The Relationship Between

# Standards & Intellectual Property

4iP Council

Rigorous empirical research on intellectual property

# The Relationship Between Standards and Intellectual Property

A Booklet published by The European Intellectual Property Teachers' Network and 4iP Council and made possible thanks to the gracious contributions of (by alphabetical order):

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# Foreword from Laurent Manderieux

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*EIPTN Editor of the Booklet.*

The relationship between Standards and Intellectual Property has always been complex, though it is an existential matter both for standards and for patents.

The present Booklet aims at clarifying concepts and current practice on Standards and IP. It also reflects on future options on patents and standards. It is of use for Academics and Scholars in all disciplines (Law, Economic, Science), as well as for business circles.

# 1. Introduction (Laurent Manderieux)

Authoritative authors from different backgrounds are demystifying a topic that, in the past, was somehow technical and confidential, and currently becomes a key matter for the development of innovation and for scientific, economic, and social progress.

By doing so, it is intended to clarify:

- What are Standards?
- Standard Processes, including the role of Standard Development Organizations
- The benefits of Open Standardization
- IP Policy and FRAND
- Open Source and Standards
- Competition Law and Standards
- Geopolitics and Standards

A Special Contribution, by Sir Robin Jacob, concludes this Publication.

Each Booklet Chapter may be read independently from others for persons who already possess knowledge on this topic and want to enhance it on a specific topic, whereas, for newcomers to Standards and IP, it is recommended to read chapters in chronological order to acquire the knowledge necessary on this topic.

This Booklet will be further updated over time, as legislation and practice may evolve in Europe and the International Environment.

EIPTN and 4iP Council thank the Booklet contributors for their dedication to this Project, and depth of knowledge shared in this Publication.

# 2. What are standards? (Olia Kanevskaia)

## Standards at a glance

A standard is formally defined as:

> *"[...]document, established by consensus and approved by a recognised 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".*[1]

Standards are ubiquitous. Behind almost every object, device, or service we use on a daily basis, there is at least one standard that enables their functioning or ensures their safety and quality.

Standards can be applied to measurements, quality, or content; they can take the form of written specifications, protocols, guidelines, or recommendations; and are based on technical considerations and experts' knowledge. In the field of technology, standards prescribe characteristics of electronic systems and software, coordinate transmission frequencies, and define protocols and procedures for Internet connection.[2] They are essential for providing device and network *interoperability,* which in turn allows for network effects, eventually leading to a better consumer experience, but also to the improved functioning of electronic systems.

## Who makes standards, and how?

Standards emerge in technical processes, and " […] *should be based on the consolidated results of science, technology, and experience, and aimed at the promotion of optimum community benefits*".[3] They can be developed by groups and committees that bring together expertise from different sectors and aim to balance various conflicting interests – the so-called "de jure" standardisation.[4] They can also be established through market-based processes, whereby the market chooses among competing technologies of different firms – the so-called "de facto" standardisation.[5] Finally, they can also be mandated by governments, although this type of standards development is rather rare. In reality, however, the three modes of standards development are often intertwined,[6] and many standards build on their forerunners or implement features of similar standards developed in a different mode or by a different group of experts.

Furthermore, some standards require fewer updates and are relatively straightforward to set and maintain: for instance, the standard series on Paper Size Dimensions, such as A3, A4, or A5 sheets, which merely

**1.** ISO/IEC Guide 2, 'Standardization and Related Activities: General Vocabulary' (2004) <https://isotc.iso.org/livelink/livelink?func=ll&objId=8389141&objAction=browse&sort=name> accessed 27 July 2022 ("ISO/IEC Guide 2:2004), Art. 3.2

**2.** Mark Lemley, 'Intellectual Property Rights and Standard-Setting Organizations' (2002) 90 CLR 1889, 1898; Raymund Werle, 'Standards in the International Telecommunications Regime' (2001) HWWA Discussion Paper, No. 157 < https://www.econstor.eu/bitstream/10419/19394/1/157.pdf > accessed 27 July 2022, 8.

**3.** ISO/IEC Guide 2:2004, Art. 3.2.

**4.** Nils Brunsson, Andreas Rasche and David Seidl, 'The dynamics of standardization: three perspectives on standards in organization studies' (2012) 33 Organizational Studies 613, 619; Ilan Oshri and Claudio Weeber, 'Cooperation and Competition Standard-Setting Activities in the Digitalized Era: the Case of Wireless Information Devices' (2006) 18 Technology Analysis & Strategic Management 265, 267.

**5.** Thomas Keil, 'De-facto standardisation through alliances—lessons from Bluetooth' (2002) 26 Telecommunications Policy 205, 206; Joseph Farrell and Garth Saloner, 'Coordination through Committees and Markets' (1988) 19 The Rand Journal of Economics 235.

**6.** Paul Wiegmann, Knut Blind and Henk de Vries, 'Multi-mode standardization: a critical review and a research agenda' (2017) 46 Research Policy 1370.

provide the sizes in inches or millimetres. In contrast, standards for wireless networks, like 3G, 5G, or Wi-Fi, involve a high amount of R&D and are complex to develop and maintain, since these technologies need to keep pace with technological evolutions.

## How can standards be categorised?

There are different ways in which standards can be categorised. For instance, the Organization for Economic Cooperation and Development (OECD) classifies standards as quality, informational, uniformity, professional conduct, and interoperability.[7] In turn, some established scholarship refers to standards for products or process that are either design-based or performance-based and have a coordinative or regulative function,[8] or distinguish between "technical" standards, that ensure interoperability of products or processes, and "non-technical" standards, that pertain to quality, management or reporting.[9]

## Standards as a tool for business and society

Regardless of their classification, standards are typically viewed as "providers" of uniform solutions for interconnecting things, methods, and people.[10] Among their many benefits, standards facilitate market access by harmonising technical requirements.[11] By complying with a set of standards, manufacturers can operate on foreign markets without needing to adjust their products, or their production and supply methods, for each country. This allows for trade expansion,[12] which is also likely to spill over to consumers, who may benefit from increased choices.

Moreover, standards protect consumers and product users by excluding non-qualifying products or requiring certain types of information on product labels. They systematise production methods and expedite supply chains, leading to economies of scale, since costs for developing and commercialising a product are reduced when producers comply with a standard that is already integrated on the market.[13] They also generate network effects, allowing more users to join the networks and augmenting the demand for complementary production due to the increase in networks' value.[14] In the field of technology, standards also provide a common platform for the production of multiple, and even competing products: to enable compatibility and synchronisation between various electronic devices, companies on the downstream market have to design their products in a way suitable for implementation of common technological solutions. To illustrate, one can access one's mailbox from different devices and using different applications. Hence, standards also promote the dissemination of innovation and the development of new technologies, which benefits both manufacturers and consumers.

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**7.** OECD, 'Standard setting' (8 March 2011) (DAF/COMP(2010)), <https://www.oecd.org/daf/competition/47381304.pdf> accessed 27 July 2022, 21.

**8.** Werle, Standards in the International Telecommunications (2001), 8-10.

**9.** Among others, Brunsson, et al, The Dynamics of Standardization (2012), 616.

**10.** Henk De Vries, 'Standardization – What's in a name?' (1997) 4 Terminology – International Journal of Theoretical and Applied Issues in Specialized Communication 55.

**11.** Alexandra Muir, 'The Race to Safety: How Private Lawmaking and Voluntary-Standard Adoption Can Inspire a Global Regime that Strengthens and Harmonizes Product Safety Standards' (2016) 23 IJGLS 323. European Commission, Benefits of standards, < https://single-market-economy.ec.europa.eu/single-market/european-standards/standardisation-policy/benefits-standards_en> accessed 1 September 2022.

**12.** Trade and public policies: A closer look at non-tariff measures in the 21st century,' World Trade Report, (2012) <https://www.wto.org/english/res_e/booksp_e/anrep_e/world_trade_report12_e.pdf> accessed 27 June 2022, 21; Walter Mattli and Tim Büthe, 'Setting International Standards: Technological Rationality or Primacy of Power' (2003) 56 World Politics 1, 2.

**13.** Patrick D. Curran, 'Standard-Setting Organizations: Patents, Price Fixing, and Per Se Legality' (2003) 70 U. Chi. L. Rev. 983, 988.

**14.** Ibid, 987.

## Standards and quality

However, standards' societal and sometimes, legal value goes beyond their technical features. Since standards provide technical rules to be followed by product manufacturers and services suppliers, they also set certain expectations e.g., regarding the functioning of certain products or the quality of certain products and services. While standards are not identical to laws and in principle, carry no legal obligations, they can become *legally* binding when referenced in a country's legislation.[15] They can also become *practically* binding when there are no other (regulatory) alternatives available.[16] Whereas the former would largely depend on a country's legal system, the latter relates to the structure and functioning of the markets.

## The politicisation of standards

Furthermore, while standards are largely the result of scientific processes and technical deliberations, they are not immune to political tensions and the strategic behaviour of stakeholders involved in standards development. Such standards may negatively affect products' quality, impede market access, and stifle innovation, and sometimes may also raise fundamental rights concerns.[17] Standards can also be used to support protectionism or to promote national products and values at the global level,[18] resulting in unfair competitive advantage and undue trade restrictions. It is thus crucial to design standards that serve for the benefit of the majority of stakeholders.

