European Commission

JRC SCIENCE AND POLICY REPORT

Innovation in the European Digital Single Market: The Role of Patents

Thematic Report on the Brussels Conference, 17 March 2015

Author: Chryssoula Pentheroudakis

Editor: Nikolaus Thumm

2015

Report EUR 27344 EN

Joint Research Centre

European Commission
Joint Research Centre
Institute for Prospective Technological Studies

Contact information
Address: Edificio Expo. c/ Inca Garcilaso, 3. E-41092 Seville (Spain)
E-mail: jrc-ipts-secretariat@ec.europa.eu
Tel.: +34 954488318
Fax: +34 954488300

https://ec.europa.eu/jrc
https://ec.europa.eu/jrc/en/institutes/ipts

JRC96728

EUR 27344 EN

ISBN 978-92-79-49552-6 (PDF)

ISSN 1831-9424 (online)

doi:10.2791/991874

Luxembourg: Publications Office of the European Union, 2015

Abstract

The Institute for Prospective Technological Studies of the Joint Research Centre (JRC) organised the Conference "Innovation in the European digital single market - The Role of Patents". This conference aimed to provide reliable evidence based on patent data analysis to support European innovation policies for a Digital Single Market.

The advancement of the digital economy in Europe does not only bring unmatched opportunities, but also a series of challenges in the area of intellectual property rights. This is particularly true for the patent system which has to strike the right balance between providing incentives for research and development investments while enabling at the same time the dissemination and re-use of technological knowledge. The difficulties of striking this balance are most apparent in the field of Information and Communications Technologies (ICT), where standardization and interoperability are important for the implementation of a Digital Single Market.

In order to pin down the role of patents in the new digital economy, it is important to look at the broader economic, legal, technological and policy context and achieve a better understanding of what is at stake in the current dynamics. It is a volatile landscape marked by patent wars, high litigation costs, overlapping rights, hold-up scenarios in the field of standardization and radical market shifts deriving from convergent technologies and emerging platform-centric business models. Against this background, the stakes are high with regards to many issues: interoperability, reasonable and timely access to key technologies and technical knowledge, legal certainty, unfettered competition and a secured return on investment in research and development.

Acknowledgments

This report is a follow-up on the Conference "Innovation in the European Digital Single Market – The Role of Patents" organized on 17 March 2015 in Brussels by the Joint Research Centre (JRC), European Commission, in collaboration with the Directorate-Generals for Communication Networks, Content and Technology and for Internal Market, Industry, Entrepreneurship and SMEs. The report relies on the fruitful exchange that took place at the conference, but also on complementary bibliographical resources in order to capture the gist of the discussions and add value to the important outcomes. The author and editor would like to express special thanks to all the panelists for their very helpful suggestions and contributions in the process of drafting this report.

Table of Contents

Foreword

The Institute for Prospective Technological Studies of the Joint Research Centre (JRC) organised the Conference "Innovation in the European digital single market - The Role of Patents" in collaboration with the European Commission's Directorate-Generals for Communications Networks, Content and Technology[1] and for Internal Market, Industry, Entrepreneurship and SMEs. This conference aimed to provide reliable evidence based on patent data analysis to support European innovation policies for a Digital Single Market. Over 150 industry representatives, digital innovation analysts and policy makers gathered together on 17 March 2015 in Brussels to discuss the latest thinking on a range of issues in the relationship between digital technologies and patents: standardisation and interoperability; fragmentation and competition; patent quality, licensing and patent aggregation; the interplay with open innovation. The discussions were divided into four panels:

- First Session -"European Digital Single Market - the role of patents" provided an overview of patenting related issues for digital technologies in a European Digital Single Market
- Second Session - "Patenting and digital markets - innovation, growth and employment" had an economic focus. The panel explored the link between patent strategies and the economic implications these might have on digital technology markets in Europe.
- Third Session - "Patenting of computer implemented inventions" dealt with aspects related to computer-implemented inventions (CII). It explored the borderline of patent protection for CII and alternative protection models and compared the different approaches on CII patentability in Europe and the United States.
- Fourth Session - "Patenting, standardisation and licensing" emphasised the interplay of patents, standards, and licensing terms of "standard essential patents" for digital technologies in Europe.

The reader is welcome to access the full content of the panellists' presentations, including the conference agenda, on the JRC website[2]. These presentations were the springboard and primary source for the drafting of this report. They are cited as "conference material" in the text footnotes. In addition, the author harnesses a wide bibliography on the respective issues in order to illuminate the current state of play as well as put into perspective the intent behind the organization of the event: creating a unique platform of exchange for industry representatives, digital innovation analysts and policy makers in an effort to share the latest thinking in the relationship between digital technologies and patents, translate the latest empirical findings into valuable insights and inform future research for the sake of policy.

---

1 The conference was prepared in the context the research project on European Innovation Policies for the Digital Shift (EURIPIDIS), for more information, see the project website: http://is.jrc.ec.europa.eu/pages/ISG/EURIPIDIS/EURIPIDIS.index.html

2 https://ec.europa.eu/jrc/en/event/conference/european-digital-single-market-role-patents

Executive Summary

The Institute for Prospective Technological Studies of the Joint Research Centre (JRC) organised the Conference "Innovation in the European digital single market - The Role of Patents". This conference aimed to provide reliable evidence based on patent data analysis to support European innovation policies for a Digital Single Market. Over 150 industry representatives, digital innovation analysts and policy makers gathered together on 17 March 2015 in Brussels to discuss the latest thinking on a range of issues in relation to digital technologies and patents.

Patents in the Digital Single Market

The advancement of the digital economy in Europe brings not only unmatched opportunities, but also a series of challenges in the area of intellectual property rights. This is particularly true for the patent system, which has to strike the right balance between providing incentives for research and development investments and enabling at the same time the dissemination and re-use of technological knowledge. The difficulties of striking this balance are most apparent in the field of Information and Communications Technologies (ICT), where standardization and interoperability are important for the implementation of a Digital Single Market.

In order to pin down the role of patents in the new digital economy, it is important to look at the broader economic, legal, technological and policy context and achieve a better understanding of what is at stake in the current dynamics. It is a volatile landscape marked by patent wars, high litigation costs, overlapping rights, hold-up scenarios in the field of standardization and radical market shifts deriving from convergent technologies and emerging platform-centric business models. Against this background, the stakes are high with regards to issues such as interoperability, reasonable and timely access to key technologies and technical knowledge, legal certainty, unfettered competition and a secured return on investment in research and development.

The number of patent filings continues to increase in the ICT fields, particularly in digital communication and computer technology. In addition, patent filings from the Asian markets are growing exponentially, with China accounting for the biggest share of this increase. These patenting trends not only pose challenges for granting authorities and the overall patent system, but are a general feature of the competitive landscape in which patenting takes place nowadays. Considerable economic growth and employment within the European Union is based on industries where Intellectual Property Rights (IPR) are more intensively used. Patent-intensive industries have an above average concentration of IPR per number of employees in these industries and a wage premium of some 64% against non-patent intensive industries. The world's top corporate R&D investors account for over 90% of global business R&D spending and own 66% of all patent families in the five large patent offices of the world. The rise of breakthrough innovators, coupled with the shifting strategic incentives for patenting, reflects the dynamics of the R&D race in ICT – when patents matter, they matter a lot.

Access to patent information and market transparency

The patent system is not only expected to reward inventions that fulfil the statutory requirements, but it should also facilitate the dissemination of technical information by aligning resources and incentives. Access to technical information related to new technologies, patent disclosures, prior art, standards, contractual schemes for patent licensing and information related to changes in patent ownership can support the dissemination of best practices, optimize resource allocation, reduce operative and transaction costs and help companies tap unused potential or scale up innovations.

Technical knowledge and patent data is collected and organized by patent authorities, public institutions, firms, IP brokers, patent pools, open source and various platforms of collaboration, exchange and licensing. In the field of standardization, relevant documentation lies with the respective Standards Development Organisations (SDOs) and their members. The challenges lie in how to link existing data collections, which type of data would be made accessible and how to create the right incentives for various stakeholders to disclose and share that sort of information without losing control over their assets, competitive edge or stakes in the innovation ecosystem.

Patent quality, a key element of successful patent systems

The success of the patent system in a digital single market depends on its quality[3] and adaptability. Patent quality can weed out trivial patents, reduce the impact of patent thickets, provide clarity and "cool down" an overheated patent system. Quality starts with the process of patent examination and appropriate patent office policies that discourage insufficient, trivial or underdeveloped applications. Given that law, technology and business are becoming increasingly interwoven in the new digital economy, patent offices will be expected to continue working towards a common approach to high quality standards of examination and increased consistency in the application of patentability criteria.

Prospects of policy-driven research

Policy imperatives prompt a number of interesting and difficult questions for researchers and economists. Though available empirical evidence has so far yielded many important insights, it has only scratched the surface of the mechanics behind the innovation engine. To bridge this research gap, we need additional data and insights that will allow a deeper understanding of the linkages at hand. The present report identifies a set of issues and framework conditions that are amenable to future research efforts and policy considerations. Some of them, such as interoperability, standardisation and standard essential patents are closely related to what the European Commission identified as essential elements of a Digital Single Market[4]. Other issues are horizontal issues determining the general framework conditions for patenting, which are important generally - not only in the context of a Digital Single Market.

Issues of specific interest to a Digital Single Market

The interplay of intellectual property with open innovation

The interplay between open innovation and proprietary knowledge is a core element of the innovation process in the field of ICT technologies. Open source, albeit subject to its own rules and procedures, is intricately linked with the patent system in that both systems are designed to facilitate technology diffusion and bring codified knowledge to the public. The diversity and evolution of the open source model and, more specifically, the incentives, procedures and comparative advantages it embodies are of particular interest here. In the scenarios of open innovation, it would be interesting to investigate further the various roles of intellectual property and how firms could use patents as valuable informational tools to signal development preferences and research activities to the public – this information may then facilitate innovative collaboration (e.g. in the case of patent pledges) or foreclose it.

---

[3] Patent quality is defined as the degree to which a patent satisfies the statutory patentability requirements, leaves little doubt as to its breadth, and discloses information that enables a person skilled in the art to implement that protected invention; EPO Report on Patent Quality, 2012, p. 8.

[4] As laid out in the Commission staff working document: A Digital Single Market Strategy for Europe – Analysis and Evidence: http://ec.europa.eu/priorities/digital-single-market/docs/dsm-swd_en.pdf

Software

The software industry provides the perfect laboratory in which to observe the coexistence of different practices of innovation and knowledge diffusion. The discussion around the scope of protection for computer implemented inventions is ongoing. As the new digital economy has put the importance of software for ICT-based innovation and economic growth in the spotlight, we are urged to reassess the standard of patentability and patent disclosure for computer-implemented inventions under the current system. What is the impact of accelerated technology convergence on software? How do economic and market factors explain changes in the propensity to patent in the software field? Which best practices can we transfer from similar "open" systems, knowledge commons or ad hoc contracted frameworks?

