the Chinese market, unfair Chinese trade practices, and/or intellectual property theft. In this, more antagonistic, scenario, "coalitions of the willing" (for a lack of a better word) are formed to increase the pressure on China so that the country is forced to accept at least some international trade and standardization norms. US policy toward the People's Republic uses a carrot-and-stick method: China has influence in international organizations and the country's legitimate interests are respected by the international community, but only if it accepts certain rules of the road.

As a consequence of China playing by these rules, foreign private firms are able to participate more in Chinese standards-setting processes and bodies.[26] Increased Chinese engagement with international SDOs results in greater adoption of international standards and norms within China. Clear red lines are delineated by a high-level summit and great power dynamics play out within the parameters of healthy competition.

## 3. Exclude China from global trade and standardization norms.

The third scenario unfolds around the pursuit of respective spheres of influence, in which both the United States and China offer versions of twenty-first-century tech governance, particularly on issues relating to telecommunications, the internet, and space. Given China's growing economic might, US policies fail to isolate the People's Republic, especially since European partners refuse to come on board due to economic ties with China. Rather, antagonistic US or Chinese policies divide the world into different spheres of economic and regulatory influence.

This scenario is a Cold War 2.0 in which the United States uses its existing economic advantage to undermine international bodies and form regional trade and standardization blocs like the Trans-Pacific Partnership and Transatlantic Trade and Investment Partnership, despite reluctance from the Europeans, who fear Chinese retribution

24 Iman Ghosh, "How China Overtook the U.S. as the World's Major Trading Partner," Visual Capitalist (blog), January 22, 2020, https://www.visualcapitalist.com/china-u-s-worlds-trading-partner/; Jonathan D. Moyer, Collin J. Meisel, Austin S. Matthews, David K. Bohl, and Mathew J. Burrows, "IN BRIEF: Fifteen Takeaways from Our New Report Measuring US and Chinese Global Influence," Atlantic Council, June 16, 2021, https://www.atlanticcouncil.org/in-depth-research-reports/report/in-brief-15-takeaways-from-our-new-report-measuring-us-and-chinese-global-influence/.

25 U.S.-China Economic and Security Review Commission, ***2020** Annual Report to Congress,* 587.

26 Ibid.

for siding with the United States. This world is defined by a battle over power that turns win-win situations into lose-lose situations, with the People's Republic retaliating where it can and globalization regressing. Two blocs form based on different norms and standards, particularly when it comes to the Internet of Things and artificial intelligence. Companies have no access to the other bloc and the United States uses significant economic and political power to keep partners and allies in check. This road is destined for global conflict and has the potential to damage the United States' international standing.

# RECOMMENDATIONS

China's status as a global technology superpower is undeniable; and since the country is producing more and more technology (and technologists), it is also inevitable that international standards originating in China will become more common. However, it is possible for the United States to maintain its edge in technology and innovation vis-à-vis China by pursuing a strong and informed strategy for engagement with SDOs and the standards-setting world.

In the expert interviews we conducted as a part of this project, a common thread emerged when discussing the path ahead for the United States—the vast majority of our interviewees favored making investments in the US technology sector as a way to maintain leadership in the SDO world. Their suggestions for good US standards policy spanned[27]

- increased and strategic investment in the private sector's innovation and technology efforts;
- the creation of a US strategic technology office, responsible for the relationship between the public and private sectors with respect to technology standards;
- building trust between government and industry by being open to new partnerships rather than emphasizing existing contracts, and by including more non-technological US stakeholders, such as congressional staff and the press;
- rather than increasing US delegates to SDOs, putting more effort into sustained participation to strengthen relationships with standards-setters;
- financially supporting organizations devoted to creating open-source standards available without licenses, which are often hubs of innovation in the development of standards for software; and
- increasing funding to US standards organizations like ANSI so that they can meet more frequently.

The history and structure of SDOs indicate that **the most successful standards are the best-engineered and most collaborative, not the ones with the most government support.** Rather than imitate China by further increasing the number of US members of standards organizations, the United States may opt to instead support the development of well-engineered American technologies that are most eligible for international adoption. Innovations, after all, are more inviting than restrictions.

27 Collected during interviews with Robert Flaim; Michael Dolan; Jim Zemlin; Greg Kroah-Hartman; Christopher Tucker, PhD; James E. Matthews III; Scott Cooper; JoAnne Yates, PhD; and Craig N. Murphy, PhD, June-August 2021. See Acknowledgements for titles and affiliations.

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