**15.** See Lawrence A. Cunningham, 'Private standards in public law: copyright, lawmaking and the case of accounting' (2005) 104 Mich. L. Rev. (2005) 291

**16.** Harm Schepel, The Constitution of Private Governance: Product Standards in the Regulation of Integrating Markets (Oxford and Portland: Hart Publishing, 2005), 4.

**17.** Jan Wouters, 'Corporations and the Making of Public Standards in International Law: The Case of China in the ITU' in Panos Delimatsis, Stephanie Bijlmakers and Konrad Borowicz (eds), The evolution of transnational rule-makers through crises (CUP 2023) forthcoming.

**18.** David Wirth, 'The International Organization for Standardization: Private Voluntary Standards as Swords and Shields' (2009) 36 Boston College Environmental Affairs Law Review 79.

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## A standard is formally defined as:

*"[...]document, established by consensus and approved by a recognised 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".*

# 3. Standards processes (Olia Kanevskaia)

## Standards processes at a glance

Standards development is a cooperative process. In order for standards to produce positive effects and to ensure compatibility of products and markets, they need to reflect various interests affected by these standards.[19] Therefore, stakeholders willing to develop a standard cooperate in so-called standards development organisations (SDOs). These voluntary organisations typically offer a collaborative environment that enables cooperation and coordination among different stakeholders in standards development.[20] SDO members and participants range from private firms to governmental agencies and consumer associations, which are represented by a team of experts in SDOs' committees or working groups where the technical work on developing standards is performed.

## The SDOs and their basic functions

There are different types of SDO, and there are different ways to classify them. In general, SDOs can be categorised as either formal bodies or informal consortia. Formal bodies epitomise private or semi-public bodies (implicitly) recognised by governmental authorities: examples of such SDOs are the International Organization for Standardization (ISO); the European Telecommunications Standards Institute (ETSI), the European Committee for Standardization (CEN) and national standards bodies, such as the German Institute for Standardization (DIN) and the French Standardization Association (AFNOR). In turn, informal interest groups and industry consortia are smaller and less organised organisations or business associations that are relatively closed and focused on narrow technological fields.[21]

While ideally, standardisation processes are based on technical merit, they still require some rules and managerial oversight, as well as administrative support for standardisation meetings. These rules and processes are largely codified in the operational frameworks of SDOs and are established by the SDO members or governance committees. Due to the differences in SDOs' operational fields, organisational culture and history, as well as the preferences of SDO members or participants, these rules and processes may differ significantly.

**19.** Anne Layne-Farrar, Gerard Llobet, and Jorge Padilla, 'Payment and Participation: The Incentive to Join Cooperating Standard Setting Efforts' (2014) 23 Journal of Economics and Management Strategy 24.

**20.** Justus A. Baron and Tim Pohlmann, 'Who Cooperates in Standards Consortia: Rivals or Complementors?' (2013) 9 Journal of Competition Law and Economics 905,906; Aija E. Leiponen, 'Competing through cooperation: the organization of standard setting in wireless telecommunications' (2008) 54 Management Science 1904.

**21.** Jan Wouters, 'Corporations and the Making of Public Standards in International Law: The Case of China in the ITU' in Panos Delimatsis, Stephanie Bijlmakers and Konrad Borowicz (eds), The evolution of transnational rule-makers through crises (CUP 2023) forthcoming.

## SDOs and regulation: formal and soft regulation

Despite the high degree of self-regulation, SDOs do not operate in a regulatory vacuum, meaning that they must comply with some laws of the country or region where they are established and ensure that their members comply with those laws. As an example, in the EU, the SDOs' standards development processes may not lead to a collision or otherwise breach provisions of competition law.[22]

At the same time, almost all SDOs share some internationally accepted procedural features, such as openness, transparency, and consensus, and strive to ensure that standards take into account various relevant interests and are of sufficient quality to be used on the market.[23] These features are largely entrenched in Western standardisation traditions,[24] and are widely implemented in national legal requirements and adopted by many SDOs worldwide. At the international level, they are introduced as the "six procedural principles for international standards bodies" in the Decision of the Technical Barriers to Trade (TBT) Committee of the World Trade Organization (WTO), namely: transparency, openness, impartiality and consensus, effectiveness and relevance, coherence, and concerns of developing countries.[25] These overarching principles are further concretised in SDOs' operational rules. Although these procedural features constrain SDO processes, they also represent procedural guarantees for SDO stakeholders which they can claim against other participants or against the SDO itself.[26]

It is important that, as a collaborative process, SDO processes remain open to stakeholders willing to participate in standards development. While openness may be subject to different interpretations, it usually refers to ensuring meaningful participation, providing equal opportunities to stakeholders as well as offering information necessary to join standardisation processes (although the latter mainly relates to *transparency*). Participation of stakeholders that are typically underrepresented in standardisation processes, such as civil society or small and medium-sized enterprises (SMEs) is becoming an increasingly important topic on the EU economic policy agenda.[27]

**22.** Guidelines on the applicability of Article 101 of the Treaty on the Functioning of the European Union to horizontal co-operation agreements (2011) C 11/1 (updated Guidelines will enter into force in January 2023).

**23.** See Olia Kanevskaia, The Law and Practice of ICT Standardization (CUP 2023).

**24.** See JoAnne Yates and Craig N. Murphy, Engineering Rules: Global Standard Setting Since 1880 (Baltimore: John Hopkins University Press, 2019).

**25.** The Committee on Technical Barriers to Trade, Second Triennial Review of the Operation and Implementation of the Agreement on Technical Barriers to Trade, Annex 4: 'Decision on Principles for the Development of International Standards, Guides and Recommendations with Relation to Articles 2, 5 and Annex 3 of the TBT Agreement,' WTO Doc. G/TBT/9 (Nov 13, 2000).

**26.** Justus Baron, Jorge Contreras, Martin Husovec, Pierre Larouche and Nikolaus Thumm, 'Making the rules: the governance of standard development organizations and their policies on intellectual property rights' (2019) JRC Science for Policy Report, EUR 29655 EN available at <https://publications.jrc.ec.europa.eu/repository/bitstream/JRC115004/sdo_governance_final_electronic_version.pdf> accessed 27 June 2022.

**27.** European Commission, An EU Strategy on Standardisation Setting global standards in support of a resilient, green and digital EU single market (2 February 2022) COM (2022) 31 final.

## Standard processes and openness

However, in the field of Internet governance and Web standardisation, openness may be interpreted differently. In these areas, "open standards" typically refer either to the process of standards' creation or to the royalty-free IPR policies.[28] Such "open," non-proprietary specifications underpin Internet infrastructure and allow devices, services, and applications to operate across a wide system of networks, ensuring their interoperability and consistency. Principles that should be adhered to by bodies and communities establishing this type of "open standard" were laid down by the OpenStand movement – an alliance between a number of SDOs.[29] Furthermore, scholars have argued that since the Internet is evolving in a constant and rapid pace, the "open standards" concept should be flexible and adjust to society,[30] while others have suggested that the concept of openness has been fundamentally changed throughout the years: by the time the importance of open systems was realised by Internet engineers, openness was attributed with political, economic, technical and cultural meanings.[31]

## The SEP as an example

SEPs (standard essential patents) are one of the most salient issues when it comes to proprietary technologies that are essential for standards' functioning. SEPs may generate tensions between stakeholders who develop technologies that become part of a standard – the SEP holders – and stakeholders who use these patents in their products or components to implement the standard – the SEP implementers. Both types of stakeholders are important for standards development processes, and to ensure that standards are implemented on the (global) markets, so SDOs need to strike a balance between the interests of SEP holders and SEP implementers. Tilting the balance towards one of the groups may result in sub-optimal outcomes, but it may also breach the applicable legal provisions, either because SEP holders may abuse their dominant position by setting unfair licensing conditions, or because SEP implementers may collude against patent holders.

SDOs do not handle the disagreements that arise between licensors and licensees of SEPs. However, they establish and implement Intellectual Property Rights (IPR) or Patent Policies. As an integral part of their operational framework, these policies prescribe rules applicable to SEP disclosure and licensing. A disclosure obligation requires SEP holders to reveal existing patents and applications for patents that may become essential, while a licensing commitment requires SEP holders to indicate whether they are willing to license their patents on fair, reasonable and non-discriminatory terms (so called FRAND terms).[32]

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**28.** C. Bred Biddle, 'No standards for standards: understanding the ICT standards-development ecosystem', in Jorge. L. Contreras (ed.), The Cambridge Handbook of Technical Standardization Law: Competition, Antitrust and Patents (CUP 2018), 21.

**29.** See <https://open-stand.org/ > accessed 27 June 2022.

**30.** See Ken Krechmer, 'Open standards requirements' (2006) 4 IJSR 43.

**31.** See Andrew L. Russel, Open Standards and the Digital Age: History, Ideology, and Networks (New York: Cambridge University Press, 2014), 6.

**32.** See, among others, Jorge L. Contreras, 'An Empirical study of the effects of ex-ante licensing disclosure policies on the development of voluntary technical standards' (2011), conducted for the National Institute for Standards and Technology (NIST), US Department of Commerce, available at <https://www.nist.gov/sites/default/files/nistgcr_11_934_empircalstudyofeffectsexantelicensing2011_0.pdf> accessed 27 June 2022.