Standard essential patents (SEPs), FRAND licensing and Standard Setting Organisations

In the absence of solid empirical evidence on royalty stacking and hold-up problems, the debate on fair, reasonable and non-discriminatory licensing terms (FRAND) will remain strongly polarized because it focuses essentially on theoretical arguments. An obvious research avenue is therefore to study concrete licensing practices of standard-essential patents (SEPs) and their impact on the transparency of patent markets, competition and innovation in the field of ICT in Europe. It would also be relevant for research to focus on the different factors that come into play during the procedures that establish essentiality and determine the outcome of bilateral FRAND negotiations. What policies are needed to ensure a level playing field, cost-efficient uptake of standards-related technology and also participation by SMEs in the negotiations? The main challenge lies in the production of relevant and solid empirical evidence on the licensing of standard essential patents and requires further support from policymakers, standards setting organisations (SSOs) and/or the companies involved in standards setting and SEP licensing. Shedding more light on the standardization process will also involve the classification and benchmarking of different SSO types, their organizational structures and their impact on industry and innovation.

Patent pools

Patent pools are gaining momentum as successful licensing models and collaborative IPR arrangements. They enable easy and timely access to knowledge, exploit patents that would have otherwise remained unused or of limited value, simplify transaction logistics and free up new paths for the acceleration and adoption of innovative solutions. Given that patent pools are generally perceived as beneficial for the intellectual property markets, it would be interesting to study concrete examples of efficient patent pooling and their effects on patenting incentives and draw on relevant benchmarks to further facilitate technology transfer in the ICT field.

Issues of wider interest in the context of a Digital Single Market

The Unitary Patent System and the Unified Patent Court (UPC)

The Unitary Patent System and the UPC are regarded as game changers which could have significant ramifications for the harmonization process in Europe. The way companies assess the impact of the new Court on their patent strategy depends largely on the diversity and size of their intellectual property portfolios, business models, corporate culture and the competition dynamics in their specific sector. From a business strategy perspective, will the economics of a single enforcement action outweigh the risk of Europe-wide invalidation? How does the heterogeneity in the efficacy of the national patent systems explain firm strategy in platform-based markets?

With regard to the patentability threshold for software patents, there is widespread uncertainty over whether the UPC will follow the European Patent Office practice on

computer-implemented inventions or adopt a different approach. Along with software patentability, the impact of the Unitary Patent System on the ICT sector and the relevant patenting strategies remains a big unknown due to the particularities and complexities of the specific industries. Economic research will have to closely follow the embedding of the new system into the European innovation landscape and its strategic use by users of the patent system. It would be also be relevant to measure its impact on R&D in the ICT field and its successes, especially in terms of cost-efficient litigation and improved access of SMEs to IP markets and technology.

Patent aggregation and the emerging secondary patent market

The economics of patent aggregation and the sphere of practicing versus non-practicing activities in Europe are largely unexplored and unpredictable. The quality, value and impact of the aggregated patents and portfolios differ significantly in the hands of the diverse practitioners in the patent marketplace. Given the wide typology of patent aggregation, it would be of great value to study the respective governance and pricing models, the justification of their presence in the innovation ecosystem and their multiple effects on technology transaction and diffusion. What policy or legislative options at national or EU level could foster the potentially beneficial impact of patent aggregation, while mitigating the negative effects associated with disruptive or litigious the activities of Patent Assertion Entities (PAE)? Are the negative effects of PAE likely to outweigh their potential benefits?

The role of IPR enforcement for innovation in ICT markets

Successful IPR policy is built on reliable and affordable enforcement mechanisms. How important is the economic impact of IPR infringement in markets that are partly based on open access and collaborative practices and what is the economic importance of injunctive relief from a welfare perspective? The question, under which conditions the implementer of a standard can avoid injunctive relief or similar orders of exclusion for infringement of a FRAND-committed standard essential patent, is currently one of the most contentious issues at the intersection of patent and competition law. The answer to this question is largely left to competition authorities and national jurisdictions. However, the economic importance of injunctive relief from a welfare perspective and the economic impact of IPR infringement in markets that are partly based on open access and collaborative practices are both still undocumented. Future research on these issues could help remove additional barriers to interoperability.

1. SETTING THE STAGE

The introductory session to the Brussels Conference included two interventions by John Bensted-Smith, Director, Institute for Prospective Technological Studies, Joint Research Centre, European Commission, and Megan Richards, Principal Adviser, Directorate-General for Communications Networks, Content and Technology, European Commission. They both highlighted the importance of measuring innovation based on patent and empirical data and developing the necessary linkage between research analyses and issues of concern for innovation policy. Before exploring the complex mechanisms around digital innovation, it is expedient to set the patent-related topics addressed in the Brussels Conference against the broader economic (1.1.), legal (1.2.), technological (1.3.) and political background (1.4.) and enhance our understanding of what is at stake.

1.1. Economic context – the costs of complexity

The accelerating pace of technological adoption and digital innovation brings the promise of growth for economies and firms, but also upends established frameworks and shortens the business lifecycle. Equally, the evolving IP landscape is no longer part of conventional narratives. New players, multi-component products, an alarming number of patent applications, overlapping rights, patent thickets, emerging practices in patent licensing and trading, litigious patent trolls and long-running legal battles around smartphone technologies create a dense web of stakeholders, transactions and disputes. The consumerisation of digital technology has placed greater significance on the strategic-transactional value of patents whereby the management of patent portfolios and the task of licensing have become particularly intricate. The result is an IP system plagued with administrative, transaction and litigation costs that render it difficult for policymakers, innovators and technology adopters to navigate.

With regards to the cost of legal action, imminent changes in the enforcement of patent rights through the introduction of the Unitary Patent and the set-up of the Unified Patent Court (UPC) will bring about immediate benefits for the patent system in Europe that is currently characterized by parallel litigation proceedings and disparate outcomes across the national jurisdictions. The users of this additional tier of the patent system will be able to profit from a cost-effective, centralized procedure for all revocation and infringement actions against a Unified Patent.

1.2. Legal context – interplay of patents and standards

In light of the above, policies have to strike a balance between IP protection as value creator and R&D investment driver, on one hand, and the imperative to disseminate key technologies for the sake of interoperability and digital integration in the DSM, on the other. The relevant challenges are particularly pronounced in the area of ICT standards. Serving as a magnifying lens for both the efficiencies and the frictions in the innovation ecosystem, the interplay of patents and standard-setting processes is critical for the successful completion of the Single Digital Market. The interface of patents with standards begins at the moment when intellectual property rights are embedded in the standardization process, either in parallel or as a consequence thereof. Standards development activities in the ICT sectors usually involve the review of many technology contributions or the exploration of new technical approaches. This large share of innovation generates many high quality patents, which may either protect breakthrough technologies or, to a great extent, build on pre-existing technologies (cumulative innovation).

Whereas patent and standards serve common objectives by encouraging innovation and supporting diffusion of technology, their relation is also an antagonistic one. It is a terrain

of strategic patenting with overlapping rights, patent ambushes and hold-up scenarios. Early on in the innovation cycle, vested interests exert control over the standardization process and shape future market conditions for both competition and the users of the system. The interdependency between the patent system and the standard-setting processes is therefore inextricably linked to the critical aspects of transparency and the governance of innovation.

1.3. Technological context – platform-centric ecosystems

Digitization and technological convergence have paved the way to a new ecosystem that is information-, platform- and customer-centric: data and content can be tagged, shared, secured and presented into structured information on a single platform that often includes highly sophisticated systems, processes and applications for content management. Packaged information is delivered through websites, mobile applications or alternative channels in a customized manner that empowers users to share and shape related content. In this environment, platforms become the buildings blocks of the new digital economy and the foundations on which innovators develop complementary products and services for an increasingly larger community of users, buyers and sellers. Demand-side economies of scale change the competition landscape irreversibly, as market power is aggregated in the hands of a few platform leaders. By reaping the benefits of network effects, technology forerunners expand into adjacent platforms with products and services that complement their primary business – a self-reinforcing cycle that renders digital technology a winner-takes-it-all business, underpinning the asymmetric aspect of patent races.

This is particularly the case in the field of mobile telecommunications: achieving platform leader status lies at the core of competitive dynamics and rapid technological advancements in the field. The smartphone represents a crucial digital platform and the main gateway to the Internet, interconnecting devices, people and household across the globe. According to data provided by Ericsson[5], the global mobile ecosystem counted approximately 7 billion mobile subscriptions in 2014, projections seeing the numbers reaching 9.5 billion by 2020. In terms of data traffic, the proportion of data per voice was 2300/210 in 2014 compared to 160/130 in 2010 only, thereby data covers the total of Internet traffic, office services, entertainment content, apps, messaging and communities. A look at how the staggering pace of technological innovation transforms our lives: it took 100 years to connect 1 billion places (in 1975) but only 25 to connect 5 billion people (in 2000) and Ericson envisions that it will take even less time to connect 50 million devices to the web[6]. This is only the beginning for the Internet of Things where the levels of connectivity will unleash capabilities far greater than the sum of the parts.

1.4. Policy context – Digital Single Market and policy relevance of patent data

The idea of the Digital Single Market (DSM) is to make everything that is possible in the physical Single Market - free movement of goods, people, services and capital - possible in the digital context. The completion of DSM has the potential to contribute an efficiency gain of € 340 billion to the European GDP through market expansion, better services at better prices and more employment opportunities[7]. It can create opportunities for new start-ups

---

[5] *Hofkens,* Innovation in the European Digital Single Market – the view of Ericsson (conference material), 2015.

[6] In its most recent Mobility Report of June 2015 (http://www.ericsson.com/res/docs/2015/ericsson-mobility-report-june-2015.pdf) Ericsson has for the first time communicated a forecast, which points to 26 billion connected devices by 2020.

[7] *European Parliament*, Mapping the Cost of Non-Europe 2014-1019, July 2014, p. 9.

and allow existing companies to grow and profit from a market scale of over 500 million people. However, the current landscape presents us with a fragmented digital internal market. Online services are largely domestic, mostly due to the slow pace of standardization. European firms have been slow in adapting to selling online. The proportion of firms selling online has been growing rather modestly over recent years, increasing only from 12% in 2009 to 15% in 2014[8]. Equally, the actual use of advanced digital technologies is very limited: big data use is low in the EU, with only 6.9% usage amongst companies with more than 10 employees (only one in the top 20 big data companies worldwide is European). Regarding the adoption of digital technologies such as cloud computing, only 1 in 5 companies use paid cloud services in the EU. This figure rises to 35% if SMEs are excluded[9].

The externality property associated with network effects disturbs the automatic transmission from local to global efficiency, revealing coordination problems of information infrastructures and a widespread lack of interoperable services and devices within and across the EU Member States. European regions vary considerably in their infrastructure development such as networks, data centres, computing and e-government services. Their capacity to turn data into business may be seriously undermined by sub-optimal network infrastructure - with spillover effects for the entire DSM. Lack of interoperability and investment in networks, research gaps and insufficient innovation efforts are some of the obstacles that seriously undermine efforts to exploit ICT and overall market potential[10].

