

Technical Standards and Great Power Rivalry

Vassilis Theodosopoulos & Edward Hunter Christie

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Technical standards and Standard Essential Patents are increasingly relevant objects of competition between states in the broader context of China's rising economic and technological power and influence. Competition over economic rents and in terms of political values may become mutually reinforcing, leading to a bifurcation between Western approaches that offer a balance between individual, corporate, and state interests, and a Chinese approach that prioritises state control.

Introduction

A technical standard is a document, established by consensus among relevant stakeholders and approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context, in relation to products, systems, processes or services. Standards may address definitions of terms, classification of components, specification of materials, performance, or operations, delineation of procedures, measurement of quantities or qualities, and testing and evaluation [1]. Standards may exist at the national, regional (e.g. European), or international levels.

By promoting interoperability and reliability, standards can benefit both producers and users by reducing costs, enhancing performance, and improving safety. From an economic perspective, standards can help to avoid costly market fragmentation and to reduce barriers to entry for new firms, provided they are developed with the right level of detail and are deployed with the right timing. For most economic actors, there are strong incentives to align with accepted standards: non-standardised products may generate far lower demand and become uncompetitive if they are not interoperable with products that users view as complementary.

Standards may be developed by a single organisation but, for the most part in recent decades, they are negotiated by groups of market stakeholders – typically by consensus – in the framework of voluntary associations known as Standard Setting Organisations (SSOs) and Standard Developing Organisations (SDOs). In what follows we will not differentiate between SSOs and SDOs and use only the SSO acronym.

SSOs can be broadly categorised into three groups: formal governmentally recognised organisations, which are open to all stakeholders, observe a certain level of transparency and due process and make their standards publicly available (e.g. the International Organisation for Standardisation – ISO); quasi-formal ones, which are comparable to the former but lack formal recognition (e.g. the Internet Engineering Task Force – IETF); and smaller, privately-organised consortia, which may be less inclusive and transparent [2]. Within an SSO, the development of standards is conducted primarily by technical and scientific personnel of participant organisations which are mainly private firms, although government and academic stakeholders participate as well [3].

Standards are voluntary, which sets them apart from technical regulations which are legally binding. In practice, standards and regulations are complementary, the latter setting out what public authorities deem essential before a product is placed on the market, the former addressing a wider scope of issues which do not all necessarily require regulation. Standards and regulations also overlap and co-evolve. Public authorities may decide that parts of certain existing standards should become mandatory, after which voluntary standards and binding regulations with overlapping subject matter will co-exist. Another possibility is that entire standards become legally mandatory. At the national (and EU) level, conformity with certain standards may be either directly required by binding regulations or it may be the most convenient way to demonstrate fulfilment of other legally mandated criteria [4]. At the international level, standards can become part of international trade law, in that any national standards that deviate from international ones may be deemed illegal under the WTO Technical Barriers to Trade Agreement, unless duly justified [5].

Standard Essential Patents as a power resource

Standard Essential Patents are patents that necessarily must be applied to ensure compliance with a particular standard [6]. In the ICT sector, around 55% of all standards are patented technology, in industries ranging from telecommunications and health to transport and manufacturing [7].

To avoid market foreclosure effects and to remove incentives for potentially excluded companies to commit patent infringements (i.e. unauthorised use of the patents), SSOs demand that holders of Standard Essential Patents (SEPs) commit to licensing their patented technology on terms that are *fair, reasonable, and non-discriminatory* (FRAND) [8]. While this should ensure technology diffusion in a controlled manner, holding an SEP can be highly lucrative, thanks to licensing revenues. For example, in 2018, Qualcomm earned EUR 5.2 billion, or more than 20% of its total revenue, from technology licensing [9], while for Nokia such revenues were EUR 1.5 billion, or around 7% of total revenue, in that year [10]. Such revenues may have a long lifetime. Patents are ordinarily valid for 20 years, and if further technological change builds on existing SEPs, the latter will generate a lock-in effect in favour of their holders [11]. Conversely, companies whose attempted technological solutions have deviated from SEPs have to redesign their products and, in any case, durably pay licensing fees to access the relevant SEPs.