## IPRs and standard processes

Similarly to other SDO rules and processes, IPR policies may differ significantly across SDOs, and will largely depend on the wishes of SDO membership and the industry where the SDO operates. In Internet and software standardisation, IPR policies would typically stipulate royalty-free licensing terms, while SDOs that are rooted in the telecommunication sector would tend to prefer licensing on FRAND terms. In this regard, some SDOs, like the Institute of Electrical and Electronics Engineers Standards Association, opt to provide a definition of FRAND,[33] and how it should be calculated; however, the vast majority of SDOs leave FRAND interpretation to the licensing parties.

**33.** US Department of Justice, Response to the Institute of Electrical and Electronics Engineers, Inc.'s Request for Business Letter Review (30 April 2007) available at< https://www.justice.gov/atr/response-institute-electrical-and-electronics-engineers-incs-request-business-review-letter> accessed 27 June 2022.

# 4. The benefits of open standardisation (Bowman Heiden)

## Benefits of open standards versus de facto standards

There are key dimensions of openness that make open standards unique from de facto standards:

- **Development – How open is the development of the standard?** This includes who is allowed to participate under what process of decision-making, characterised by the following elements:[34]
    - Collaborative participation – voluntary, market-driven development that is reasonably open to all interested parties.
    - Reasonably balanced – ensures that the process is not dominated by any one interest group.
    - Due process – focused on technical merit following a transparent, consensus-driven process

- **Distribution – How open is the distribution of the standard?**

  This includes who is allowed to use the resulting standard under what conditions, characterised by the following elements:[35]

    - Quality and level of detail – sufficient for the development of competing implementations of interoperable products or services.
    - Accessibility – easily available to review at a nominal fee.
    - Terms of use – clear licensing terms for Intellectual Property Rights (IPRs) essential to implement the standard. Negotiations are typically left to the parties concerned and are performed outside the SDO.

**34.** Id. Based on ITU-defined elements of "open" standards. See <www.itu.int/en/ITUT/ipr/Pages/open.aspx.>

**35.** Id.

Figure 1 below provides a graph of the different dimensions of openness and illustrates the degrees of openness for four specific open standards, including 5G (3GPP), HTML5 (W3C), Bluetooth (Bluetooth SIG), and Blu-ray (BDA). Open standards often cluster in this area of the graph between a smaller and larger stakeholder governance on the development side and a Fair Reasonable And Non-Discriminatory (FRAND) and Royalty-Free (RF) IPR policy on the distribution side.[36] This level of control over the development process is necessary to achieve a high quality, dependable standard that can be improved in a structured, collective manner over time.

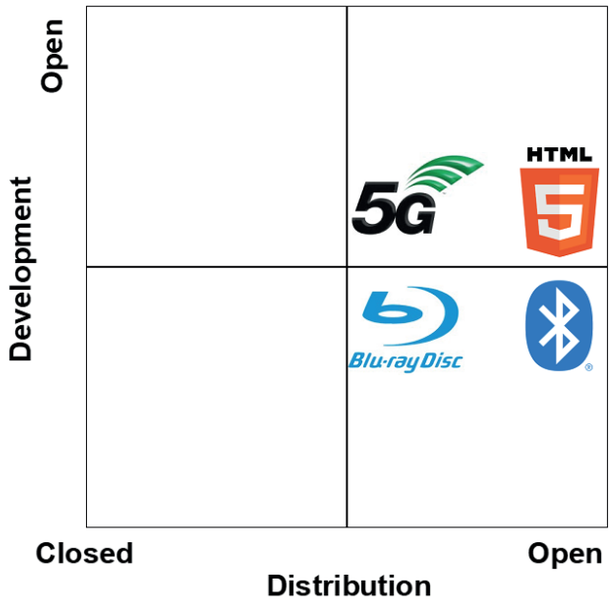



Figure 1. Dimensions of openness for open standards

Therefore, open standards are typically created in standard development organisations (SDOs) with specific governance procedures regarding participation, technical contributions, approval of specifications, and IPR policies. These SDOs operate as open innovation ecosystems that support the creation of both a technology system (i.e., a technology standard) and a market for standard-enabled products and services. Thus, instead of multiple firms introducing competing inventions and technologies into the market, the role of standard development organisations (SDOs) is to facilitate competing inventions submitted by many actors towards the development of one, joint technical solution as a standard, as shown in the context of cellular standards in figure 2 below.[37] The single cellular standard that emerges from this cooperative process not only ensures interoperability and efficiency by coordinating inventive efforts but also facilitates the formation of a global market for cellular connectivity.

**36.** For comparison purposes, Apple iOS could be described as a completely closed platform occupying the bottom left of the graph and Wikipedia as a completely open platform situated at the top right.

**37.** Heiden, B. (2020). The Value of Cellular Connectivity–From Mobile Devices to the Internet-of-Things (IoT). Available at SSRN 3670222.

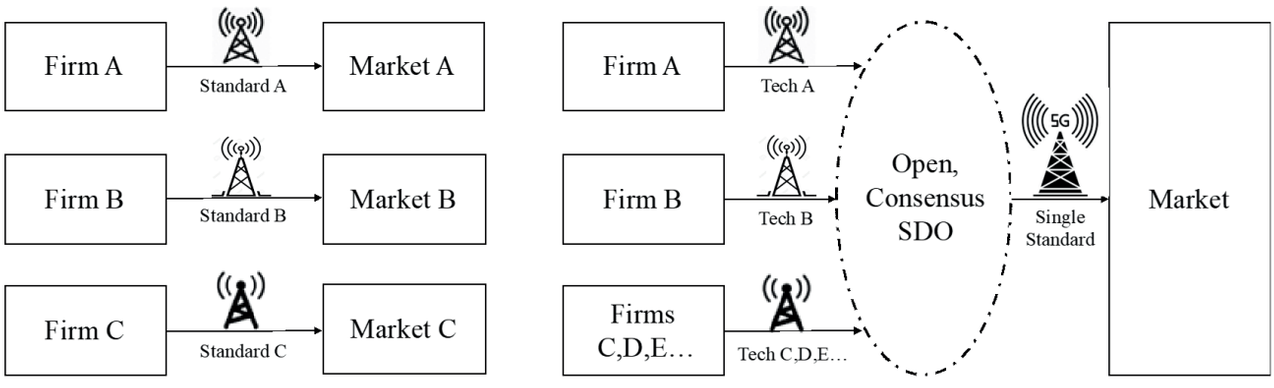



Figure 2. Competing de facto standards vs Standard Development Organizations (SDOs)[38]

For example, cellular standards such as 5G are developed through member company contributions at the 3rd Generation Partnership Project (3GPP), which is a consortium of seven international SDOs.[39] In comparison, the Bluetooth standard is developed by the Bluetooth Special Interest Group (Bluetooth SIG), which is a not-for-profit corporation driven by a handful of key promoter firms and over 36,000 associate and adopter members in total.[40]

The distribution, on the other hand, is more open and dependent on different factors, including historical paths, industry culture and norms, heterogeneity of participants, level of R&D investment, and diversity of business models to name a few. For example, the World Wide Web Consortium (W3C), which develops HTTP5 and other web standards, as well as the Bluetooth SIG maintain RF IPR policies with respect to terms of use of the resulting standards. On the other hand, 3GPP and the Blu-Ray Disc Association (BDA)[41] allow for FRAND licensing as a means to incentivise the contribution of the highest-performance technology to the standard. These policies are decided by the members. As one can see, open does not necessarily mean free of governance or free of cost.

- Competition

In addition, while open standards can often lead to one global standard, there can also be competition between open standards for market adoption (e.g., Cellular v. WiMax and Blu-ray v. HD-DVD).

**38.** Id.

**39.** 3GPP (2023), 'About 3GPP'. Available at: <https://www.3gpp.org/about-3gpp>

**40.** Bluetooth (2023), 'About Us'. Available at: <https://www.bluetooth.com/about-us/>

**41.** Blu-ray Disc Association (2023). Available at: <https://us.blu-raydisc.com>

## Benefits of open standardisation

The main goals of open standards are to produce high performance and interoperability to promote widespread adoption. In particular, the "open" nature of the standard development is intended to outperform a "closed" approach to technology development through a collaborative approach that benefits from the diverse, collective knowledge of many contributors. An "open" approach that creates large-scale participation and a shared design process can also accelerate global adoption and innovation. In short, open standards don't only develop technical specifications, they develop markets. Below are a number of specific benefits associated with open standards:[42]

- Drive Interoperability, Scalability, and Lower Costs
  Defining and providing open access to common specifications and interfaces reduces the risk of early adoption, leading to both increased supply-side and demand-side economies of scale that can facilitate lower costs and risks, resulting in further increased adoption in a virtuous cycle. For example, the greater adoption of the Blu-ray standard led to greater content becoming available on Blu-ray that increased the scale of production of Blu-ray discs and players, generating lower prices, greater content availability, and further adoption.

- Encourage New Entrants and Market Competition
  Open access to standards facilitates both neutral vendor participation in downstream markets and increased entry by new actors, often SMEs, that can lead to greater market competition, generating better customer choice and lower prices. For example, mobile subscriptions worldwide built on cellular standards exceeded the number of people on the planet in 2016, providing a large variety of phones and services to satisfy a large diversity of customer needs from the most to least developed countries.

- Open New Markets and Applications
  Open standards can serve as building blocks to complementary/follow-on innovation by tangential firms that can lead to new applications and markets. For example, connectivity standards led to the smartphone (e.g., Apple iPhone) and the ubiquitous use of mobile apps that have created new markets for transportation (e.g., Uber) and social media (e.g., Instagram) to name a few.