The high potential of economic growth of the Digital Single Market is not fully tapped and it is not always easy for countries or regions to identify the tools available or capture the opportunities on offer. Information asymmetries, technical and legal barriers to trade stand in the way of the digital "single" market, highlighting the need for a comprehensive and coherent policy response at the European level. Shaping a supporting environment for online services requires further harmonization, infrastructure investments and the creation of industry-wide standards related, among others, to big data, cloud computing, cybersecurity and the Internet of Things. Priority is given to the advancement and fast delivery of sector-specific standards in areas where interoperability is key, e.g. transport, health, e-payments, e-government and 5G[11]. Support for ICT is also part of the Horizon 2020 agenda, the biggest EU Research and Innovation programme and a financial vehicle of fundamental importance for research initiatives. Horizon 2020 is geared to ensure that Europe produces world-class science and technologies. In 2014 alone, more than €1 billion were injected into projects that focus on creating a more entrepreneurial ICT ecosystem. Available funding for ICT favours innovation by ensuring that respective R&D investments develop into tangible benefits for the European citizens and markets.

In the era of big data analytics, the ability to convert market and business data into useful insights acts as a catalyst for future economic growth and innovation output across major sectors of the European economy[12]. In this context, attention is drawn to evidence-based

---

8 *European Commission,* A Digital Single Market Strategy for Europe - Analysis and Evidence, SWD(2015)100, p. 8.

9 *European Commission,* A Digital Single Market Strategy for Europe - Analysis and Evidence, SWD(2015)100, p. 59.

10 *European Commission*, A Digital Agenda for Europe, COM (2010) 245, p. 5.

11 The Commission fosters partnerships with several leading tech companies (5G-Public-Private-Partnership), aiming to deliver solutions, architectures, technologies and standards for the next generation communication infrastructures.

12 The big data sector is growing by 40% per year. Global big data technology and services are expected to grow from 3 billion EUR in 2010 to 16 billion EUR in 2015, growing seven times quicker than the overall IT market. Studies estimated that by 2020 big data analytics could boost EU economic growth by an additional 1.9%, equaling a GDP increase of 206 billion EUR.

policymaking and the relevance of patent statistics as a unique source of information for policymakers and businesses alike. Patent-related data serve as proxies for measuring innovation processes at both micro- and macro level, enhancing our understanding of R&D linkages, innovation incentives, market trends and economic performance. Latest empirical evidence and large-scale surveys rely heavily on patent metrics in order to establish meaningful outcomes, provide a holistic view of the relevant context and maximize the impact of policy action on the society.

Meanwhile, the use of big data by the top 100 EU manufacturers could lead to savings worth 425 billion EUR; See *European Commission,* A Digital Single Market Strategy for Europe - Analysis and Evidence, SWD (2015)100, p. 62.

2. EUROPEAN DIGITAL SINGLE MARKET – THE ROLE OF PATENTS

The First Session *of the Brussels Conference provided an overview of patenting related issues for digital technologies in the European Digital Single Market. It focused on a number of issues, including the role of patents in the new digital economy (2.1. Patents as a policy lever), the impact of scaled-up technologies and increased patent volumes on corporate strategy and IP portfolio management (2.2. Patents as a strategic tool) as well as the emergence of new intermediaries and patent aggregators in the IP market (2.3. Patents as a currency).*

Chair*: Kerstin Jorna, Director, Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, European Commission*

Panelists*: Ruud Peters, Executive Vice President, Philips Group Innovation; Prof. Knut Blind, Technical University Berlin, Chair of Innovation Economics, Fraunhofer Fokus; François Arbault, Head of Industrial Property Unit, Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, European Commission; Prof. Dietmar Harhoff, Director, Max Planck Institute for Innovation and Competition; Thomas Graf, Partner, Cleary Gottlieb Steen & Hamilton.*

2.1. A policy view on patents – patents as a policy lever

Policymakers can leverage patent policies with the aim to facilitate technology dissemination and unlock significant value for SMEs and the ICT services sector.

At the level of services built on and around the Internet platforms of the new economy, ICT technologies are of incremental importance to economic growth and a driving force for business innovation - non-ICT patents are in fact rarely known in service firms. Traditionally, the patent system was strongly associated with the manufacturing sector, whereas services had received little attention in the patent debate due to their particular characteristics: service innovation was less dependent on R&D and often without any visible link to technology. Network effects, fast production and delivery cycles and the accelerated pace of ICT developments have reconfigured the IT and telecommunication services, revealing a significant share of patenting activity[13]. With the data-driven society progressively relying on ICT services, the emergence of numerous start-ups around these services build a still unexplored but promising group of innovators, which, from a patent office perspective, would be worth canvassing[14]. On this note, an analysis of a representative sample of services revealed that 30% of the applications filed with the EPO in 2014 came from small and medium-sized enterprises (SMEs)[15].

However, systematic data that link patent propensity and activity to specific ICT service sectors - across firm sizes and technical fields - are neither complete nor mature[16].

---

[13] *Blind et al*, Patents in the Service Industries, 2003, p. 1 ff.

[14] Cf. *Frietsch et al.*, SME Patenting – An Empirical Analysis in Nine Countries, 2013. ICT services should be defined as services that enable the function of information processing and communication by electronic means. They are classified under telecommunications, software publishing, computer programming/consultancy, data processing/hosting, and repair of computer and communication equipment (OECD classification based on ISIC Rev. 4). The technology-enhanced "sharing economy" expands their breadth and economic relevance of ICT services such as Uber and Airbnb.

[15] EPO Annual Report 2014, available at www.epo.org.

[16] Current empirical research concentrates on the patenting activities of ICT services companies and the competitiveness of SMEs in the ICT services industry; see, respectively, *Sadowski/Whalley*,

Generally speaking, service industries that are based on or driven by high technology and embedded systems rely less on proprietary technology and more on packaged software, standardised IT backbones or cloud-based solutions. Their competitive advantage is not typically built on patents but rather on "appropriability strategies" such as first-mover advantages, complementary assets, trade secrets, marketing capabilities and customer loyalty. However, start-up ventures can significantly benefit and create additional value through industry-specific patenting strategies. Depending on the respective market specificities, IP assets can help market entrants or small firms establish market credibility, secure seed capital, increase bargaining power or improve their odds for a successful Initial Public Offering (IPO). At the same time, patents may offer mixed to weak incentives in the case of strictly service-centric SMEs. This may be tied to specific market factors as well as to cost considerations involving insufficient funding and infringement risks. Under the confluence of technology and business cycles, the influx of services moving online continues to drive new business models that do not only remain peripheral, but leverage network effects to build their own content, data infrastructures and ecosystems[17].

2.2. A corporate view on patents – patents as a strategic tool

Evolution of patent portfolio management

Depending on industry sector, competition dynamics, size and market position (entrant, incumbent, market leader), companies view and manage their patent portfolios in various ways. Corporate leaders in highly competitive markets typically regard their patents as powerful assets that help them secure their market share against rivals and entrench their dominant position. For others, licensing in-house developed technology is a source of significant revenue stream and return on investment. From that perspective, the value of the invention and its contribution to growth lies in the widespread commercialization and efficient diffusion of the related technologies. In any case, even companies with a robust IP strategy and a dynamic patent portfolio are exposed to the rapid shifts of technology and the evolution of markets: how does interoperability and standardization affect current business models and boardroom decisions? How do patent diversification and emerging licensing trends impact the management of IP portfolios? How to best leverage patents to generate additional intellectual property value?

Technological convergence, interconnectivity and the creation of Internet ecosystems induce a new range of products and services as well as the emergence of new players. Technology developers may specialize upstream, supplying new technology to downstream producers who harness the advantage to the benefit of manufacturing and marketing processes. However, market shifts undermine the privileged access to technology that incumbent firms in an industry may enjoy, allowing for both competitors and entrants to acquire similar technology from alternative suppliers and engage intensively in knowledge-creation and dissemination[18]. Compressed product lifecycles and lower barriers to entry disrupt well-established industries and seemingly unrelated players suddenly become rivals. In search for appropriate strategic responses, companies try to grasp the long-term implications of these disruptions on their strategies, capitalize on new technologies and reconfigure their business models in order to withstand increased competition – a

---

Schumpeterian Patterns of Innovation in the ICT Eco-System: Evidence from the FT 500 (2015, forthcoming) and *ECORYS,* FWC Sector Competitiveness Studies - Competitiveness of the EU SMEs in the ICT services industry, Report 2009.

17 See for example *World Economic Forum,* Global Information Technology Report 2015 – ICTs for Inclusive Growth, p. 39.

18 *Arora et al.,* Markets for Technology: The Economics of Innovation and Corporate Strategy, 2001, p. 224.

balancing act. With industry and firm boundaries in flux, the way companies capture the value of their intellectual capital and the returns from its use could be vital for creating or sustaining a competitive edge. For larger technology companies size seems to matter: they invest considerable time and resources in assembling and diversifying an extensive patent portfolio as a means to explore potential synergies between the areas of strategic focus and the optimal exploitation of knowledge. Under the strategic view, patents evolve beyond their typical function as defence against infringement and become tradable assets that can be deployed to avert costly court battles, negotiate agreements, provide collateral for funding, increase market valuation and expand opportunities for investment, partnerships and M&A.

In addition, licensing becomes a focal point of IP strategy as companies find it increasingly difficult or inefficient to develop in-house the various technologies embedded in multicomponent products. Even large firms abandon the conventional view that technologies must be retained in-house, signifying the decoupling of IP assets from the traditional notion of ownership. Although firms with unique and strong IP positions will most likely continue to leverage their clout in bilateral negotiations with their customers/technology adopters, the need for interoperability and easy access to new technologies encourages or *de facto* forces the creation of formal and informal networks of collaboration among companies, researchers and institutions. In this context, network effects and standardization issues are addressed through cross-licensing agreements, joint ventures and strategic alliances. The consequences thereof - knowledge spillovers, clustered activities and jointly developed IP – translate into radical shifts for the innovation process that also witnesses a commoditization of inventions through an increasing number of open source practices and royalty-free licensing commitments. These models of "open" innovation create a paradigm shift in traditional proprietary concepts and give rise to new collaborative practices of technology transfer where patents are recalibrated into a conduit for the cross-pollination of ideas and technologies.

Impact of the Unitary Patent and the Unified Patent Court on patent strategy

Although the UPC is regarded as a game changer with significant impact on both the application process and the strategic management of patent portfolios, concerns are voiced over how the UPC will affect the current ecosystem from an enforcement perspective and the challenges at the implementation stage. There appears to be a lack of awareness among companies over the relative risks and rewards of enforcing patents via this additional tier to the patent system: Could the economics of a single enforcement action outweigh the risk of Europe-wide invalidation? With regards to the handling of future filings, the users of the system will be confronted with strategic choices, i.e. opting for new unitary patents versus classic European patent or for a mix of both.

