European University Institute

ROBERT SCHUMAN CENTRE FOR ADVANCED STUDIES

Issue 2020/10
February 2020

POLICY BRIEF

FSR COMMS & MEDIA
Florence School of Regulation

Innovation Conference
The Way Towards the Internet of Things: Open Standards vs Silos

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On 15 November 2019, the Robert Schuman Centre hosted the first Annual Innovation Conference relating to the project 'Innovation and Intellectual Property in the Digital Age: Global Challenges and European Responses', which was organized by the Florence School of Regulation – Communications and Media (FSR C&M) at the European University Institute's (EUI's) campus in Florence. The conference focused on the challenges that are associated with the full realization of the Internet of Things (IoT), which is often addressed as the next Industrial Revolution, and which affects the way businesses, governments, and citizens interact with the physical and digital worlds. IoT can be described as a globally distributed network (or networks) of physical objects that are capable of sensing or acting on their environment, and that are able to communicate with each other. At present, its adoption is accelerating across different sectors, from which an abundance of smart, connected devices and platforms that are integrated into a wide range of applications are emerging. In this respect, challenges are appearing at the intersections between technology, innovation and intellectual property law.

The Conference gathered academics, practitioners, officials from the National Regulatory Authorities, the European Commission, and representatives from the industry, to discuss and exchange views on these controversies.

The keynote speech that opened the event addressed the European Commission's policy perspectives on the IoT. While IoT adoption is maturing in Europe, where the IoT industry's spending was expected to reach €127 billion in 2019[1], the vision of the Commission rests on three pillars[2]: the development of a single market for the IoT, with IoT devices and services able to connect seamlessly, and on a plug-and-play basis, anywhere in the European Union; a thriving IoT ecosystem, with open platforms that are used across vertical silos to help developer communities to innovate; a human-centred approach to IoT, meaning that its development must be informed by European values, and must be in line with the standards for the protection of personal data and security. The keynote also addressed the EU IoT Strategy, which is based on three main kinds of actions: the funding of research and innovation activities (under Horizon 2020, the EU intends to invest almost €500 million in Internet of Things-related research, innovation and deployment); the adoption of a set of supporting policy actions to accelerate the take-up of the IoT, and the engagement of stakeholders. An example, in this respect, is the Alliance for IoT Innovation (AIOTI), which was initiated by the European Commission in 2015 to strengthen the dialogue and interaction among the IoT players in Europe, and to foster a culture of experimentation, replication and deployment of the IoT, thus supporting convergence and interoperability.

Interoperability in the IoT: Open Standards versus Silos

The first panel focused on *interoperability,* and on the different ways to address it in the new paradigm of the IoT. Interoperability is a key concept in current policy debates concerning the digital economy, since the expected benefits of the Internet of Things and Industry 4.0 hinge on the smooth 'communication' between networks, software and data. The EU roadmap that leads towards assuring interoperability relies on encouraging ICT standardisation[3] and an 'open platform' approach that supports multiple application domains and cuts across silos. Despite the term being in the spotlight, the panel discussed the lack of a uniform definition of "interoperability", which might turn into a limitation when developing adequate policies. The concept is complex, and it involves several trade-offs. A crucial distinction is that between *vertical* and *horizontal* interoperability. While horizontal interoperability denotes the ability of horizontally competing networks, services or platforms, to interact with one another, vertical interoperability refers to the interaction of networks, services or platforms only with complementary products and services. In reality, it was claimed, horizontal and vertical interoperability should be framed along a continuum that runs between *no-* and *full-* interoperability. Interoperability is therefore a matter of degree[4] and, in this respect, there are possibilities to differentiate between the layers and levels. There are also pros and cons in relation to interoperability: if more interoperability can reduce transaction costs for firms and boost innovation and competition, that may benefit the consumers, the massive adoption of uniform standards may also lead to a greater homogeneity and to lock-in effects which, in the end, may negatively affect innovation and the fulfilment of consumer preferences, instead.

Since, on the markets, firms compete with business models that entail different degrees of interoperability, and both vertical and horizontal interoperability have costs and benefits, the impacts on competition and innovation probably cannot be disconnected by the analysis of the specific economic and technological conditions of the markets. The discussion lead to the identification of a crucial question for policymakers: "should we mandate for interoperability, or should we leave its development to the market?" which, according to the panellists, can be considered to be an open question that demands a cautious approach. This consideration can also be due to the fact that there is a broad consensus that interoperability is not an aim in itself but, rather, it is a means that leads towards the reaping of the full benefits of the digital economy.