**42.** For the full list of ten benefits of open standards, see https://open-stand.org/resources/infographics/.

- Ensure High Performance through Technology Competition
  Open standards incentivise firms in different ways to collaboratively contribute their best technology to generate a greater impact by the standard on the market. Due to technology competition within the SDO, only the best technical contributions will be chosen and implemented in the standard. Better standards increase adoption, which is beneficial to all actors in the value chain. As the technical contribution to the development of the open standards is not equal across all market actors, FRAND-based IPR policies have been enacted in certain SDOs to further incentivise participation by technology firms to invest and contribute their R&D results to the standard.

## Case study:

The case of 3GPP open standardisation

As an example, Figure 3 below provides a holistic overview of the scale of inputs and outputs of the 3GPP standard development process, covering three distinct but iterative and overlapping phases:[43] 3GPP stands for third-generation partnership project, bringing together national SDOs from around the globe, and responsible for developing 3G to 5G cellular standards.

1. **R&D** – This includes technology investment by private firms into research, prototyping, trials, and other technology development focused on achieving the functionality and performance goals of the standard. For cellular standards, R&D investment has been estimated at tens of billions of dollars annually.[44]

2. **Standard Development** – This includes the investment of time and knowledge by members within the SDOs of reviewing member contributions and producing technical specifications through an open, consensus-driven process. For cellular standards, this includes hundreds of actors making thousands of contributions and working hundreds of thousands of hours, leading to hundreds of technical specifications on an annual basis.[45]

3. **Implementation** – This includes investment in cellular infrastructure and the launching of cellular networks by mobile telecommunication operators as well the creation of cellular-enabled products and services across industry verticals and use-cases. Currently, the mobile economy is estimated to produce $5.2T of economic value, and mobile operators are investing approximately $200B per year in mobile infrastructure.[46]

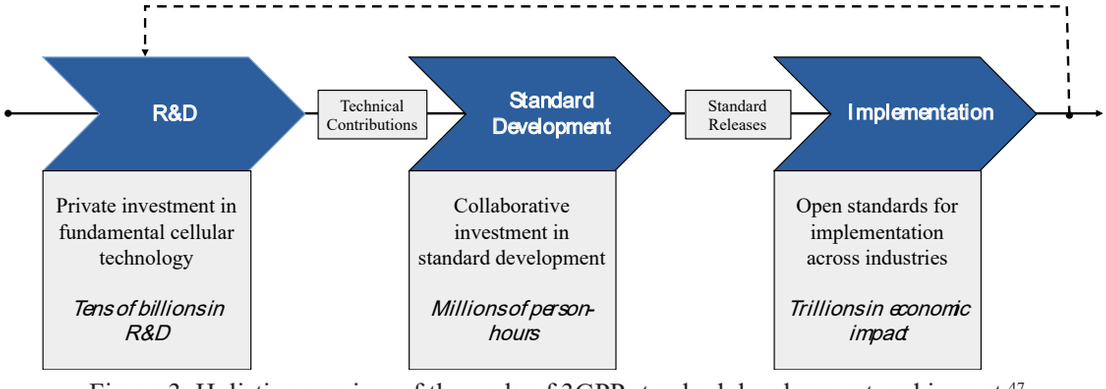



Figure 3. Holistic overview of the scale of 3GPP standard development and impact.[47]

**43.** Id.

**44.** Boston Consulting Group (2015). The Mobile Revolution: How Mobile Technologies Drive a Trillion-Dollar Impact.

**45.** Baron, J., & Gupta, K. (2018). Unpacking 3GPP standards. Journal of Economics & Management Strategy, 27(3), 433-461.).

**46.** GMSA (2023), The Mobile Economy 2023.

**47.** Heiden, B. (2020). The Value of Cellular Connectivity–From Mobile Devices to the Internet-of-Things (IoT). Available at SSRN 3670222.

# 5. IP Policy & FRAND (Igor Nikolic)

## Standard essential patents at a glance

Technological standards typically include patented technology. Members of Standard-Development Organisations (SDOs) develop and submit their best available technologies to be a part of the next-generation standard. A patent that must be implemented to comply with a standard is called a Standard Essential Patent (SEP). Simply put, the SEP is necessarily infringed when implementing the standard. Well-known standards such as 3G, 4G, 5G or Wi-Fi often include hundreds or thousands of different SEPs.

## Is there a tension between standards and patents?

At first sight, it may appear that there is tension between patents and standards.

Patents grant their owners a temporary right to exclude others from using the invention, while standards aim to make technological solutions accessible to the widest number of users. Nevertheless, patents and standards share the same goal of promoting innovation although they use different means. ETSI (the European Telecommunications Standards Institute) clearly encapsulates these principles by stating that it seeks a "balance between the needs of standardisation for public use in the field of telecommunications and the rights of the owners of IPRs. IPR holders should be adequately and fairly rewarded for the use of their IPR in the implementation of standards. ETSI shall take reasonable measures to ensure that its activities will be available to potential users in accordance with the general principles of standardisation."[48]

Standards Development Organizations (SDOs) are well aware of the existence of patented technology in standards and adopt Intellectual Property Rights (IPR) Policies regulating their usage.[49] SDOs also often adopt guidelines and explanations relating to their IPR Policies.

## IPR policies include two main obligations related to SEPs: disclosure and licensing[50]

Disclosure obligations are intended to provide information about the existence of patented technology that might become essential to the standard and, later on, to provide assurances that, should any of the disclosed patents or patents applications ever become essential they will be available under certain licensing terms (generally on Fair, Reasonable and

**48.** ETSI IPR Policy, Clause 3

**49.** Besides patents, other IPRs may also be relevant for standards such as copyright (text of standardization documents) and trademarks (logos). Because the use of patents over the years has been the subject of many policy discussions and disputes, they will be the focus of this chapter.

**50.** IPR Policies may also include other provisions such as transferability of licensing commitment, dispute resolution, promotion of patent pools and more specific licensing obligations.

Non-Discriminatory (FRAND) terms and conditions). It is possible to identify two different categories of disclosure obligations: i) *ex-ante* and *ex-post*, and ii) blanket and specific disclosures.

*Ex-ante* disclosure refers to the disclosure of patents and patent applications during the development of a standard, while *ex-post* disclosure occurs after the standard has been finalised. Making *ex-ante* disclosure is an uncertain process: the finally agreed version of a standard may not include technology disclosed early in the standard's development; it is difficult to assess with a sufficient degree of accuracy whether a patent is essential and whether it would remain essential to a finally agreed version of a standard; a patent application at that time may still be pending and it is unclear whether the granted patent will ultimately read on a standard. Moreover, the duty to identify and disclose patents is typically limited to the personal knowledge of the individuals participating in SDO meetings, making possible unintentional errors. As a result, often there is over-disclosure of patents that may not be essential for a standard. This is why we distinguish between patents *disclosed* before an SDO that *may be* essential from patents that are truly essential for a standard.

A specific disclosure identifies a patent or a patent application that may be essential for a standard, while a blanket disclosure only indicates that a company may hold SEPs without revealing the details of any such SEPs. Specific disclosure provides transparency in the patent landscape but is more costly for companies to implement, while blanket disclosure is easier to use and ensures access to all SEPs that a company may hold, but it does not contribute to patent transparency.

Licensing obligations require a company that holds patents or patent applications that may be essential for a standard to state its licensing position. IPR policies commonly require patent holders to license their SEPs either on FRAND terms or royalty-free. Patent owners may also decide not to license their SEPs, in which case SDO members should decide whether to proceed with the inclusion of that technology in a standard or to adopt an alternative technology.[51] FRAND licensing is by far the most widely used option. A study of 37 SDO IPR Policies found that 32 SDOs allow members to choose FRAND licensing, while the remaining 5 SDOs require royalty-free licensing.[52] Another study determined that 68% of all analysed declared as potential SEPs are licensed under FRAND terms.[53]

Terminologically, some SDOs require licences to be available only on "Reasonable and Non-Discriminatory" (RAND) terms, omitting the term "fair". It is commonly accepted in the literature that there are no substantive differences between FRAND and RAND terms and that the two should be treated as synonyms unless SDOs or courts rule otherwise.

**51.** See ETSI, Intellectual Property Rights Policy (3rd September 2020) Article 8 (procedure when licensing assurance is not given).

**52.** Baron, Spulber 479.

**53.** T Pohlman, K Blind, 'Landscaping Study on Standard Essential Patents (SEPs)' (2016) 36 (the remaining 32% declared SEPs did not specify their licensing conditions).

## How to ensure reasonable and non-discriminatory licences

The purpose of FRAND licensing rules is to secure widespread implementation of a standard while, at the same time, ensuring innovation incentives to SEP owners. Licensing rules enable engineers to focus on adopting the best available technologies without worrying that the implementation of the standard may later be blocked by patent owners deciding not to license their technology. To implementers of the standard, it ensures that licensing costs will be on a reasonable level, and to SEP owners it guarantees a fair and reasonable reward for their technological contributions.

Commercial negotiations about specific licensing terms are left for the parties to determine outside SDOs.[54] SDOs do not intervene in commercial licensing negotiations, and parties should arrive at terms they see as fair and reasonable in good-faith licensing negotiations. The open-ended nature of FRAND terms has led to some tensions, as what may be fair and reasonable to patent owners may not be so for standard implementers. Some authors and officials have argued for more precisely defined obligations under FRAND commitments. However, others maintain that FRAND provides the necessary flexibility for parties to negotiate a licence tailored to their specific circumstances. The very absence of a clear definition makes it possible to negotiate licensing conditions with each licensee and to consider the unique characteristics of certain sectors, contributing to the widest possible adoption of standards.