According to a benchmark study[19], 56% of the users expect unitary patents to make up all or most of their future filings. Also, 91% of telecoms, media and technology companies see important benefits from the implementation of the new system such as a higher degree of harmonization in IP enforcement, greater legal certainty, cost and time efficiencies in the management of pan-European patent portfolios. At the same time, strategic preparations for the UPC are burdened by internal challenges such as lack of resourcing to audit the patent portfolio. In general, the way companies assess the impact of UPC on patent strategy depends largely on the diversity and size of their IP portfolios, business models, corporate culture and the competition dynamics in the specific sector.

[19] See *Allen & Overy*, UPC Benchmark Study – Opt in / Opt out, where do you stand? 2014.

EPO workshops on Unitary Patent and the Unified Patent Court[20]

A series of workshops on the Unitary Patent and the Unified Patent Court held by the Economic and Scientific Advisory Board (ESAB) of the EPO provided an important opportunity to gauge reactions to the new regime and the possible scenarios ahead. With respect to the unitary patent, the most significant benefits noted by participants were the administrative simplification of patenting in Europe, the potential for saving costs (validation, translation and post-grant administration costs) and the geographic extension of patent protection. From a strategic point of view, the UPC is likely to be particularly attractive to parties seeking to obtain injunctions or revocations that apply throughout the territory of the EU member states. In this scenario, the ruling of the future Court will have a significant economic impact on the business of the parties to the proceedings. Whether the UPC avenue is chosen or not, will partly depend on how users assess the strength of their patents in any particular case and how the calculated risk of "putting the eggs in one basket" is aligned with the overall business strategy. Part of the attractiveness of the new system will certainly lie in the structure of renewal fees and the additional pricing incentives. Trust in the system will largely derive from the expertise of its judges and the quality of its jurisprudence.

2.3. A market view on patents – patents as a currency

Technological convergence and the intensity of information flows have challenged traditional business models associated with intangible assets. The ease of transactions and the experimentation with new collaborative models have shifted the perception of patents from merely exclusive rights to value drivers and tradable assets. The need to facilitate and maximize the exploitation of patents has resulted into the emergence of new players in the form of IP-specialist firms with a wide array of services tied, directly or indirectly, to the trade of patents: IP-management support, licensing, evaluation, insurance, securitization, investment, funding, auction, portfolio analysis or patent mapping and pooling have infused liquidity into the IP market[21]. These collaborative infrastructures and transaction platforms become a central topic of research with respect to emerging licensing practices and the various forms of patent aggregation. Many of these intermediaries fill in pre-existing market gaps and address inefficiencies. The benefits and risks associated with these new players are assessed according to their mission and type of activities. For instance, patent pools or consortia are generally viewed as facilitators in the licensing of ICT standards, having the potential to provide greater access to essential patents for practicing a certain standardized technology in a single transaction.

By contrast, concerns are raised over the aggressive, litigious behaviour of Non-Practicing-Entities (NPE), which exploit information asymmetries in a market inundated with patents in order to engage in hold-up practices. These entities neither invent nor use patents for themselves; they merely purchase or architect divergent patent portfolios, usually of non-core technology and assert the related rights by threatening litigation or seeking preliminary injunctions against companies that have already invested in the commercialization of the allegedly infringed product. Due to the complexities involved in patent monetization, an aggregated patent portfolio of this type provides a unique competitive advantage. It is also a disproportionally strong weapon in the hands of entities,

---

[20] See http://www.epo.org/about-us/office/esab/workshops_de.html.

[21] Analysis on these players has been a central topic of research in *Yanagisawa/Guellec,* The Emerging Patent Marketplace, OECD 2009; *European Commission,* Expert Group on Patent Aggregation, Report 2015, p. 43.

which, by not practicing any technology, are practically invulnerable to the threat of infringement and have no need to cross-license. In this scenario, NPEs represent a form of patent thicket, raising transaction costs or blocking the market entry of companies[22]. Given that NPE activity is a widespread phenomenon in the US, it remains open to speculation over the degree to which the UPC jurisdiction will alter the litigation dynamics for NPE activity in Europe and whether it would enable their US practices to spillover into the EU market.

From a policy perspective, the size and evolution of patent transaction markets are difficult to measure, all the more to regulate. This is due to a number of factors such as the diversity of commercial activities in the field and the lack of transparency in patent transactions, which are based on confidential agreements. However, understanding how IP-specialist firms emerge and perform in these markets and how their primary objectives support, complement or even disrupt the system can guide European action into the right direction.

ESAB workshop on patent aggregation[23]

In this light, a recent workshop on patent aggregation organized by the EPO's Economic and Scientific Advisory Board (ESAB) at the EPO addressed both the benefits (i.e. trade facilitation, innovation and investment incentives, increased access to patented technologies) and the risks (i.e. anti-competitive behaviour) of patent aggregation at the interplay of patent and competition law. Given that certain forms of patent aggregation can foster the evolution of IP markets, the challenge is to identify how policy can harness potential benefits to the largest extent possible – not an easy task given the lack of transparent and reliable data. Patent aggregation in the context is defined as any activity where patents that were previously owned by a number of different parties are now brought under the control of a single actor or entity - control meaning essentially the right to decide which party gets access to the patents and under which terms. According to the statement issued by the EPO's Economic and Scientific Advisory Board (ESAB), the various forms of patent aggregation should not be treated per se as anti-competitive; rather, potential misconduct of individual aggregators should be evaluated on a case-by-case basis, taking into consideration the particular facts and circumstances. In this respect, the pertinent questions are how aggregators build their patent portfolio and set their licensing terms, and whether they create or use any market power to impose restrictions and reduce competition on the technology market.

In order to improve transparency and framework conditions in the IP market, attention is drawn to the possibility of tracking patent ownership. The patent legal status plays a critical role in strategic decision-making and the assessment of infringement risks so that the lack of relevant information can delay or even discourage foreign investment. The availability of information related to re-assignments is rather loose. It is nearly impossible to find out what patents exist, who owns those patents, and whether they are enforceable. The EPO is currently looking at the feasibility of gathering and registering changes in ownership, e.g. through a regular declaration of ownership at the time of renewal fee payments or additional measures such as the improvement of patent legal status dissemination systems[24]. Given that the European Patent Register contains information on changes in

---

22 EPO Report on Patent Thickets, 2012, p. 13.

23 See http://www.epo.org/about-us/office/esab/workshops_de.html.

24 At the EPO Patent Information Conference (EPOPIC) held October 22-24th, 2013, in Bologna, Italy, the EPO highlighted two common approaches for disseminating legal status – a distributed, federated search system, or a centralized data collection. The federated approach can get the most up-to-date information from the national patent registers, while the centralized database can be incorporated into other software products for search and analysis work.

patent ownership up to the grant (the national patent offices see over the registration of re-assignments in the national phase), the EPO is in the process of establishing deep links to the registers of 26 participating national patent offices in order to provide a post-grant legal status information on European patents through a central server, denoted "Federated Register".

MPI project on patent transfers[25]

First insights into a new dataset on patent transfers generated at the Max Planck Institute for Innovation and Competition (MPI-IC) in Munich were given. The dataset entails approximately 1 200 000 registered changes in patent ownership information of about 890,000 patents granted (DE) or validated (EP) in Germany between January 1981 and September 2013. The dataset draws primarily on register data from the German Patent Office (DPMA) and the European Patent Office (EPO). With regard to EP patents, about 450,000 changes were registered with the EPO during the pre-grant phase and about 250,000 with the DPMA during the post-grant/national phase. With the help of dictionary-based and rule-based methodologies, all ownership changes are in the process to be classified according to a taxonomy that accounts for the relational and spatial distance between current and prior patent owners. Excluding mere corrections of names and addresses, about 300,000 EP patents have been subject to a change in ownership and/or location. Preliminary results highlight the frequency of cross-country patent transfers in both directions, i.e. from Germany to the US and Europe as well as from the US to Europe. The highest frequency of patent transfers takes place in the technical areas of polymers, chemical engineering, medical technologies, optics, audio-visual and surface technology.

[25] See http://www.ip.mpg.de/en/research_teaching/innovation/research_projects.html.

3. PATENTING AND DIGITAL MARKETS – INNOVATION, GROWTH AND EMPLOYMENT

The Second Session *of the Brussels Conference had an economic focus. It explored the link between patent strategies and the economic implications these might have on digital technology markets in Europe. Specifically, the panel discussed the new patenting trends and the rising volume of Asian filings according to the Annual Report 2014 of the European Patent Office (3.1. Mapping patenting trends), revisited a recent OHIM-EPO study that highlights the contribution of IPR-intensive industries to economic growth and employment (3.2. Linking patents to economic growth) and presented new empirical evidence from an OECD-JRC study on the IP strategies of global corporate R&D investors (3.3. Linking patents to R&D).*

Chair*: Stuart Graham, Assistant Professor of Strategic Management, Georgia Institute of Technology*

Panelists*: Grant Philpott, Principal Director, European Patent Office; Nathan Wajsman, Chief Economist, OHIM; Mariagrazia Squicciarini, Head of Unit, OECD; Patrick Hofkens, Director IPR Policy, Ericsson; Rebekka Porath, Standards Policy Manager, Intel; and Prof. Salvatore Torrisi, Bologna University.*

3.1. Mapping patenting trends

The annual patent filings of the European Patent Office (EPO) provide an important indicator for Europe's technological and scientific performance. Patent statistics support methodologies and metrics related, among others, to economic performance, employment, GDP growth, research and innovation, market competitiveness and FDI appeal.

From a technical perspective, there has been a significant increase in patent filings from ICT fields, most prevalent in digital communication and computer technology[26]. Additional trends include a global increase of convergent technologies related to areas such as the Internet of Things, smart grids, health and telematics, in which ICT technology combines with more classical technology, as well as a continuous convergence of the technological interests of industries within ICT, focusing to a large extent on data and cloud applications.[27]

[26] An examination of technological fields attributed to patents applications filed under the Patent Co-operation Treaty (PCT) can function as a proxy for knowledge flows between ICTs and other technological areas. According to OECD, in 2009-11, about a quarter of ICT-related patents also belonged to one or more other technological fields. Patents in medical, biotechnology or pharmaceutical technology fields added up to about 14% of this group, while transport, logistics and machine tools amounted to 8%. Many patents cover technological fields contiguous to ICTs, such as electrical machinery (14%) or audio-visual technologies (5%). Numerous examples include patents in technologies likely to be applied in the ICT field, such as basic chemistry or nanotechnologies. Often ICT-related inventions in this group lie at the crossroads between several other technological fields and their potential applications also bridge different industrial domains; OECD Report, Measuring the Digital Economy – a New Perspective, 2014, p. 120.

[27] *Philpott,* Trends in patenting digital technologies at the EPO (conference material), 2015.