1. IDC Worldwide Semi-annual Internet of Things Spending Guide, 2019. The study is available at the website: https://www.idc.com/getdoc.jsp?containerId=IDC_P29475
2. See: EC (European Commission). Commission Staff Working Document "Advancing the Internet of Things in Europe", Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. (Brussels, 19 April 2016).
3. The legal framework and the key implementation documents that are related to ICT standardisation can be accessed at the following website: https://ec.europa.eu/growth/industry/policy/ict-standardisation_en
4. See: Kerber, Wolfgang, and Heike Schweitzer. "Interoperability in the digital economy." *J. Intell. Prop. Info. Tech. & Elec. Com.* L. 8 (2017): 39.

During this panel, interoperability was also addressed in a broader discussion on the 'quality of innovation', a discussion that stems from two different ideal types of industrial organisations that have a central role in the innovation processes of the digital economy: the Standard Setting Organisations (SSOs) and the digital platforms, which are frequently referred to as GAFAM[5]. The main features of the two models were compared in relation to several dimensions that referred to their typical innovation processes: price; speed; transparency and social accountability; competition dynamics. The panel members discussed the notion that while SSOs' mode of organising innovation is based on negotiation, and coordination is achieved via consensus driven processes, the coordination mechanism of the digital platforms rests on the leadership of the dominant players. The standards devised in the context of SSOs, through technical cooperation and licensing, are mainly aimed at extending horizontal interoperability, while the model of the Silos mixes the unilateral control of the core with the creation of a proprietary standards' ecology that favours the entry and innovation of complementary interoperable components or subsystems, but only at the periphery, and hence the use of the metaphor of the 'silos' to refer to this kind of innovation platform.

As pointed out by one of the speakers, the IoT's ecosystem is still very immature, and it is highly fragmented, due to the presence of several different standards and the large number of companies and small startups entering the market, each using a specific set of open standards to address a broad range of different requirements. Fragmentation and Silos are holding back the potential of the new technological revolution, but it was also underlined that the reality of the digital markets is very dynamic. In particular, big internet players are today pushed to change their business strategies to face the new reality of the IoT, which requires the need to carefully balance competition and cooperation with the other actors in the business community.

On the same topic, as suggested by another speaker, fine tuning competition and cooperation - the hybrid idea of 'co-opetition' was proposed, in order to refer to this challenging exercise – which, in the new technological and business environment of the 5G markets is, at present, crucial in order to govern the complexity of the whole ecosystem. If co-operation is essential in stimulating the emergence of standards and interoperability, competition needs to be preserved in every case, and at every level, in such a manner that there is no risk of market failures. In this respect, whether a new contractual or regulatory approach to standardization in the IoT might be devised, was discussed, one which might include some sort of light-touch regulation for the definition of the boundaries of competition and cooperation.

Patent Licensing in the IoT

The promise of the IoT is that functionality improves as the network of connected products grows. It is therefore an important policy objective to ensure product developers have easy access to the IoT technology, so that they can benefit from this functionality, which will ultimately be to the benefit of consumers. At the same time, companies that invest in the development of the IoT infrastructure should be properly remunerated for their efforts. This remuneration normally takes the form of Fair, Reasonable and Non-Discriminatory (FRAND) royalties that are payable for the use of their Standard Essential Patents (SEPs).[6]

The second panel opened with a brief introduction to the European legal framework for the enforcement of SEPs.[7] Although emerging case-law has clarified many contentious issues in this respect, many questions remain to be answered. For instance, it has not yet been settled whether FRAND refers to a specific price or to a royalty range, although there is a growing acceptance of the latter position.[8] Other questions include: how does portfolio

5. The acronym is popularly used to refer to Amazon, Apple, Facebook, Google and Microsoft, the dominant companies in the information technology industry.

6. For the European Commission's view on how to reconcile these two policy objectives, see *Communication from the Commission setting out the EU approach to Standard Essential Patents*, COM(2017) 712 final (29 November 2017).

7. See, in particular, the European Commission's Summary Decisions of 29 April, 2014, in cases AT.39939 (*Samsung*) and AT.39985 (*Motorola*); the decision of the European Court of Justice (ECJ) of 16 July, 2015, C-170/13 (*Huawei/ZTE*); and the aforementioned Communication.