By implication, a nation whose corporate sector succeeds in developing a large number of SEPs in ubiquitous technologies will ensure a large and long-term flow of revenues, made up of the sum of direct sales and licensing revenues. This naturally constitutes a competition for long-term economic rents which will, by itself, trigger a degree of political interest and concerns about national competitiveness in nations that are dependent on foreign-held SEPs. Such concerns will be considerably sharpened if the respective nations are rivals in other areas, as each nation may then worry about SEPs potentially becoming instruments of economic statecraft in the hands of their respective rival(s). Dependent nations should be expected to be particularly weary of any signs that licensing is not on FRAND terms, but on terms that reflect the political values or the foreign policy interests of a rival nation. Should such tensions become significant, one may expect policy interventions aimed at decoupling or bifurcating from standards that are seen as being in the hands of a rival nation. This could in turn lead to a fragmentation of standards, with different groups of nations opting for mutually exclusive clusters of interoperability in certain technological areas. This pattern was common in previous historical periods, and the fact that it became

less common in recent decades may be viewed as a major achievement of post-Cold War globalisation. The rise of China and Western reactions to it are the principal challenge to this recent pattern.

China in international technology standardisation

Over the last two decades, China has drastically expanded its footprint in international technical standardisation, which has become a core component of its domestic and international industrial development strategy. Using SEPs as a proxy for a country's relative weight in international standard setting, a 2016 study found that, whereas in the 1990s most SEPs originated in the US, Europe, and Japan, since the early 2000s the number of SEPs from China, Korea and Taiwan have increased [12]. In 5G, for example, China's share of SEP declarations stands at around one-third of the total, compared to around 7% in 4G [13]. This is partly a natural outcome of the rapid growth in Chinese technology and innovation capacity and the emergence of Chinese companies as technological leaders in certain sectors, and partly the result of targeted public policy, which includes the provision of public financial incentives to encourage contributions by state-owned and private companies [14]. The Chinese government has invested significantly in bolstering the country's international standardisation power, which is a key pillar of its "China Standards 2035" strategy that was released in 2020 [15].

A key avenue through which China aims to shape standards setting at the global level is through the established international SSOs. The largest and most prominent are the International Organisation for Standardisation (ISO) [16], the International Electrotechnical Commission (IEC) [17], and the International Telecommunication Union (ITU) [18]. Whereas ISO and the IEC follow a bottom-up, multi-stakeholder approach that involves business, academic, governmental and other stakeholders, the ITU is part of the United Nations system and thus an essentially state-centric and more political organisation, where governments hold decision-making power. As such, China can leverage its diplomatic clout, particularly among developing countries, to exert disproportionately greater influence there compared to other SSOs, where governmental influence is diluted [19]. Consequently, Beijing has been trying to increase the importance of the ITU relative to other international SSOs. For instance, in 2019, the Chinese Ministry of Industry and Information Technology, along with state-owned China Mobile Communications Corporation, state-owned China Unicom and Huawei, introduced a proposal in the ITU whereby the ITU's Telecommunication Standardization Sector (ITU-T) would take on a leading role in the development of new IP protocols and a new communications network [20]. This marked a clear attempt to expand the remit of the ITU at the expense of the Internet Engineering Task Force (IETF) and the Institute of Electrical and Electronics Engineers (IEEE), which have led the work in these areas until now [21].

As of 2021, both the ITU and the IEC are headed by Chinese nationals, while ISO had its first Chinese President between 2015 and 2017. Between 2011 and 2020, the number of Chinese-staffed secretariats of Technical Committees, Subcommittees and Working Groups in ISO and IEC grew by 73% and 67% respectively [22], although it should be noted that this merely represents a partial catching up with the representation levels of major individual Western nations, which still have larger footprints in both organisations [23]. That said, Chinese companies such as Huawei, ZTE, China Telecom, and Alibaba hold vice-chairmanship positions in the ITU. Also, Chinese companies with voting rights in the Third Generation Partnership Project (3GPP), the SSO responsible for 5G, have more than doubled during the past few years and now control around 25% of the votes in its General Assembly [24].