## Setting the scene with examples

The *Huawei v ZTE* case of the Court of Justice of the European Union (CJEU) provided a negotiation framework for both sides in the context of seeking injunctions for the infringement of SEPs.[55] The steps are the following:

i) Before seeking an injunction, the SEP holder must approach and notify the implementer about infringement and designate specific SEPs that are infringed.

ii) The infringer should express its willingness to conclude the licensing agreement.

iii) The SEP holder should then provide the specific, written offer for a licence on FRAND terms.

iv) Infringer must then diligently and in good faith respond to the offer, without any delaying tactics. If the infringer does not accept, it must submit promptly and in writing its FRAND counteroffer.

**54.** See ETSI, 'Guide on Intellectual Property Rights' (10 June 2021) 4.1; ITU-T, IEC and ISO, 'Patent Statement and Licensing Declaration Form' (2 November 2018) p. 2; CEN-CENELEC, Guide 8: Guidelines for Implementation of the Common Policy and Patents (2019) ("CEN and CENELEC however, never interfere with licensing negotiations and any licensing discussions shall take place outside the CEN and CENELEC system and among the relevant patent or other IPR holders"); IEEE, 'Standards Board Bylaws' (February 2022) p. 18.

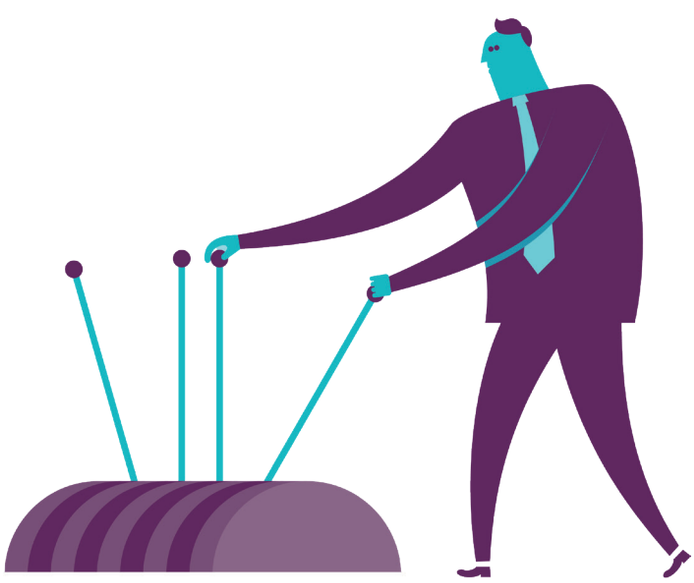
**55.** See 4iP Council, National Courts Guidance to see how these steps have interpreted by European courts at https://caselaw.4ipcouncil.com/guidance-national-courts

v) If the SEP holder rejects the counteroffer, the infringer must provide appropriate security and render accounts.

vi) At all times the infringer should be allowed to challenge the validity, essentiality, and the infringement of SEPs both during the negotiations and after the conclusion of a licensing agreement.

The CJEU's *Huawei v ZTE* framework has now been recognised as a standard commercial practice in negotiating FRAND licences when parties are behaving in good faith.

More information on SDOs' IPR Policies and FRAND licensing can be found in numerous comprehensive studies published over the years.[56]



**56.** See R Bekkers, A Upgedrowe, 'A Study of IPR Policies and Practices of a Representative Group of Standards Setting Organizations Worldwide', Commissioned by the US National Academies of Science, Board of Science, Technology, and Economic Policy (17 September 2012); K Maskus, S Merrill (eds.), 'Patent Challenges for Standard-Setting in the Global Economy: Lessons from Information and Communication Technology' (National Research Council 2013); J Tsai, J Wright, 'Standard Setting, Intellectual Property Rights, and the Role of Antitrust in Regulating Incomplete Contracts' (2015) 80 Antitrust Law Journal 157; J Baron, D Spulber, 'Technology Standards and Standard Setting Organisations: Introduction to the Searle Center Database' (2018) 27 Journal of Economics & Management Strategy 462; J Baron, J Contreras, M Husovec, P Larouche, 'Making the Rules: The Governance of Standard Development Organizations and their Policies on Intellectual Property Rights' (Publication Office of the European Union 2019); I Nikolic, Licensing Standard Essential Patents: FRAND and the Internet of Things (Hart Publishing 2021).

# 6. Competition Law & Standards (Igor Nikolic)

## The dual role of competition law for standards

Competition law plays a dual role when it comes to standardisation. During the development of a standard, it ensures that the standardisation process does not lead to collusion among SDO members or the exclusion of competitors. Then, after the standard is set, competition law controls the conduct of SEP owners with increased market power.

Technological standardisation within SDOs involves cooperation between various entities such as companies, universities, or government-funded institutes. The widest cooperation is necessary to create the best possible interoperable technologies. However, companies that participate in standard development are often mutual competitors in technology or downstream product markets. Standardisation is thus a form of *coopetition*, where companies both cooperate within SDOs to create technological standards and then compete outside SDOs in selling standard-implementing products.

## Avoiding collusion among SDO members

Competitors coming together naturally raises competition law concerns. The main concern is that a standard-development process may be used as a cover for cartelisation, market collusion or exclusion of competitors.[57] Companies working within SDOs may exchange sensitive commercial information enabling them to collude on prices, output, markets, or other factors of competition. They may also abuse SDO procedures to exclude competing technology from a standard or put pressure on third parties not to use products that do not comply with the standard. For example, in one US case, a large company used its influential position to make an SDO committee chair issue a letter stating that the competitor's products were not compliant with the relevant safety standard.[58] The company then used this letter to discourage customers from buying competitors' products. In another case, the largest US producer of steel conduit colluded with members of the steel industry and other steel conduit manufacturers to exclude alternative plastic conduit technology from the standard by packing the annual SDO meeting with new members whose only function was to vote against the inclusion of competing technology to the standard.[59] In the EU, the Commission fined producers of pre-insulated pipes for, among other things, using standards to prevent or delay the introduction of new technology which would result in price reductions.[60]

**57.** See OECD, 'Standard Setting' DAF/COMP(2010)33 (08 March 2011) 30-31.

**58.** American Society of Mechanical Engineers v Hydrolevel (1982) 102 S.Ct. 1935.

**59.** Allied Tube & Conduit Corporation v Indian Head (1988) 108 S.Ct.1931.

**60.** Case No IV/35.691 - Pre-Insulated Pipe Cartel, Commission Decision of 21 October 1998, 1999/60/EC.

Competition rules and guidelines applicable to SDOs and companies involved in standard-development require the introduction of different safeguards to minimise potentially negative anti-competitive effects.[61] The European Commission considers that SDOs that fulfil the following four conditions will normally not restrict competition:[62]

1) Unrestricted participation in standard development
2) Transparent procedure for adoption of the standard
3) No obligation to comply with the standard
4) Access to the standard on FRAND terms

**61.** Commission, 'Guidelines on the applicability of Article 101 of the Treaty on the Functioning of the European Union to Horizontal Co-operation Agreements' [2011] C 11/1 (Commission, Guidelines on Horizontal Co-operation Agreements); Standard Development Organization Act 2014, 15 U.S.C. §§ 4301-4306; US Department of Justice and Federal Trade Commission, 'Antitrust Enforcement and Intellectual Property Rights: Promoting Innovation and Competition' (2007) 33-57.

**62. Commission, Guidelines on Horizontal Co-operation Agreements, para 280.**

Case studies

Competition law also plays a role in constraining the unilateral conduct of SEP owners who hold a dominant position in the market. Existing cases relate to patent ambush, where companies failed to disclose their SEPs during the development of the standard, alleged non-FRAND pricing strategies, and the use of injunctions for the infringement of SEPs.

Case study n° 1

The US Federal Trade Commission and the European Commission investigated Rambus for patent ambush. Rambus had allegedly intentionally concealed the existence of its patents and patent applications during the development of certain chip standards and, once its patents were included in a standard, it started asserting them against implementers without a FRAND commitment. The FTC considered such conduct a violation of US antitrust laws,[63] but the D.C. Circuit on appeal set aside the FTC's decision holding that the FTC did not prove that the SDO would have adopted alternative technology even if SEPs were timely disclosed.[64] A deceptive failure to disclose SEPs should directly contribute to the exclusion of alternative technologies. According to the court, the mere avoidance of FRAND commitment is not enough to establish competition law liability. In the EU, the European Commission closed the case by accepting Rambus' commitments to charge zero royalties for standards developed while it was an SDO member and to lower SEP royalties for later generations of chip standards.[65]