8. *Unwired Planet v. Huawei* [2018] EWCA Civ 2344, Par. 121 (overturning a contrary conclusion by the First Instance Court); and the District Court of the Hague, 8th February, 2017, ECLI:NL:RBDHA:2017:1025 (*Archos/Philips*), Par. 4.3. See also: J. Gregory Sidak, 'Is FRAND Royalty a Point or a Range?', *Criterion Journal on Innovation* 401 (2017), and Jorge L. Contreras, 'A New Perspective on FRAND Royalties: Unwired Planet v. Huawei', University of Utah College Working Paper,

licensing affect FRAND-pricing, if it is appropriate to tie SEP-licensing to the purchase of physical components? And, where in the production chain should licensing occur? The discussion in the second panel touched on many of these issues.

One of the speakers thus inquired what obligations, if any, the requirement to be fair imposes on SEP-holders. In SEP-disputes, courts do not always distinguish between FRAND and RAND obligations, but if FRAND is properly conceived of as a range of potential royalty amounts, it makes sense that some points in that range are fairer than others. A FRAND license could thus differ from a RAND license by requiring that the royalty lie not just within the range of RAND-amounts, but also in a position that leads to a fair division of any surplus between the patentee and the licensor. In other words, the "F" in FRAND restricts the allowable range of potential royalties to those royalties to which the parties would voluntarily agree.[9]

The panel further inquired whether holders of SEPs should license their patents to Original Equipment Manufacturers (OEMs), or whether they should license them at the component level. This question is subject to considerable controversy and was raised in SEP-litigation in various jurisdictions, as well as in complaints to competition authorities in both Europe and the United States.[10]

Proponents of OEM-level licensing argued that it has efficiency advantages. Rather than having to license the producers of individual components at various steps in the production chain, SEP-holders could simply negotiate with the entity that assembles these components into an end product. In addition, licensing deals typically involve large portfolios that are also comprised of patents that are only infringed by the end product, so the OEM must, in any event, conclude a license with the SEP-holder. Lastly, members of the panel argued that OEM-level licensing increases compliance, because only the OEM knows how many products it has eventually sold, and at what price, so that the value of the technology is easiest to calculate at the OEM-level.

On the other hand, opponents argued that OEM-level licensing may in fact be much less efficient than component-level licensing in the IoT space, because it will have far more OEM's than component manufacturers. It was cited the example of the Wi-Fi technology: whereas there are only a handful of manufacturers of the Wi-Fi components, there are thousands of OEM's making devices that incorporate the Wi-Fi functionality. In such an environment, the transaction costs of licensing at the OEM-level would be very high. Furthermore, even if the added value of IoT-technology may only materialize in the final product, the complementarity of IoT-technology with other elements of the device might inflate the value of the patented technology. It was thus argued that component manufacturers are more suitable licensing partner for the SEP-holder.

Perhaps unsurprisingly, the panel did not resolve this contentious issue and differences of opinion remain. However, the exchange of arguments painted the picture of this issue in all its complexity to the benefit of the audience.

Lastly, the panel focused on the issue of patent pools.[11] Conventional wisdom suggests that patent pools lower transaction costs by acting as a one-stop shop for market participants seeking licenses from SEPs. However, the question arises as to whether patent pools should charge identical prices to all of the potential licensees, or whether they should be allowed to apply price discrimination between industries. Economic theory suggests that price discrimination increases the total quantities sold, but lowers the quantities sold in the more expensive market. However, the panel presented findings that showed that in a situation that is characterized by network effects – such as the IoT – this may not hold true. That is, if network effects influence consumers' buying decisions, price discrimination in an IoT context may, in fact, increase the quantities sold in both markets.

No. 206 (2017).

9. See also, J. Gregory Sidak, "What Makes FRAND Fair? The Just Price, Contract Formation, and the Division of Surplus from Voluntary Exchange", 4 *Criterion Journal on Innovation*, 701 (2019), and J. Gregory Sidak, "Negotiating FRAND Licenses in Good Faith", 5 *Criterion Journal on Innovation*, 1 (2020).

10. See, e.g., *Federal Trade Commission v. Qualcomm, Inc.*, Case 17-CV-00220-LHK (N.D. Cal, 2019); and Léon E. Dijkman, "Nokia v. Daimler: (anti-)anti suit injunctions and the Brussels I regime in global FRAND litigation", *IPKat* 5 August 2019.

11. See, generally, Richard J. Gilbert, "Collective Rights Organizations: A Guide to Benefits, Costs and Antitrust Safeguards", in: Jorge L. Contreras (ed.), *The Cambridge Handbook of Technical Standardization Law* (Cambridge: Cambridge University Press 2017).