In addition, China seeks to shape international standard development through activities outside the framework of established international SSOs. Its major infrastructure and investment policy, the Belt and Road Initiative (BRI), incorporates a standardisation dimension and its Action Plans for “Harmonisation of Standards along the Belt and Road” have explicitly called for internationalising its domestic standards in BRI countries [25]. To that end, Beijing offers BRI countries ‘package deals’ that condition loans for infrastructure projects on the adoption of Chinese technical standards. As of late 2019 China had signed 97 standards cooperation agreements with 54 participating countries and regions and international organisations [26]. The “China Standards 2035” strategy unveiled in 2020 envisions turning these bilateral agreements into a new SSO, the BRI Standards Forum, in order to facilitate the dissemination of the country’s domestic standards and enhance its influence in global standard-setting.

The view from the West

In recent years, China’s growing influence in international standardisation has sparked concerns among Western countries. A key driver behind those is the Chinese approach to technical standardisation itself. Western standardisation models, on which the international ones are largely based, are essentially market-driven, granting industry a dominant role. In contrast, standards development in China has traditionally been a state-directed process. Under its current regulatory framework, standardisation activities in China are coordinated by the Standardisation Administration of China (SAC), which ultimately answers to the State Council, and many standards are developed by the SAC, various ministries, and provincial or local authorities [27]. While the system also includes a ‘market’ tier, it is dominated by state-owned enterprises and privately owned ‘national champions’ with close ties to the Chinese Communist Party [28].

Given the party’s dominant role in steering the economy, Chinese standardisation efforts are seen as serving political priorities and public policy objectives, rather than merely technical and commercial considerations. The concern, therefore, is that China’s state-driven approach could turn technical standardisation from an engine of connectivity and interdependence into an instrument of power politics, simultaneously strengthening Beijing’s global influence and undermining the foundations of the existing global economic order [29]. This view appears to be supported by the fact that Beijing’s efforts to shape international standards have not been matched by a willingness to adopt international standards. Between the end of the 1990s and 2017, the share of standards in China adopted from international SSOs fell from 70% to 21%, suggesting that Beijing is mainly interested in a one-way projection of influence [30].

Another concern relates to the political and ethical values inherent to Chinese positions which could shape new and emerging technologies in ways that run counter to Western liberal values. For example, at the ITU and the UN more broadly, Beijing has consistently pushed for approaches that would limit the role of non-governmental stakeholders in standardisation and governance and advocated for technologies that reinforce state control over the Internet, under the label of ‘Internet sovereignty’ [31]. In addition, China has sought to remove references to democracy and freedom of expression from key documents [32]. It has also leveraged its influence in the ITU to suppress human rights concerns regarding Chinese technologies [33]. At the same time, Chinese companies such as Huawei, ZTE, Hikvision, and Dahua are reported to have almost monopolised submissions to the ITU for facial recognition and surveillance standards that often entail privacy risks [34]. One such standard, proposed by ZTE and China Mobile and adopted in June 2019, concerns ‘smart’ street lights with embedded video monitoring capabilities,

reflecting the design features of ZTE's smart street light products [35]. Chinese companies have also submitted proposals for facial recognition standards, which would require the permanent storage of information on individuals' biometric data (e.g. race, skin colour, birthmarks), a technology that is suspected of being used to monitor China's Uighur population [36].

China, through Huawei, has also put forward a proposal for a new Internet Protocol ("New IP") that would be intended to gradually edge out the existing TCP/IP standard [37]. The Chinese proposal focuses mainly on the functional models of the new architecture, which is justified by the alleged need to address certain technical deficiencies of the existing protocols. However, Western ITU delegates and other stakeholders have argued that the proposal's technical rationale is flawed and the suggested framework is 'unrealistic and unproven' [38]. Of particular concern are the underlying design principles and features of New IP and its supporting technologies, which would facilitate top-down control and fragmentation of the Internet, in a fundamental departure from today's open and decentralised model [39]. The proposed framework would enable the linking of human users to internet addresses as well as grant network operators and infrastructure providers fine-grained control over network access and data flows [40]. Centralised authorities could thus easily monitor individuals' online activity and cut off communication between particular addresses and the rest of the network, with clear negative implications for civil liberties and human rights violations [41].