Case study n° 2

The next line of cases looked at whether it is anti-competitive for the SEP owner to offer licensing terms that are not FRAND. In the US, charging excessive prices by dominant companies as such is not prohibited. Therefore, antitrust claims have been centred around the accusation that the SEP holder *deceived* an SDO in order to unlawfully acquire monopoly power. In *Broadcom v Qualcomm*,[66] Broadcom alleged that Qualcomm deceived an SDO to include its SEPs into the standard by falsely promising to license its patents on FRAND terms, and then breached such promise by licensing its technology on non-FRAND terms. The Third Circuit held that for the violation of competition law it must be proven that: 1) the SEP holder intentionally falsely promised to license its SEPs on FRAND terms, 2) the SDO's reliance on that promise when including the technology in a standard, and 3) the patent holder's subsequent breach of that promise.[67] This is a high threshold to overcome and we have no final court judgment to date that has definitively established a competition law liability for a deceptive breach of FRAND commitment.[68] In the EU, it also seems that the mere breach of FRAND commitment, without more, is not anti-competitive. The European Commission investigated Qualcomm for allegedly charging excessive non-FRAND royalties but closed the investigation without any definitive finding,[69] while a UK court held that a non-FRAND rate could be anti-competitive only if it is so far above FRAND as to act to disrupt or prejudice licensing negotiations.[70]

Finally, competition authorities were suspicious of SEP owners asking for injunctions for the infringement of SEPs. SEP owners could allegedly use an injunction to exclude implementers from the market or pressure them into acceptance of non-FRAND rates. The FTC in two cases investigated SEP owners that pursued injunctions, ending in consent orders without the establishment of liability.[71] The European Commission also took the view in cases against Motorola and Samsung that seeking injunctions against companies willing to take a FRAND licence is anti-competitive.[72] The Court of Justice of the European Union in *Huawei v ZTE* provided a framework for SEP licensing negotiations and a safe harbour for when seeking injunctions would not be abusive.[73] That framework is now being used by national courts in assessing whether to grant an injunction for the infringement of SEPs.

**63.** In the Matter of Rambus, Inc., Docket No. 9302 (FTC 2006), Opinion of the Commission. The FTC investigated and closed two other patent ambush cases with consent orders, see Dell Computer Corporation, Docket No. C-3658 ,121 (FTC 1996); Union Oil Company of California, Docket No. 9305 (FTC 2005).

**64.** Rambus v Federal Trade Commission 522 F.3d 456 (D.C. Cir. 2008).

**65.** Commission, 'Antitrust: Commission Accepts Commitments from Ramus Lowering Memory Chip Royalty Rates' (2009) IP/09/1897.

**66.** Broadcom v Qualcomm 501 F.3d 297 (Third Cir. 2007).

**67.** Broadcom v Qualcomm 501 F.3d 297, 314 (Third Cir. 2007).

**68.** See cases Continental Automotive Systems v Avanci 2020 WL 5627224 (N.D. Tex. 2020) 12; Wi-Lan v LG Electronics 382 F.Supp.3d 1012 (S.D. Cal 2019); Microsoft v Interdigital 2016 WL 1464545 (D. Del. 2016); Apple v Samsung 2012 WL 1672493 (N.D. Cal. 2012) 8Research in Motion v Motorola 644 F.Supp.2d 788, 798 (N.D. Tex. 2008).

**69.** Commission, 'Antitrust: Commission closes formal proceedings against Qualcomm' MEMO/09/516 (2009).

**70.** Unwired Planet v Huawei [2017] EWHC 2988 (Pat) 765.

**71.** In the Matter of Robert Bosch GmbH, Docket no C-4377 (FTC 2013); In the Matter of Motorola Mobility LLC and Google Inc. Docket no C-4410 (FTC 2013).

**72.** Motorola - Enforcement of GPRS standard essential patents (Case AT.39985) Commission Decision C(2014) 2892 (29 April 2014); Samsung - Enforcement of UMTS standard essential patents (Case AT.39939), Commission Decision C(2014) 2891 (29 April 2014).

**73.** C170/13, Huawei Technologies v ZTE ECLI:EU:C:2015:477.

# 7. Open source & standards (Justus A. Baron)

## Open innovation at a glance

Open innovation is a process of combining different companies' ideas to bring a new technology to the market, in a process that is both open and transparent – open innovation has no secrecy and no gatekeepers.

Open innovation is a radical idea – many innovative companies may not want to show what they are working on before they have a market-ready product; much less share their ideas with competitors. Nevertheless, open innovation is not the exclusive domain of enthusiasts, hobby technologists and academics. In fact, open innovation can be a highly efficient and profitable way of developing new technology.[74]

Open standards and Open Source Software (OSS) both result from open innovation processes.

## The different processes of open standards and OSS

Even though both Open Standards and OSS are facets of open innovation, they are very different, and they serve very different goals.

OSS is a software, e.g., a web browser or an operating system, that consumers can download and use. While there are many different types of OSS, they share certain characteristics setting OSS apart from "proprietary" software; e.g. *free distribution* (anybody can get access to the software, and can make and distribute copies of the software to others) and *open source code* (anybody can look under the hook and make any desired changes to his or her own copy of the software).[75]

Open standards, by contrast, are rules (often called technical requirements or specifications). These rules may serve different purposes – they e.g., make sure that a product is safe to use. Many standards are compatibility standards, and make sure that all products confirming to a set of common specifications interoperate in an expected way. Standards e.g., make sure that an electric device fits into the sockets at your home, or that your phone may communicate with another consumer's phone.

**74.** Chesbrough, Henry W., and Melissa M. Appleyard. "Open innovation and strategy." California Management Review 50.1 (2007): 57-76.

**75.** Weber, Steven. "The success of open source." The Success of Open Source. Harvard University Press, 2005.

Because of their different goals, OSS and open standards are developed through different processes. OSS processes are geared towards the rapid development of innovative and flexible software. Anybody can participate, but project leaders or a restricted number of 'maintainers' of the OSS project may retain or reject contributions.[76] Nobody has a right to have his code considered. This way, like-minded peers can collaborate without being held back by disagreements. And if you like a piece of code that was rejected, you can insert it in your own copy of the software and distribute it under a different name (a process called *forking*).

Open standards are developed through processes aiming at *consensus* among relevant stakeholders and subject matter experts. While compliance with open standards is generally voluntary, standard specifications set out requirements that everybody has to follow in order to be in conformity with the standard. For standards such as WiFi, LTE, and USB, the networks of standard-compliant devices are so large, and interoperability with other devices is so important that a product de facto has to conform to the standard in order to be viable. In some cases, conformity with a standard may even become a legal requirement, e.g. when a standard is incorporated into binding government regulation.

As standards may wield significant power, it is important that requirements embedded in standard specifications are objectively justified and not biased against different stakeholders' interests. Standards Development Organizations (SDOs) thus follow processes that attempt to balance the interests of different constituencies and ensure that all significant objections are addressed.

## Open standards, oss and intellectual property rights

Open standards and OSS also have a very different relationship with IPR. Every OSS is distributed under a specific license. The terms of this license determine whether a software is OSS (e.g., free, unrestricted use, etc.). The license is usually self-executing; i.e. a user enters into the license by downloading a copy of the OSS. On one hand, this allows rapid distribution of the software without any need for users to separately sign or even negotiate a licensing contract. On the other hand, contributors to the OSS may not stipulate specific licensing conditions for their contributions to the OSS. Potential contributors must thus carefully evaluate whether the licensing terms of a particular OSS are compatible with their business models.

**76.** Shaikh, Maha, and Ola Henfridsson. "Governing open source software through coordination processes." Information and Organization 27.2 (2017): 116-135.

Open standards, by contrast, require a balancing act. On one hand, open standards must be open and available for implementation by any interested stakeholder; on the other hand, open standards must result from standards development processes that are open to different stakeholders with different business models. SDOs solve this balancing act through their IPR policies. While all SDO IPR policies require SDO members and contributors to provide standard implementers with reasonable access to any standard-essential IPR, most SDOs allow owners of standard-essential patents (SEP) to charge standard implementers fair, reasonable, and non-discriminatory (FRAND) royalties.[77] For many contributors to open standards development, these FRAND royalties constitute an important source of revenue, and a main incentive to participate in open standards development.[78] SDOs' IPR policies do not determine the level of these FRAND royalties, nor any other terms of the licenses between SEP owners and standard implementers. These commercial aspects are left to negotiations taking place outside of the SDO.

## Interactions between open standards and OSS

While Open Standards and OSS often co-exist in different parts of the universe of open innovation; there are important interactions between both processes.[79]

OSS and open standards may compete with each other: technologies defined by open standards, such as ISO/IEC's video compression standards AVC and HEVC, may compete with OSS codecs (AV1 and VP9).

It is also common for OSS and open standards to complement each other. As any user of an OSS may make changes to the OSS, different versions of an OSS are not necessarily interoperable. Open standards may provide general rules, so that OSS users can adapt the software to their own needs without losing the benefits of interoperability.

There are also cases in which an open standard is very complex, or even ambiguous. Potential implementers may find it difficult to produce a product that is guaranteed to comply with the standard's requirements, and different implementations of the same standard may not be fully interoperable. In these cases, users may find it beneficial to develop a reference implementation of a standard, which is usually a software that interested users can use to ensure a fully compliant standard implementation. It is common for such reference implementations to be produced in OSS processes and distributed under an OSS license.

**77.** Bekkers, Rudi, and Andrew Updegrove. "A study of IPR policies and practices of a representative group of Standards Setting Organizations worldwide." Available at SSRN 2333445 (2012).

**78.** Baron, Justus, Cher Li, and Shukhrat Nasirov. "Why do r&d-intensive firms participate in standards organizations? The role of patents and product-market position." The Role of Patents and Product-Market Position (April 1, 2019) (2019).