The overarching question raised during this panel was whether the IoT will require the modification of the legal framework for SEP licensing as it currently stands. Indeed, this question was raised at the beginning of the panel, and was the main thread running through it. More than any technology that came before it, the success of the IoT depends on its widespread adoption, and the ability of devices from ostensibly unrelated industries to communicate with each other is thus unprecedented. This may indeed prove to be a gamechanger, though it remains to be seen how robust the current legal framework will turn out to be.

The Industrial Internet of Things: Self-Driving Vehicles

The last panel of the day addressed a particularly promising application of the IoT: self-driving vehicles (SDV). To an increasing extent, SVD are no longer the subject of science fiction. Autonomous vehicles are not just tested in Silicon Valley, late-stage testing is also conducted in Europe. For instance, demonstrations of various aspects of autonomous driving technology have taken place in Turin, Italy, and the transition from the trial phase to the commercial application of the technology can be expected before too long.

The panel explained that, over the past few years, the numbers of patent applications relating to IoT-functionality in the automotive sector have been steadily increasing[12]. The increase in the number of patent applications, and the diversity of applicants, mean that the patent landscape is becoming increasingly complex, which should be a call for companies operating in this field to be cautious. At the European Patent Office, most of these applications are filed by European or American companies. The data available also show that almost all of the patent applications relating to SDV technologies (in the period 2011-2017) were filed by two groups of companies that are labelled: 'Telecommunications and ICT', and these mainly encompass large tech companies, and: 'Automotive, Other Transport and Machinery & Electrical Equipment', which are mostly established players in the transport sector[13]. These data seem to suggest that a trend towards industry convergence is at play, and this is likely to be the driver of a growing complexity in the patent landscape, challenging, at the same time, established practices in IP management and strategy.

The panel also addressed the most important technological challenges that must be overcome in order to operationalize SDV and, amongst them were *collective perception* and *planning*. Collective perception[14] is the capacity of vehicles and infrastructures to exchange information so as to improve the perception of the driving environment beyond the vehicle's local sensing capabilities (i.e., the amount of traffic around the corner), while planning refers to the ability of the system to make purposeful decisions in order to achieve the assigned goal (i.e., making predictions about other vehicles and calculating the trajectory in order to avoid collisions with both static and dynamic objects). The development of these functionalities crucially depends on assuring the interoperability between all the devices and infrastructures in the driving environment ("vehicle to everything", or a V2X kind of connectivity). At present, there are two competing technologies for V2X implementation: the first, mostly developed in the context of the IEEE, is the use of dedicated short-range communications (DSRC, as it is called in the USA), an early variant of Wi-Fi. A challenge to DSRC comes from the cellular industry, in the form of C-V2X, a standard developed in the context of 3GPP, which uses LTE, and which will upgrade to 5G.

The competing technologies raise a policy conundrum: should the EU select the most promising one and designate it as a standard, or should it await further developments? On the one hand, settling on one solution risks locking the technology into a solution that, with hindsight, might turn out to be sub-optimal. On the other hand, arguably the most important European technological development – the 2G network – was possible only because the underlying technology was identified at an early stage as being the most promising candidate for further development.

12. Patents and Self-Driving Vehicles. The Inventions Behind Automated Driving. European Patent Office, November, 2018. The study is available at the website: http://documents.epo.org/projects/babylon/eponet.nsf/0/65910DF6D3F02057C125833C004DB1E6/$File/self_driving_vehicles_study_en.pdf

13. See the EPO study that was mentioned in the previous footnote, p. 39.

14. See G. Thandavarayan, M. Sepulcre and J. Gozalvez, "Analysis of Message Generation Rules for Collective Perception in Connected and Automated Driving," 2019 IEEE Intelligent Vehicles Symposium (IV), Paris, France, 2019, pp. 134-139.

The panel also addressed the field of tension that exists between extending access to technology to competitors, or keeping it to oneself. Both business models have advantages and disadvantages, and the challenge for policy makers is to provide proper safeguards for companies that choose to share their technology with others. In that respect, it is important to devise a legal and regulatory framework that creates the proper incentives to encourage each party to engage in licensing discussions.

This may prove particularly urgent in the present scenario. While, historically, there has been less patent litigation in the automotive industry, if compared to other technology industries, this is no longer the case. The rate of intellectual property litigation in the sector has increased rapidly in recent years and it is expected to rise even more dramatically in the near future.

QM-AX-20-010-EN-N

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With the support of the
Erasmus+ Programme
of the European Union

doi:10.2870/60488
ISSN:2467-4540
ISBN:978-92-9084-823-3