EPO Annual Report 2014[28]

According to the EPO Annual Report 2014, a total of 64,600 patents were granted by the EPO in 2014 (2013: 66,712). Patent filings grew by 3.1%, hitting a new record high of over 274,000 (2013: 266,000). The 38 member states of the European Patent Organisation consolidated their share of 35% of the total filings last year (1.2% growth in volume). Roughly two-thirds of the total filings in 2014 came from outside Europe, 26% originated from the US, 18% from Japan, 9% from China and 6% from Korea. Looking at growth rates, China showed the biggest increase (+18%), followed by the US (+7%) and Korea (+2%). The increase in foreign patenting reflects the attractiveness of the European market for innovators outside its borders as well as the spillovers of these countries' patenting activity into Europe.

Growth in European filings was highest in the Biotechnology sector (+15.9%, share of 56%), Digital Communication (+12.5%, share of 38%), and Measurement (+9.8%, share of 55%). Only in Computer Technology do European firms (29%) lag behind the US (38%).

To address the trends of converging technologies and the increasing number of patent filings and Asian documentation, the EPO is taking the necessary steps to further improve patent quality, procedural harmonisation and efficiency[29]. Relevant initiatives include re-structuring in order to mirror technological developments and exploit synergies (e.g. Telecommunication and Computer clusters brought into a single ICT Principal Directorate), a project portfolio in 5 key areas to improve efficiency (IT, HR, Buildings, Quality, Cooperation), timeliness and quality measures in alignment with industry's needs (ISO9001, Early Certainty from Search), cooperative patent classification, internal and free public patent-translate service into 32 languages, lifting of the PCT limitation of competence for US business methods applications, revision of the EPO Guidelines content relating to computer-implemented inventions and enhanced coverage of standards related-prior art via extensive in-house collections with over 2.2 million standards documents (over 14,000 standards documents were cited as prior art in 2013). Further measures are prompted by the rapid explosion of Asian documentation and tackle issues of prior art (21% of the patents cited in the EPO search reports in 2013 had an Asian priority; the EPO now has a searchable collection of over 35 million Asian patent documents), data acquisition, classification, search and documentation tools, translation options, access to work output from the Asian Offices, examiner training etc.

While the speed of examination and the timely issuance of patents are very important, the broader issue of patent quality is paramount to the smooth functioning of the patent system as a whole - from a legal, administrative and procedural perspective over to the socio-economic ramifications of patenting activity. Patent quality is complex in terms of definition and measurement. It is an overarching principle, covering pre-grant and post-grant processes and variables. Patentability and disclosure requirements, access to prior art, classification, procedural economy, transparency and publication requirements are all subject to continuous review and improvement when patent quality is at stake[30]. Beyond the actual patenting process, patent quality is further reflected in enforcement aspects such as timely and easy access to litigation before the national jurisdictions and a uniform practice in both the interpretation of patent provisions and the application of preliminary injunctions. Easy access means that patents should be available and enforceable at a reasonable cost, albeit not cheap. The latter could result in a tide of patent applications of

[28] Available at: www.epo.org.

[29] Information on the patent quality focus at the EPO is available at www.epo.org/about-us/annual-reports-statistics/annual-report/2014/quality.html.

[30] Cf. EPO Report, Workshop on Patent Quality, 2012.

questionable quality and the proliferation of "junk" patents with detrimental effects for the entire system[31].

3.2. Linking patents to economic growth

Economic growth is a function of technological progress, which depends on the processes by which the use of new technology spreads throughout the economy. How does IP protection and patents fit into this equation? A recent study entitled "Intellectual Property Rights intensive industries: contribution to economic performance and employment in Europe" provides relevant evidence. Carried out jointly by the Office for Harmonization in the Internal Market (OHIM) and the European Patent Office (EPO), the study constitutes the first EU-wide attempt to measure the impact of IPR on the European economy in terms of growth, employment, wages and trade. Given that IPR are rarely used in isolation, the study takes into account all IP bundles, not only patents. The underlying methodology covers a total of 321 IPR-intensive industries, about half of the total 615 industries that use IP as an intrinsic part of their business. By doing so, the study arguably understates the overall contribution of IP rights to the European economy.

OHIM-EPO study[32]

According to the OHIM-EPO study on IPR-intensive industries, the use of IPR is ubiquitous across industries: engineering, real estate, financial and insurance activities, manufacture of motor vehicles, retail, computers and pharmaceuticals are among the top 20 IPR-intensive industries in Europe. The study reveals that IPR-intensive industries generated 39% of EU GDP (€4.7 trillion annually), 35% of EU employment (77 million jobs) and 90% of total EU exports (€1.4 trillion annually) during the period 2008-2010. Respectively, patent-intensive industries account for 14% of GDP (€1.7 trillion annually), 16% of employment (35 million jobs) and 71% of EU exports. In addition, IPR-intensive industries are viewed as attractive employers with a wage premium of 41% higher than other industries with the patent-intensive industries offering the highest compensation (64% higher than other = € 831 per week).

In the ICT sector, the most patent-intensive industries include telecommunications (incl. wireless and satellite), manufacturing of electricity distribution and control apparatus, manufacturing of fibre optic cables, manufacturing of communication equipment and software publishing. These industries account for 1.8% contribution to GDP (€ 217,938 million) and 1% of total EU employment (over 2 million jobs).

The study yields many important insights regarding the macroeconomic dimension of IPR bundles and how IP protection and diffusion govern diverse sources of economic growth in the EU. European governments rely on robust IP-based sectors and key players in the relevant fields in their efforts to stabilize their economy and stimulate growth. Given the high returns extrapolated from the use of patents, patent-intensive sectors are assumed to play a similarly important role in the context, although detailed research that will measure the added value of these industries (including the technology sector) in terms of GDP contribution and industrial output, could shed more light on their economic relevance. In view of the large concentration of IP activity among a few leaders and geographical hubs, it would also be interesting to explore at a given point if and how the IP system could offer a wide range of tools to less performing regions with diverse cultural and socioeconomic background.

---

[31] European Patent Office, Workshop on Patent Quality, initiated by the EPO Economic and Scientific Advisory Board, 7 May 2012.

[32] OHIM-EPO, Intellectual property rights intensive industries: contribution to economic performance and employment in the European Union Industry-Level Analysis Report, September 2013.

At the next stage, a follow-up study will round up the above data with micro-level evidence. The second part will namely examine the impact of IP on the productivity of firms. It will take into account the use of national and EU-wide IP rights, incl. European patents, and assess the financial performance of IPR-intensive industries (= revenue per employee as measure for productivity) against those that rely less on intangible assets. Measuring the contribution of IPR to firm performance is an important missing link in the innovation equation. Mapping this landscape will help identify not only the strengths but also the weaknesses in the system, i.e. unlocked potential, challenges for SMEs and areas of possible funding, sensitivity of innovative industries to economic downturns etc.

3.3. Linking patents to R&D investments

To what extent do businesses turn investment in R&D into new technologies, improved processes or new products launched on global markets? A new economic research on the subject, conducted by the OECD and co-authored the Joint Research Centre of the European Commission, offers original data and statistics on the innovation output of the world's top corporate R&D investors. Entitled "World Corporate Top R&D Investors: Innovation and IP bundles", the report provides statistics on the patent and trademark strategies of the world's corporate leaders and examines the extent to which these companies bundle the two forms of intellectual property rights to protect their assets.

The OECD-JRC report constitutes a significant contribution to evidence-based policymaking, suggesting a positive correlation between R&D expenditures and the inventive activity of global corporate players. The expansion of breakthrough innovators across Europe, US and Asia with multiple R&D affiliate facilities and joint research activities reflects the scaling-up of innovation networks, the worldwide dispersion of high value-added activities related to product development and research activities, the global division of labour and the multi-direction of knowledge flows. The rise of these innovators puts into perspective the dynamics of the R&D race between incumbent firms and how the intensity of IP use and its spillovers stimulate growth that runs broader and deeper, cutting across industries and geographies. The evidence gleaned from the aggregated data underpins the incremental value of IPR bundles for the investing decision, a strong propensity to patent on behalf of world-leading investors, but also a high concentration of patenting activity within the terrain of an innovation elite.

OECD-JRC report on World Corporate Top R&D Investors[33]

According to the report, top R&D investors located in Europe and the United States demonstrate a highly diverse expertise across a broad spectrum of technologies, including those that are fundamental to tackling big societal challenges related to health, ageing and the environment. For the period 2010-2012, the European economy derived its technological advantage mainly from the pharmaceutical, chemistry, biotech and medical technology sectors. On top of these industries, the US economic powerhouse relies also on the computer technology and IT sectors. By contrast, companies based in Korea, China and Japan are characterized by a higher degree of specialization with particular emphasis on

[33] *Dernis et al.,* World Corporate Top R&D Investors: Innovation and IP bundles. A JRC and OECD common report, 2015. The analysis in this report is based on the sample of the *top 2000 corporate R&D investors worldwide* published in the 2013 edition of the EU Industrial R&D Scoreboard. The top ten includes Volkswagen, Samsung, Microsoft, Intel, Toyota, Roche, Novartis, Merck, Johnson & Johnson, Pfizer. As a prominent example for the ICT sector, Intel accounts for more than $10 billion annual investments in R&D and nearly 60,000 patents; its contribution to EU covers 10,000 employees in Europe in more than 40 R&D locations across the member states, so *Porath,* Perspectives on Patenting and Digital Markets – innovation, growth and employment, A view from Intel (conference material), 2015.

ICT technologies. These countries are an industry heavyweight in the areas of telecommunications, digital communication, semiconductors and computer technology. Evidence also shows that an extensive proportion of the R&D investments are concentrated in a relatively small number of world-leading corporate innovators, mostly multinational groups. These companies also account for a significant proportion of the patents and trademarks filed in the most important intellectual property offices around the world. Specifically, the world top corporate R&D investors considered in the report account for over 90% of global business R&D spending and own 66% of all patent families in the five large IP offices (IP5) in Europe, the US, Korea, China and Japan.

The patenting activity of the top R&D investors focuses predominantly on technologies related to Electrical engineering (50% of total patent families) and Mechanical engineering (20% of total patent families). Over the last 10 years, patent filings in the fields of Computer technology and Electrical machinery have demonstrated an upward trend. The filing strategies across the IP5 offices depend on the technological field of the particular invention these companies want to protect. Patent families filed at the KIPO, USPTO and SIPO are largely oriented towards electrical engineering applications, while EPO patent family members show a stronger orientation towards mechanical engineering and chemistry. Patent family members at the JPO are mostly oriented towards instruments and mechanical engineering.

Against this background, the web of interdependencies between R&D and patents, prompts further investigation into the "black box" of this relationship: What is the distribution of R&D input across patent-intensive European firms of all sizes and which patenting strategies do they pursue? Furthermore: deepening the link of patents to R&D – and with it our understanding of the respective economic effects of patenting - requires additional evidence that would complement the relationship between patents and R&D *input* with data related to the ratio between R&D *output* and the patenting activity of firms. This could prove a challenging task given that R&D investments *may* lead to inventions that *may* lead to patents, revealing a lot of unknowns in between about the ROI on R&D investments and the relative share of IP as a substantial part of the innovation equation – with variables such as convergent and hybrid technologies, undisclosed company data around patenting strategies, patent variations in scope, value and use further blurring the picture.