Conclusions

In sum, we highlight the following two challenges regarding growing Chinese power in the area of technical standards as the most important:

- Increasing market lock-in effects through SEPs that will guarantee economic rents for China's corporate sector at the expense of Western corporate interests, and
- The adoption of standards that prioritise state control of private communications over other considerations across a growing set of non-Western nations.

Cyber-security and cyber-espionage are clear concerns as well, although it is debatable to what extent standards or SEPs can *by themselves* be vehicles for such threats. Western governments can easily choose to prohibit procurement from certain Chinese suppliers, while also super-imposing adequate security and data protection requirements if Chinese-held SEPs need to be used. The former approach is already in force. In the United States, for example, pursuant to the 2019 National Defense Authorization Act, agencies of the Federal Government are prohibited from procuring telecommunications equipment or services from Huawei and ZTE, and video surveillance or telecommunications equipment or services from the Hytera, Hikvision, or Dahua companies [42]. In many nations of the Global South, however, it may be expedient for governments to allow for extensive adoption of Chinese-made systems and products, alongside participation in the Belt and Road Initiative [43].

The two leading challenges we have highlighted may lead to a bifurcated global system, with direct competition between a Western set of standards that offer a balance between individual, corporate, and state interests, and a Chinese set of standards that guarantee the latter under all circumstances. Attempts by Western governments to facilitate economic rents for their corporate sectors should be expected to incentivise global dialogue and outreach to China as long as China's share of SEPs remains limited. Beyond

some threshold, however, Western governments may be increasingly incentivised to decouple from Chinese-led standards and to coordinate opposition to Chinese state goals in existing SSOs. In parallel, China may find that it can develop and lead alternative institutions that include many non-Western nations, leading to a hollowing out of the role of global institutions. In a more moderate scenario, standards would not grow apart significantly if major states were able and willing to carefully delineate between competition over economic rents and competition in terms of political values, and if divergences remained moderate in both areas. Conversely, economic rents and political values could be mutually reinforcing drivers, making bifurcation likelier and potentially deeper. Recent trends would seem to confirm this in light of the decoupling effect of Western restrictive measures already in force against certain Chinese companies, not only regarding procurement for the public sector, but also given investment bans into those same companies [44] and given prohibitions and compulsory “rip and replace” measures for civilian infrastructure [45]. As Western and Chinese markets decouple in strategic technologies, the economic incentives for either side to uphold a unified set of standards will naturally weaken, while competition between the two sides, for both market shares and standards alignment, should be expected to sharpen across a large set of non-Western nations.

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Notes

[1] Based on definitions by CEN-CENELEC and the OECD.

The OECD definition is cited in: Jacobs, K. (2000). *Standardisation Processes in IT: Impacts, Problems, and User Participation*, (1st ed.) Vieweg, p. 10.

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[5] https://www.wto.org/english/docs_e/legal_e/17-tbt_e.htm

[6] <https://www.etsi.org/intellectual-property-rights>

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United States: <https://www.reuters.com/business/media-telecom/fcc-votes-finalize-program-replace-huawei-equipment-us-networks-2021-07-13/>
United Kingdom: <https://www.bbc.com/news/technology-53403793>
Sweden: <https://www.reuters.com/technology/swedish-court-upholds-ban-huawei-selling-5g-network-gear-2021-06-22/>
- Regarding (actual or potential) bans on Hikvision or Dahua surveillance equipment, see for example:
UK and US: <https://www.cctvusergroup.com/post/cctv-user-group-statement-on-use-of-cctv-cameras-and-other-equipment-from-chinese-manufacturers>