**79.** Blind, Knut, and Mirko Boehm. "The Relationship Between Open Source Software and Standard Setting", Publications Office of the European Union. Belgium

## How are OSS used in standards development?

Given the potential for beneficial interactions between open standards and OSS, many SDOs look to integrate OSS processes and licenses into their own standards development processes.[80] SDOs may e.g., use OSS processes for developing certain tools, such as software used in conformity assessment. Many SDOs also integrate the processes of standards development (i.e., the drafting of requirements in a technical standard document) with the development of an OSS reference implementation (i.e., the development of a software that implements these requirements). The integration of the two processes allows for beneficial feedback loop; e.g. developers of the reference implementation may find certain technical requirements difficult to interpret; as these developers also participate in the simultaneous drafting of the technical standard, they may immediately suggest changes to the relevant specifications.[81]

While such a reference implementation does not have to be developed under OSS processes, OSS processes have many advantages making them well-suited to this task – they are flexible, lean, and reduce the potential for conflicts to delay or derail a collaborative project.

In spite of the potential benefits, integration of OSS into open standards development processes may alter the nature of the standards development process. Open standards development processes should be open to stakeholders with different business models – SDOs thus usually seek a balance between different constituencies' interests and avoid to set commercial terms for relationships between firms. Some OSS licenses, however, have terms that some companies would find impossible to accept – e.g., many OSS licenses grant users the right to use any of the contributors' patents related to the OSS without having to pay royalties.[82]

## The limits of OSS

Companies that rely on patent licensing as an important source of revenue are unlikely to participate in the development of a reference implementation distributed under such a license, as users of the reference implementation would acquire a royalty-free access to their SEPs. If the development of the standard and the OSS reference implementation are tightly integrated, these companies may be excluded from important parts of the decision-making on the technical specifications of the standard.

Many SDOs have recognized the need to preserve the overarching balance of their processes and IPR policies when integrating OSS processes and licenses into standards development. Many of these SDOs have devel-

**80.** Lundell, Björn, and Jonas Gamalielsson. "On the potential for improved standardisation through use of open source work practices in different standardisation organisations: How can open source-projects contribute to development of IT-standards?." The 22nd EURAS Annual Standardisation Conference, Berlin, Germany, June 28-30, 2017. Verlag Mainz, 2017.

**81.** Lundell, Björn, et al. "How Can Open Standards Be Effectively Implemented in Open Source?." Open Source Systems: Long-Term Sustainability: 8th IFIP WG 2.13 International Conference, OSS 2012, Hammamet, Tunisia, September 10-13, 2012. Proceedings 8. Springer Berlin Heidelberg, 2012.

**82.** Herman, Michele, and Justus Baron. "Downsides of Using Inadequate Open Source Software Processes and Licenses within Standard Development Organizations." Available at SSRN 3790616 (2021).

oped tailor-made OSS licenses, which limit the scope of the OSS license to copyrighted contributions to the reference implementation, while any potential SEPs related to the standard continue to be subject to the SDO's IPR policy and FRAND licensing requirements.

## A bright outlook for open standards and OSS

As technological innovation is increasingly based on software, open standards are likely to be increasingly implemented in OSS. The two processes can complement each other in beneficial ways and deliver the benefits of seamless inter-operability in flexible and agile open innovation processes. Nevertheless, it is important for SDOs to preserve the balance and openness of their processes, by adopting OSS licenses and processes that are well-suited to SDOs' needs, and compatible with their IPR policies.

# 8. Geopolitics and Standardisation: Statecraft Shaping the Future of Technology (Raluca Csernatoni)

## Geopolitics and standardisation at a glance

Emerging and Disruptive Technologies (EDTs)[83] are impacting international relations in novel ways, and in the process, they are creating new responses to growing geopolitical disputes. Technological innovation is reshaping economies and societies across the globe at an unprecedented pace, and many have argued that we are living in the fourth industrial era.[84] Cutting-edge technological domains such as Artificial Intelligence (AI), autonomous robotics, Big Data, quantum-enabled technologies, and future generation telecoms networks, are already disrupting existing systems of international governance while prompting complex debates about their innovation, norms, legal implications, and technical standards.

Today, the development, governance and regulation of EDTs is occupying an increasingly central role in world politics. They bring new tensions in foreign policy and require different statecraft strategies of adaptation from various stakeholders such as states, international organisations, and the private sector. In this context, statecraft is the strategic use of assets, resources, or tools, be they economic, diplomatic, military, or other, that an international actor can deploy to advance its interests on the global stage, affect the conduct of other actors, or shape the dynamics of international relations. While major players, such as the United States of America (US) and China have been driving the global technological innovation 'race' in recent years through various forms of statecraft, these developments influence the entire geopolitical landscape, including the role of the European Union (EU).[85]

Recent scholarly and policy work has zoomed in on the link between geopolitics and EDTs, while claims that we are experiencing (yet again another) 'return of geopolitics' have become the norm. This link denotes a discourse that promises to deal with rising geopolitical rivalries and global insecurity by providing technological fixes[86] to it. This is further accounted for by the emergence of a new player in the EDT game, China, and its drive for technological dominance and state-driven strategies in creating native technologies, the US fielding large investments in frontier EDTs for both commercial and defence purposes, and the EU's use of its market and regulatory powers to externalise internal technological norms and standards.[87]

**83.** Antonio Calcara, Raluca Csernatoni, and Chantal Lavallée, The European Governance of New Security Technologies (Routledge Studies in Conflict, Security and Technology, 2020)

**84.** Klaus Schwab, 'The Fourth Industrial Revolution: what it means, how to respond' (World Economic Forum, 2016) <https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/> accessed 21 July 2022.

**85.** Raluca Csernatoni, 'The European Union's Sovereignty Agendas: A Quest for Technological Power: From Strategic Autonomy to Technological Sovereignty' (Carnegie Europe Article, August 12) <https://carnegieeurope.eu/2021/08/12/eu-s-rise-as-defense-technological-power-from-strategic-autonomy-to-technological-sovereignty-pub-85134> accessed 21 July 2022.

**86.** Sean F. Johnston, 'The technological fix as a social cure-all: origins and implications' in IEEE Technology and Society [2018] 37(1):47-54.

**87.** Anu Bradford, 'Exporting standards: The externalization of the EU's regulatory power via markets' in International Review of Law and Economics [2015] 42:158-173.

Accordingly, such statecraft strategies, including the geopolitics of technical standards-setting, need further examination, particularly in terms of better understanding the nexus between national interests, technology, and standards.

## How are standards becoming an international governance mechanism?

High tech is becoming high politics, fuelling a turn to technological sovereignty.[88] Whereas developing EDTs used to be mainly a commercial or business pursuit, now it is primarily about foreign and defence policies, supply chain security, avoiding critical dependencies, and setting the international agenda in technical standards. When it comes to geopolitics, three dimensions are relevant:

- International relations;
- History;
- Geography;

all three being shaped by their intrinsically political character. In terms of the geopolitics of technology nexus, while technology plays a crucial role, geography also matters, if not even more nowadays.

The current international turn towards localised technological sovereignty approaches across the globe, and the push for home-grown technological innovations, are both intertwined with the strategic use of international standards development organisations (SDOs) to legitimise and promote such national solutions in the global marketplace.

## China and technical standards

Technical standards, as international governance mechanisms, reflect varying combinations of public and private governance architectures at different levels, from national, regional, to international, according to their scope, competencies, and the institutional capacities of SDOs.[89] In recent years, China's statecraft activities in SDOs[90] to advance its long-term political, economic, and technological strategic interests have raised 'Western' concern. Such activities are also consistent with China's stated goal to become a technological superpower, accounted for by various other initiatives: from the Made in China 2025 Strategy (2018) which strives to secure the country's position as a global powerhouse in high-tech industries; the China Standards 2035 Report (2018) aiming to create a blueprint for the government and leading tech companies to set global standards for EDTs such as AI, 5G, and the Internet of Things (IoT); to the Belt and Road Initiative, China's global infrastructure development strategy.

**88.** Raluca Csernatoni, 'European Strategic Autonomy and Future Technology' (Policy Brief in the Friedrich Naumann Stiftung and LSE IDEAS Report on 'Beyond Autonomy: Rethinking Europe as a Strategic Actor', 2022) <https://www.lse.ac.uk/ideas/publications/reports/beyond-autonomy> accessed 21 July 2022.

**89.** Kenneth W. Abbott and Duncan Snidal, 'International "standards" and international governance' in Journal of European Public Policy [2001] 8(3):345-370.

**90.** Stacie Hoffmann, Dominique Lazanski, and Emily Taylor, 'Standardising the splinternet: how China's technical standards could fragment the internet' in Journal of Cyber Policy [2020] 5(2):239-264.

China's quest to play a central role in international standardisation processes should be viewed as going hand in hand with the country's objective to forge its technological sovereignty, reduce dependencies on foreign technology imports, and invest heavily in home-grown innovation to help national tech champions compete internationally. In this respect, the connection between geopolitics and standardisation can be construed as a form of statecraft in pursuit of global market domination, by which a state can strive to control and manage the formulation of standards in various SDOs fora as a form of influencing international governance mechanisms. This allows on the one hand stronger control over agenda-setting and over system design, and on the other hand it creates opportunities in formulating industry standards. Indeed, standards are typically created on the best technical solutions, which reflect the advanced development of a country and outline future trajectories of technological innovation. Consequently, the twin goals of promoting a state's global presence *and* of boosting the global profile of indigenous tech champions are achieved.