Furthermore, questions arise around the incentives of companies to patent and the strategic importance of patents in the new IP market. A strong patent protection is bound to have a positive effect on the willingness to innovate, but why are some patents exploited commercially, others are licensed out and others not used at all? Not all new technologies translate into lucrative products and many are never commercially exploited, i.e. either used strategically to block rivals or not used at all (sleeping patents). New empirical data around the use of patents and the characteristics of non-used patents provides a better understanding of the role of patents in a system that is often criticized for its inefficiencies, fragmentation and patent thickets. The PATVAL 2 survey covers the period November 2010 - September 2011 and harnesses data from ca. 23,000 business inventors of EPO patents located in 20 European countries, US, Japan and Israel. By investigating the patent incentives of these businesses and the way they utilize their patents, the survey unveils a substantial share of unused patents, namely unused blocking and sleeping patents. These assets either serve ulterior strategic motives or merely reflect tacit knowledge and unfulfilled – or perhaps even unlocked – potential. Most importantly, though, they underscore the increasing relevance of strategic patenting in the new digital economy, i.e.,

the strategic use of the patent systems by leveraging the complementarities between patents in order to attain a strategic advantage over technological rivals[34].

PATVAL 2[35]

According to PATVAL 2, the most powerful incentive to file a patent is to block competition (66% of the respondents). In terms of asset utilization, commercialization represents by far the most frequent patent use (55%), followed by licensing (7%), new firm creation (4%), and patent sale (4%). Only 1% of patents are used in cross-licensing agreements. In total, 58% of the patents are used for any of these purposes while the rest remains unused. As a rule, large firms are characterized by a higher patent propensity compared to small or medium-sized firms. This patenting behaviour increases the share of unused patents, suggesting that larger firms are (and can afford to be) more actively engaged in strategic patenting than smaller ones. Specifically, large firms exhibit the largest share of strategically non-used patents (31% of patent are filed to block competitors without the intention to use the patent, i.e. twice the share of small and medium-sized firms) and sleeping patents. Comparatively, small and medium-sized firms are more active in commercial use and licensing. Cross-licensing, in particular, is an important source of income for industries characterized by cumulative innovation such as semiconductors and biotechnology - a practice that leads to a greater dispersion of patent ownership. However, the owners of large patent portfolios in these industries are expected to continue to hoard blocking patents, as they remain exposed to the risk of hold-up and blocking patents of other players. When not licensed, the arsenal of own (unused) patents may be used as a bargaining chip in infringement suits.

When examining the association between used and unused patents by controlling for multiple variables - family size, scope, generality and overlapping claims, technology area, type of applicant and the competitive environment -, evidence from PATVAL 2 shows that patent use varies significantly between complex technologies (electrical machinery, electrical energy, audio-visual technology and information technology) and discrete technologies (pharmaceuticals and cosmetics). Patents in complex technologies are more likely to be used - both strategically and commercially - and less likely to remain unused. Patents are intensively used for commercial purposes in process engineering (62%) and consumption and construction (68%). Licensing is more frequent in these two technologies, as well. In line with earlier studies, cross-licensing occurs more frequently in electrical engineering, confirming that cumulative innovation and product complexity drive companies to harness the technology markets for additional opportunities of commercial exploitation. Also, patents related to software and business methods are more likely to be used for sale and licensing purposes than, for instance, pharmaceutical and biotechnology patents, thus favouring the development of downstream applications.

The empirical evidence gleaned from the PATVAL 2 survey demonstrates that the use of patents has evolved into a complex strategic tool beyond its original *raison d'être,* i.e., blocking competition. The increasing use of patents for strategic purposes is a two-edged sword: whereas it reinforces the importance of patents in the new markets for IP and creates additional incentives to patent, it loads the system with large patent volumes, overlapping rights and tacit, largely unexploited technical knowledge in terms of societal impact.

---

[34] *Harhoff et al.,* The strategic use of patents and its implications for enterprise and competition policies, 2007, p. 79.

[35] *Torrisi et al.,* Used, Blocking and Sleeping Patents: Empirical Evidence from Large-Scale Inventor Survey (PATVAL 2), 2014 (to be published). See also *Torrisi,* Used and Unused Patents, 2015 (conference material).

The PATVAL 2 survey suggests that Europe has a large share of sleeping patents (14%). This share does not include unused blocking patents, which are not deployed strategically. It does, however, raise questions about the potential value of this small fraction of sleeping patents that may protect an early stage invention whose development and commercialization require irreversible investments that the owners could undertake if technological or market conditions are favourable. Notwithstanding the affirmation that there is no significant market failure in terms of all unused patents, the EC Expert Group on Patent Aggregation has identified the need for supporting measures for the development of unused or immature but promising technologies, e.g. through technology development funds[36]. The underlying concern here is tied to the general inefficiencies and barriers that prevent the EU market from fully exploiting its technological potential. Issues such as lack of transparency, information asymmetries, investment gap, high transaction costs or enforcement difficulties may impose challenges on technology-centric companies, especially start-ups and SMEs. Making a case for unlocking the potential of unused patents fits into the broader effort of securing an extensive body of evidence for policy deployment and evaluation.

Beyond data, the key outcome of the survey is particularly valuable in the context of the present report: IP should complement policymaking. In order to discourage the emergence of patent filings that aim largely at creating strategic defences and barriers to entry for newcomers, policy tools should put emphasis on patent quality and the application of stringent patentability criteria in the pre- and post-grant procedure.

[36] *European Commission,* Expert Group on Patent Aggregation, Report 2015, p. 19.

4. PATENTING OF COMPUTER-IMPLEMENTED INVENTIONS

The Third Session *of the Brussels Conference closely examined patenting issues related to computer-implemented inventions (software) in the new digital context. The panel compared the different approaches to software patentability in Europe and the United States with special reference to the US Supreme Court decision in re Alice Corp. v CLS Bank (4.1. Patenting issues in the field of software), looked into the dependence of the software-based industry on patent filings and its contribution to growth and competitiveness as part of a new research project by the Fraunhofer Institute (4.2. Economic effects of software patents) and explored the borderline of software patent protection and alternative protection models (4.3. Interplay of proprietary and open source regimes for software).*

Chair*: Nikolaus Thumm, Senior Fellow, Institute for Prospective Technological Studies, Joint Research Centre, European Commission*

Panelists*: Clara Neppel, European Patent Office; Stuart Graham, Associate Professor of Strategic Management, Scheller College of Business, Georgia Institute of Technology; Dr. Rainer Frietsch, Fraunhofer Institute for Systems and Innovation Research ISI; Jonathan Sage, Global Technology Policy, IBM; Mirko Boehm, Director, Open Invention Network; Nicolas Schifano, EMEA Director for Standards and Interoperability Policy, Microsoft.*

4.1. Patenting issues in the field of software

The software industry is a knowledge-intensive industry whose output is information, namely the coded instructions that guide the operation of a computer or a network of computers. At the interface of software with ICT technologies, internet and communication infrastructures rely heavily on computers and applications for modelling, simulation and analysis. In addition, technologies around the Internet of Things broaden the scope of software application, opening pathways to new interoperable solutions and unprecedented business synergies as the recent evolution of smart cars ("a smartphone on wheels") demonstrates. It is a software-enhanced network of devices that transforms systems into user interfaces, blurring the traditional boundaries between hardware and software.

At the intersection of software and hardware, computer-implemented inventions encompass both ICT-related software, e.g. data compression, as well as embedded software, i.e. software incorporated directly into a product which controls the hardware and whose operation is typically not under the user's control. From an intellectual property perspective, the hybrid nature of software renders them eligible for both copyright and patent protection. In the presence of network effects, software raises issues regarding the relationship between these two types of protection. The distinction between the linguistic and functional features of a programme code are relevant for the distinction between copyright and patent protection; copyright generally protects the concrete expression of a computer programme whereas patents protect its functionality insofar a claim meets the patentability requirements. When patent authorities and courts are reluctant to grant patent protection to software, much of the pressure to protect them shifts to copyright. However, given the stronger protection scope of patent law, patents are largely preferred by incumbent large corporation for strategic purposes.

European approach to patentability

With regards to patentability, software is understood as a combination of computer instructions and data definitions that *enable* computer hardware to perform a *function*, either computational or control-related. According to the patentability standards of European law, the claim as a whole must define a technical solution to a technical problem.

Non-technical features, e.g. belonging to business methods or abstract mental acts, cannot contribute to inventive step. A mere interaction with technical elements is not deemed sufficient for patent eligibility. Additional filters, such as novelty and inventive step ensure that conventional hardware, which carry out technical tasks in an obvious way - although deemed technical - will be excluded from patentability as non-inventive.

The importance of patentability filters is particularly pronounced in the case of business methods, many of which regularly concern software-embodied tools or routines deployed by online providers in support of the delivery of online goods and services to end users. Business methods are not considered to have a technical effect in the European patent system; hence, the grant rate in this area is very low. Among all business method applications at the EPO, for which a final decision could be taken in 2014, only 2% were granted. 59% were refused based on lack of technical character and a wide scope of prior art that includes open source as well as standards-related documentation acquired by the EPO. The grant rates in the areas of computers and ICT were 32% and 55% respectively[37].

The growing use of patents in the software industry raises concerns over the issue of the quality of CII patents and, by extension, the broader issue of patent quality. Given their economic significance, the EPO implements critical quality-control mechanisms such as Raising the Bar, a review of the EPO Guidelines for Examination related to CII, an interdisciplinary examination through joint divisions and clusters as well as a common patent classification. The Cooperative Patent Classification (CPC), jointly developed with the USPTO and based on EPO in-house classification standards, provides an effective classification system for efficient document retrieval. Classification schemes are not only important in the field of prior art; they can also support multidisciplinary effort and large-scale economic studies on the effects of CII.

US approach to patentability

On the other side of the pond, a more expansive judicial treatment of the breadth and strength of software patents since the early 1990s was the key factor for the accelerated growth of related patenting activity in the US. The *State Street Bank v. Signature Financial Group* decision[38] taken by the Court of Appeals for the Federal Circuit (CAFC), which allowed for the patenting of business methods for online transactions and marketing techniques in 1998, also drove increased software patenting (since many such methods are implemented in software) in the US market. The latest case law by the US Supreme Court in the decision *Alice Corp. v CLS Bank International* has neither brought the much-anticipated clarity nor attempted to bridge the gap between the different approaches on the patentability of CII.[39]

---

[37] *Neppel,* Intellectual Property for Software – a view from the EPO (conference material), 2015.

[38] *State Street Bank v. Signature Financial,* 149 F.3d 1368 (Fed. Cir. 1998).

[39] During the court hearing, Justice Sotomayor repeatedly raised the question of software eligibility, asking *inter alia* "Do you think we have to reach the patentability of software to answer this case?" The Solicitor General replied "I think the answer to that question is no, not necessarily," and then laid out in general terms the same reasoning that the Court ultimately adopted, that "Bilski answers the question whether this is an abstract idea" and "Mayo answers the question of whether the use of a computer in this case adds enough to the abstract idea beyond conventional steps". In addition, the ruling did not offer a solution to the "irreconcilable differences" between two distinct and contradictory approaches to the interpretation of patent claims, namely the Diehr approach which evaluates § 101 eligibility of the subject-matter based on the claim "as a whole", "wholly apart" from novelty and non-obviousness of components; and the Mayo approach which evaluates eligible subject matter by disassembling a patent claim into constituent parts, and characterizing each part in terms of its novelty and non-obviousness.

Alice Corp. v. CLS Bank International (June 19, 2014)[40]

The patent at issue was a computer-implemented, electronic escrow service for facilitating financial transactions. In a unanimous decision, the Supreme Court held that because the claims were drawn to a patent-ineligible abstract idea, they were not eligible for a patent under 35 US Code § 101. Specifically, the Court stated that if one has an idea so abstract that it cannot be patented, simply tying it to a "generic computer cannot transform a patent-ineligible abstract idea into a patent-eligible invention". It also stated that tying an abstract idea to "purely functional and generic" hardware would equally not render the idea patentable.

In its *Alice* decision, the Supreme Court refrained from addressing the major issues in the field, namely the patentability of business methods, the challenges to the system imposed by Non-Practicing Entities and the overall eligibility of software - it did not even refer to the terms "software" or "computer program". For that reason, the decision is under scrutiny within the IP circles as, for some, it may render many hundreds of thousands of software patents invalid[41]. On the other hand, it is argued that the Supreme Court ruling is more important for what it signals: it fulfils an important task, i.e. to curb poor quality software patents and a long-standing practices of the CAFC that, according to critics, contend little to no regard to small inventors, start-ups, and the public interest[42]. At the end, time will prove whether the Supreme Court *Alice* decision will shape future dynamics towards a more robust patent system or whether the perceived lack of clarity will prevail with negative impact on R&D investment.

Like their European counterparts, US policymakers are equally confronted with the question as to how they should understand software as an emerging inter-connected technology in order to make informed policy decisions. Empirical data can offer many pointers. For instance, a recent survey explores whether software patents contribute to higher litigation and use data to shed light on the matter[43]. One of its main findings is that the relationship between low quality patents and smartphone litigation appears weak. The authors also suggest that software exhibits the characteristics of a "general purpose technology" in that it displays wide economy-wide adoption and spawns cumulative innovation with pervasive impact across diverse sectors such as electronics, automotives, chemistry, machinery, and pharmaceuticals / biotechnology. They present additional evidence showing that USPTO treatment of software patent applications has been more restrictive than critics contend, during the past decade comparing favourably to examination in other technologies: Approx. 50% of the related applications were rejected in 2012 by "first final actions" whereas approx. 13% were allowed by "first actions," figures that are statistically undifferentiated from the treatment of all other (non-software) patents at the USPTO[44].

Additional evidence from studies of US start-ups show that software patents can be important for successful entrepreneurship, and produce private value to the firms that hold

---

[40] 134 S.Ct. 2347. http://www.supremecourt.gov/opinions/13pdf/13-298_7lh8.pdf

[41] See e.g. the criticism from ipwatchdog at www.ipwatchdog.com/2015/01/09/a-software-patent-setback-alice-v-cls-bank/; cf. www.ipwatchdog.com/2014/06/27/alice-the-illusory-death-of-software-patents/

[42] *Samuels,* Patent Trolls are mortally wounded, 20 June 2014, available at http://www.slate.com/articles/technology/future_tense/2014/06/alice_v_cls_bank_supreme_court_gets_software_patent_ruling_right.html

[43] *Graham/Vishnubhakat,* Of Smart Phone Wars and Software Patents, Journal of Economic Perspectives, 27(1): 67-86, 2013.

[44] For research purposes, a "final" action is either a final rejection or an allowance. The "first" final is whichever one of those came first; *Graham/Vishnubhakat,* Of Smart Phone Wars and Software Patents, Journal of Economic Perspectives, 27(1): 67-86, 2013.

them. Statistics gleaned from another survey[45] reveal that US companies competing on software/Internet technology and founded less than 10 years prior are holding patents at higher rates than previously believed: 24.3% of software/Internet companies drawn from a population sample, and 68.6% of a smaller sample drawn from only VC-backed firms reported holding US patents or patent applications. Regarding the importance of patents for a start-up's competitive advantage and the attractiveness of patenting to potential investors, the surveyed companies were most likely to cite to preventing copying as a motive for patenting, but other motives were prominent reasons, such as securing investment, improving exit chances, enhancing reputation and improving chances of a favourable exit, such as acquisition or IPO. In a more recent research[46], scholars have found a positive relationship between holding patents by software companies and the market value of the firm, providing a counterbalance to contentions made by many that software patenting is wasteful and destroys value.

Towards legal certainty

Given the different patentability requirements and scope of patent protection in the field of computer-implemented inventions, patent experts and innovators are confronted with an increasing lack of clarity. Certainly, the assessment of the "technic effect" in the European practice still provides a stable and reliable criterion for a company to determine whether a particular invention is worth patenting, whereas the many changes in the US case law around software patentability make it less easy to apply the similar considerations in practice. Nevertheless, there is a growing gap between the industrial need for patent protection, on one hand, and the availability of patents, which can affect innovation, on the other[47]. The latter raises questions about the suitability of the patent system in Europe to encounter the next wave of industrial revolution in the field of software. Lack of legal certainty, coupled with the accelerated lifecycles of the CII, points to the necessity for further harmonization with regards to both the interpretation of the patentability criteria and the scope of CII patents across patent offices and national jurisdictions. There is a fine balance to strike in this case, since it is doubtful whether allowing more patent claims for CII would offer an adequate response - a more "dynamic" approach to patents that prioritizes speed and quantity over quality may tip that balance. In this context, the UPC is expected to have a significant impact on both patent applications and existing portfolios, leading to a more intelligible, coherent jurisprudence. To this point, there is widespread uncertainty over whether the UPC will follow the EPO practice on CII or adopt a different approach. Given that the UPC will start building up its case law in a few years from now, applicants of CII patents may well consider seeking protection with the national patent authorities and jurisdictions and, with it, a certain degree of predictability in their established practice and jurisprudence[48].

At the same time, innovation policies should be able to look beyond the legalistic debate around patents and study the particularities of the software sector in the new economy: Despite the applicability of software across various sectors, the ownership of CII patents is highly concentrated in the portfolios of a few market leaders, whereas the relative low share of "pure" software inventions suggests that, with the exception of a few industries,

---

[45] *Graham et al.,* High Technology Entrepreneurs and the Patent System: Results of the 2008 Berkeley Patent Survey, 24(4) Berkeley Technology Law Journal 255 (2009).

[46] *Noel/ Schankerman,* Strategic Patenting and Software Innovation. Journal of Industrial Economics, 61: 481–520, 2013.

[47] *Sage,* Innovation in the Digital Single Market – The Role of Patents (conference material), IBM 2015.

[48] *Sage,* Innovation in the Digital Single Market – the Role of Patents (conference material), IBM, 2015

patents are not regarded as the most favoured means of profiting from inventions[49]. Against this background, it would be interesting to empirically examine where CII patents derive their value from, whether there is a positive correlation between market value and patent quality in the particular field and whether the contribution of the CII-based industry to the overall economy balances off the incurring costs.

4.2. Economic effects of software patents

The software sector as a whole is highly valued, both in terms of R&D resources and innovation output. The applicability of software is ubiquitous throughout the markets. Fierce competition in the field and the threat of product imitation enhance the need for protection through a bundle of IPR, driving an upward trend in patent filings. Economic aspects related to the dependence of the software-based industry on patent filings and its contribution to growth and competitiveness form the subject of a study, currently conducted by the Fraunhofer Institute for Systems and Innovation Research ISI.

Fraunhofer study on the Patentability of CII[50]

The research aim of the ongoing Fraunhofer study is twofold: to carve out the significance of computer-implemented inventions for the German and European economy with a special focus on SMEs, and to investigate the consequences of a possible abolition of patent protection for CII, including its impact on the international competitiveness of German and European companies. The study consists of three main parts. The first part addresses the legal status quo as well as the implications of a possible change in patent law. The second part covers an empirical investigation of the structures and trends in patent protection of computer-implemented inventions. The final part focuses on the results of a survey that examines the patenting behaviour of patenting and non-patenting companies

According to the first outcomes of the study, computer-implemented inventions (CII) represented over 35% of total EPO filings per year since about 2003. More than 40,000 EPO filings originated from the US during the period 2009-2011. The different patenting patterns for CII between EU (23% of total filings) and the US (31% of total filings) clearly reflect the different approach on patentability between the two systems[51]. In absolute terms, there is an average range of 90,000 – 110,000 software patents filed with the USPTO every year. In 2010, there were 95,000 CII applications filed with the USPTO as opposed to the EPO total number of 30,000 CII filings[52]. From the total EPO filings related to CII, 78% stemmed from the manufacturing sector.

---

[49] *Bakels et al.,* Study of the effects of allowing patent claims for computer-implemented inventions, Final Report and Recommendations, 2008, p. 29.

[50] *Neuhäusler et al.,* Patentierung computerimplementierter Erfindungen – Aktuelle Rechtslage und ökonomische Implikationen**,** Fraunhofer ISI Discussion Papers Innovation Systems and Policy Analysis No. 46 ISSN 1612-1430 Karlsruhe, March 2015; German text available at http://www.isi.fraunhofer.de/isi-wAssets/docs/p/de/diskpap_innosysteme_policyanalyse/discussionpaper_46_2015.pdf (English translation to be published at 4ipcouncil.com).

[51] The 23% share of EU total filings refers to the identification of CII filings without using the claims. When claims are included in the keyword search, the respective share reaches an estimated 35%, bringing the EPO to a similar level with the USPTO. A higher share that includes keyword search within the patent claims is not available for the USPTO data; the US share of 31% has therefore been calculated as a benchmark and should be regarded as a rather conservative estimate.

[52] As indicated above, the EPO number of total CII filings is derived from a keyword search that excludes the claims. Once the claims are added, the respective number goes up to a total of approx. 44,000 CII filings.

According to the Fraunhofer study, both the European and US system are characterized by an increased concentration of patent filings in the portfolios of large corporations that dominate the sector. The share of CII applications filed by SMEs is visibly lower in the US (17%), compared to the higher participation of European SMEs (22%) that seem to benefit from the advantages of the EPO system. Notwithstanding these numbers, SMEs that file for CII patents are still underrepresented in both systems in proportion to the overall share of SME filings across the entire industry spectrum. Drawing on this analysis, the study affirms the need for clear rules regarding the patentability of CII.