## State-led or industry-driven technical standards?

As China strives to set the agenda when it comes to foundational standards that will shape future technologies, markets, and industries to the advantage of national champions, it becomes clear that national policies and / or opaque statecraft from any state player may not be internationally accepted, as they may result in highly challenged global market dominance. This is especially true in a dynamic global environment characterised by constant competition in the research, development, and innovation of EDTs, and driven by lucrative business opportunities and the pursuit of technological and industrial excellence.

This builds on internationally recognised standards that are voluntary, industry-led and market-driven, based on openness, reliability, cost-efficiency, and interoperability. When it comes to standard-setting in the case of EDTs such as AI, future generation networks, cloud computing, Big Data infrastructures, or IoT products, forward-looking thinking and concerted action is also needed to navigate the complex SDO ecosystem. This is especially important given the increasing (cyber)security concerns across the world. Currently, these concerns come from OECD countries and focus on[91] the Chinese tech companies and key industry players, as their technologies are then translated into SDOs, but one may consider that at any time concerns may come from any player/ state player against any other player/state player.

**91.** Jennifer Hewett, 'UK Splits from Australia and US over Huawei' (Australian Financial Review, 27 January 2020) <https://www.afr.com/companies/telecommunications/uk-splits-from-australia-and-us-over-huawei-20200127-p53v5c> accessed 21 July 2022.

## Avoiding geopolitics in standard setting?

Different kinds of standards-setting organisations[92] can be identified, namely multistakeholder and multilateral or a combination of both, each SDO being set up according to agreed-upon rules and norms. For instance, multilateral SDO activities, undertaken under the leadership of the International Telecommunication Union (ITU), the United Nations' System Organization covering these activities, can become sites of geopolitical rivalry and state capture, due to the fact that governments rather than industry hold decision-making powers in agreements and negotiations. Accordingly, this also highlights why any major new entrant (as currently in the case of China) may prefer to pursue its strategic goals to internationalise national standards in easier to access multilateral SDO fora where states are the key power holders and where the industry is somehow weaker.[93] This is often considered as running counter to a model of international governance that relies on multistakeholder public and private approaches, global academic expertise, and non-discrimination, and sometimes tenets of good governance at the intersection of the private sector, civil society, and academia.

## Towards a new approach from OECD key players

This vision is now starting to be acknowledged by OECD States that had, up to recent times, typically preferred *laissez-faire* market-based and industry-driven approaches to standard-setting in a usually open, multistakeholder, and decentralised SDO ecosystem. With industry in the driver's seat regarding SDO participation and strategising, more attention is paid to the demand for standards from the businesses and organisations who use them, or to creating standards from technical protocols used in products, rather than geopolitical considerations of statecraft. While in this respect standard-setting appears to be a voluntary, bottom-up, and consensual search for the technically most appropriate solution, in reality, the process is increasingly becoming a balancing act between statecraft, technological excellence, interoperability, cost-efficiency, and profit. This is why the SDO ecosystem is more and more becoming a critical arena for power politics and tech rivalries between major Powers and state-backed technological giants.

In fact, neither technology nor standardisation need be an ingredient for geopolitical competition. This also begs the question whether the single biggest challenge around EDTs is the way in which they are being both weaponised and nationalised. States around the globe are racing to deploy various localisation strategies: to protect key technological domains for national security reasons; to avoid critical dependencies; to use targeted

**92.** Dominique Lazanski, 'Governance in International Technical Standards Making: A Tripartite Model' in Journal of Cyber Policy [2-19] 4(3): 362-79.

**93.** Yin Chen, 'Panel 1 Setting the Scene' (Presented at the Internet Governance Forum, Athens, Greece, 30 October 2006) <https://www.intgovforum.org/cms/IGF-Panel1-301006.txt> accessed 21 July 2022.

subsidies, foreign direct investment screenings, and export controls. And as explained above, these are coupled by statecraft strategies to proactively get involved in setting international norms and standards that reflect national policies and politics. Yet, the geopolitics of technology and standards-setting risks perpetuating a reductionist and zero-sum conflictual approach to technological competition, which has alternatively been a driver of progress, globalised interdependencies, and economic prosperity, even if in some parts of the globe more than in others.

*"People of the same trade seldom meet together, even for merriment and diversion, but the conversation ends in a conspiracy against the public, or in some contrivance to raise prices". -* ***Adam Smith.***

# 9. Special Contribution by Sir Robin Jacob

Set amongst the umbrella pines in the hills above the Mediterranean Sea midway between Nice and Cannes is Sophia Antipolis Science Park. It is the home of ETSI - the European Telecommunications Standards Institute. It is here that many standards are set by engineers from many companies working together. The modern, fast changing world of technology owes much to what goes on here. The most important standard (but far from the only standard) is the one for telecommunication, 2G, 3G, 4G 5G, and, for the future 6G and onwards.

> Some view this activity with suspicion: They recall the words of Adam Smith:
>
> *People of the same trade seldom meet together, even for merriment and diversion, but the conversation ends in a conspiracy against the public, or in some contrivance to raise prices.*

What Smith said was largely true in his days – and very probably still is where the trade concerned is in known goods, particularly staple commercial products, commodities such as cement, fuel, and potatoes. But it does not apply to the "conspiracy" of companies who contribute to standard setting. Why? Because the "conspirators" who set standards are not interested in price fixing of the kind Smith had in mind. They are, of course, interested in making money. But their way is making innovative products – they compete in innovation itself. That cannot be done without standards. The way of getting sales – of making money – is to offer the consumer a product which is technologically more advanced than the one she/he has already. That is why those of us old enough to remember traded up from 2G to 3G to 4G. And why they are now trading up to 5G and will trade up to 6G and beyond. Price fixing has nothing to do with it.

Another suspicion is that the engineers are briefed by their company to push for that company's technologies (which might be patented) to be part of the standard. The thought is that there will be no money in any technology rejected for a standard. Only accepted technology will have value. That is of course true – indeed it is a trite observation, though some seem to think it profound. But this undeniable fact should have no place in policy. After all the standardisation process involves many engineers from many companies that may have commercial relationships and might be competitors. Their goal is to create the best technologies to form a standard that will enable interoperability between products and services provided by multiple companies that may or may not have contributed to the standards development organisation. For an engineer to push for his company's technology she/he has to satisfy the others that it is the best solution. A well-

known example is the adoption of basic technology for 3G of a leading company in wireless technologies. It was the best and resulted in a huge jump in performance of mobile devices. There is no evidence that any company has ever succeeded in persuading any standard setting organisation to adopt a technology which was inferior to other possible solutions. It sounds improbable. Standards development organisations create technical standards following a long process, that could take up to a decade, where a broad diversity of companies submit technical contributions. These contributions are challenged, discussed, modified until a consensus emerges towards their inclusion into the standard. When a company participates to a standards development organisation, it accepts its rules including its intellectual property rights policy. As a consequence, if a company submits its technology that may include patented components to a standards development organisation, the company accepts that its invention be accessible to all under licensing terms.

In the early days of telecommunication standard setting – the early 90s -standards were not even worldwide – you had to have a different mobile phone for the USA and Europe for example. That was a re-enactment of the early days of the telephone system itself. In the US, owners of Bell telephones could only call owners of other Bell phones not Western Electric for example. The young Lars Magnus Ericsson visited the US, realised the significance of that and returned to Sweden with the idea that you could call all phones not just those of the maker of your phone. The rest is history – a history of standards.

The standard setting – a process involving co-operation between competitors - is not prima-facie anti-competitive activity at all. It is not something which should be viewed with suspicion, tolerated at best and regulated. It is the most successful example of co-operation between commercial rivals the world has ever seen. The public benefits have been huge. The big picture is that the system works. Indeed, it works very well with innovation proceeding at a greater and greater pace and competition between companies getting fiercer.

Given that, when how and why competition authorities have been so concerned about the operation of the standard setting system is a legitimate question.

Let us look first at when. The first competition law concern to come to prominence (perhaps the first such concern altogether) arose as a result of the Rambus case in late 2000s. To simplify, it was alleged that Rambus had participated in a standard setting operation and allowed or encouraged the body to adopt its patented technology without disclosing it had patents over it. Although that was not made out, the litigation and competition authority intervention made it clear that such conduct was in principle anti-competitive. A good analogy would be a man who allowed or encouraged another to build on land over which he had rights and only sought to assert his rights after they had done so.

"Patent ambush," as it has become called, has never been a problem since then: Why? Because of the FRAND (fair, reasonable and non-discriminatory) commitment. In the essays which follow others are bound to set its wording out in detail. For present purposes it is enough to say that every member of a standard setting body commits in advance to license all his patents covering the standard as it is and may be developed, on FRAND terms. The commitment is made very early – when the patent is only an application. So no-one knows for certain whether there ever will be a patent or what its claims are or whether it will cover the standard as adopted. What follows from that is, or should be, simple. If an implementer is willing to pay a FRAND rate he will not be injuncted by any court. There is no known instance of this. Such few injunctions as have been granted have been in cases where the implementer has refused to take a licence and dragged out negotiations for years. This behaviour is called patent holdout.

Despite this simple truth competition authorities thought they had to intervene. They developed the notion that if patentees sued for infringement, the threat of an injunction would mean that the implementer would be forced to pay more than a FRAND rate. That notion was not based on any evidence. It still is not. Why would a court injunct an implementer who is willing to pay and is entitled to be offered a FRAND licence? I know of no answer. Or that it has ever happened.

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