4.3. Interplay of proprietary and open source regimes for software

The Internet infrastructure is largely dependent on open source software and open protocols: 80% of the web stack, i.e., operating system, web server, database server and programming language, is developed collaboratively[53]. On the infrastructure level, open source software represents the lower stack (protocol) while the proprietary models of Software as a Service (SaaS) cover the higher stack of Internet applications. Cloud computing, mobile devices, the Internet of Things and Software-Defined Networks (SDN) have provided new impetus to the diffusion and rapid growth of open source technology. The economic impact of open source is thus significant but tends to disappear from the economic analysis because open source software is not directly tied to revenue – at least traditionally.

The software landscape is characterized by opposing trends, reflecting the tensions between the need for interoperability, on one hand, and competitive differentiation, on the other. A balance between the two allows for the coexistence of different models of technology diffusion that range from the traditional proprietary solutions over to hybrid solutions and open source. Patent protection and open source ecosystems involve different intangible assets and types of license, thereby serving disparate objectives and market needs. Although open source software is a low cost alternative to proprietary software, its lure lies with the flexible and reliable structures of a platform that stays free from IP intervention. Acting as corrective for market asymmetries and inefficiencies, open source models represent a viable alternative for companies that want to avoid high transaction or litigation costs, speed up time to market, improve product quality, engage directly with customers and partners, and use customization in order to build a competitive edge within their most mission-critical environments[54]. Current trends towards collaboration and rising investment in open source solutions round up software developers and businesses across multiple industries and pool available resources towards a common goal, namely the development of open source code bases that enable the differentiation of their individual products and services[55].

---

[53] *Boehm,* The Open Source Community as a Consumer of the Patent System – 5 Problems with Software and Patents for the Open Source Communities' Perspective (conference material), 2015.

[54] *Boehm,* The Open Source Community as a Consumer of the Patent System – 5 Problems with Software and Patents for the Open Source Communities' Perspective (conference material), 2015.

[55] LINUX, Collaborative Development Trends Report, 2014, pp. 5. The influence of large corporations in the collaborative development is particularly visible in the development of Open-Stack, a package of software designed as a foundation of cloud computing. Another example is the US-based Open Invention Network (OIN), which is backed from Google, IBM, NEC, Philips, Red Hat, Sony and SUSE. A hybrid of open source and defensive patent, it has the mission to protect Linux, a free IT operating system. It safeguards developers, distributors and users from IP interventions by acquiring and sharing IP to promote a collaborative Linux ecosystem. The network currently

Within these collaborative dynamics, a new breed of US open source groups that turn the popularity of open source into profits is on the rise. Traditionally, open source platforms aim at turning users into customers by giving away software free of charge while selling support services and add-ons built on top of these platforms. However, the increasing popularity of collaborative development among large tech companies such as IBM, HP, Microsoft and Oracle forces open source initiatives to readjust their business models in order to avoid being crowded by the very same corporate establishment they have been trying to distance themselves from. Especially in the field of cloud computing and big data, open source groups carve out a new, profitable business model by adding commercial tools and services to the development of software and databases that manage applications and big data in the cloud (e.g. Docker, NoSQL group, Hadoop group). With investors lining up, these companies report rising revenues and are valued up to $14 billion at the front of a wave of IPOs expected next year[56].

Despite the radical transformations taking place in the open source (business) community, the aforementioned models and technologies are still untested and therefore subject to speculation. Their premature success and evolving mechanics may prove to be elusive, but their emergence is certainly a sign of the times with possible spillovers into the European market. As with the emerging market of IP specialist firms, it remains to be seen whether the coexistence of proprietary regimes, conventional open source models and emerging for-profit open source alternatives could provide a sound basis for an economically efficient IP ecosystem.

counts 1250 participants and 2250 open source packages, covering 1.6 million potential patents and applications in its cross-licensed pool.

[56] *Second Wave of Open Source Software,* Financial Times, 7 April 2015, p. 16.

5. PATENTING, STANDARDS AND LICENSING PRACTICES

The Fourth Session *of the Brussels Conference drew attention to the interplay between patents, standards and the licensing terms of "standard essential patents" for digital technologies in Europe. The panel provided an overview of the current dynamics in the standardization process, including the recent changes in the IEEE-SA policies (5.1. Interplay of patents and standards – tensions and trade-offs), gave the floor to the most important positions in the debate over the licensing terms of standard essential patents (5.2. Controversy of FRAND licensing) and explored future areas of interest in the context of the Digital Single Market with particular emphasis on the role of patent pools in the context (5.3. Role of patent pools).*

Chair*: Tony Clayton, Chief Economist, UK Intellectual Property Office*

Panelists*: Prof. Yann Ménière, Ecole des Mines; Serge Raes, Standards and IP Senior Manager, Orange; Konstantinos Karachalios, Managing Director, IEEE-SA; Ashok Ganesh, Director Innovation, CEN CENELEC; Heinz Polsterer, Head of Standardization and IPR Management, T-Mobile Austria; and Roberto Dini, Founder Sisvel.*

5.1. Interplay of patents and standards – tensions and trade-offs

The area of standardization is a rapidly changing and complex environment characterized by complementary technologies with high functionality, short lifecycles, IP intensity, market deregulation, fierce competition and litigation. ICT standards are perceived as the foundation of interoperability and the success of new products that interact seamlessly with existing devices, platforms and ecosystems. Consensus building among the various stakeholders is therefore an essential determinant of standard-setting processes, a platform critical to ensuring wide market distribution and acceptance of innovative services and applications. The presence of network externalities and the strong public interest dimension of standardization processes spur a highly dynamic field of intricate structures and far-reaching policy implications. The business landscape around standardisation spans a vast array of industries in telecommunications, computers, and audio-video consumer electronics. It is a heterogeneous landscape where the various specificities of these industries render it often difficult to align the conflicting interests of upstream and downstream players with those of research-based players.

Wireless data services and systems represent a rapidly growing segment of the communications industry, enabling Internet access through a wide range of digital devices. Computers, tablets, phones, and televisions increasingly share these capabilities. The functionality of broadcasting, satellite and cellular networks depends on their compliance with industry standards. Technologies embedded in these standards may be patented or subject to patent applications at the time a standard is developed. The developers of standards opt increasingly for patent protection in order to meet specific design requirements and commercialize their inventions. Standard essential patents offer a powerful incentive for developers of the related technologies to participate in the standard-setting process in which multiple parties contribute valuable knowledge to the technical specification of a standard, including textual description, formal language, data structure, software reference model, conformance test suite and logo. From the definition of a standard and by the time the embedding product reaches the market, essential patents obtained during the early part of the technology lifecycle may already be 5-10 years old. This explains why technical insights and standards inputs during standard setting predetermine the type of technology, principal interface and architecture of the future - a significant strategic advantage for the companies whose standard gets adopted in the

process. These companies seek an economic return on their R&D investments (ROI) either through various avenues such as direct licensing, cross-licensing and joint licensing agreement or via a patent pool. The ROI calculation is based on a series of factors and values that weigh disproportionally, i.e. achieving technological competitive advantage (50%), securing essential patents (20%), influencing standardization (15%) and sustaining technological advantage (15%)[57].

Albeit subject to different institutional frameworks and independent processes, patents and standards interact in a manner that is as much complementary as it is adverse. Given that efficient standards typically expand output due to externalities in the form of network effects, the incorporation of IP into a standard enhances the value of IP itself. After a standard is adopted, the patent may become essential to implementing the standard, hence the focus on the so-called Standard Essential Patents (SEPs). This added value should not necessarily be attributed to the standard, which acts as a catalyst and an amplifier of the marketability of IP, but rather to the embedded IP itself: if a particular IP provides a new, inventive and uniquely efficient way to solve a problem that must be overcome in order for a standard to work, the intrinsic value of IP lies with the patent owner's incentive to diffuse and market the underlying technology with a view to a monetary return on its investment. This is so even if the standard unlocks value in IP for which there was no market until the standard was created[58].

However, proprietary technologies are often subject to tensions and diverging interests between participating firms[59]. On one end, patent holders have an interest in improving the standard to protect it from becoming obsolete and being replaced by rival technologies. They seek widespread acceptance and subsequent application of their standards, which, on the negative side, may result in lock-in effects, market fragmentation and hold-ups. On the other end of the spectrum, users perceive standards as critical technology platforms that should be accessible on affordable terms. In this context, various Standard Setting Organisations (SSOs) such as ITU, IEEE-SA, 3GPP, IETF and CENELEC assume the role of ensuring the interoperability of technology products and facilitating the necessary exchange of data through the development of industry standards. It is inherent to their mission to provide the right conditions for the speedy creation and adoption of an appropriate technical solution.

In order to serve this purpose, SSOs have developed IPR policies and guidelines that govern under which conditions such technologies should be licensed. To reduce opportunities for hold-ups and to mitigate uncertainty around the adoption and implementation of a standard, some SSOs suggest or mandate the disclosure of patent rights before the standard is designed or require ex ante commitments by holders to license any patents incorporated into standards on fair, reasonable and non-discriminatory terms (FRAND). The basis of these policies is the agreement that there has to be a "reasonable" reward for the inclusion of a patented technology in a standard. For many, it is the ambiguity of the term that raises concerns around the efficiency of these policies in practice and whether they are still in sync with the fast pace and complexities of standardization in the global knowledge

---

[57] *Raes,* Innovation, Patenting, Standardisation and Licensing – A view from ORANGE (conference material), 2015.

[58] Cf. *Meyer,* US Department of Justice, How to Address "Hold Up" in Standard Setting without Deterring Innovation: Harness Innovation by SDOs, 2008; available at www.justice.gov/atr/public/speeches/234124.htm.

[59] For a comprehensive overview of the dynamics in the standardization landscape, see *Maskus/Merrill (ed.),* Patent Challenges for Standard-Setting in the Global Economy: Lessons from Information and Communication Technology, 2013.

economy[60]. An SSO's decision to impose only vague licensing conditions may be an implicit decision to get more patentee participation in the standard development on the front end, and accept more risk of high licensing fees in the implementation on the back end[61]. Given the delicate trade-offs necessary for the efficient functioning of the standardization process, an SSO may equally choose to rely on non-contractual factors, i.e. the parties' bargaining power, or decide that the lack of ex ante safeguards is a reasonable price to pay in exchange for making the standard-setting process as licensor-friendly or as fast as possible[62].

The SSO practices have come under scrutiny in recent years. On the premises that there is a public or societal dimension to the standardization process tied to the imperatives of increased transparency and good governance in the system, it is argued that the SSOs can no longer content themselves with serving only as the battlefield where the bargaining power of a few industry giants sets the rules and the limits; rather, they have a responsibility not only toward their industry "stakeholders" but also towards the society at large[63]. As previously mentioned, the adoption of an essential standard may confer substantial market power upon a large number of SEP-holders, locking in the related technology markets by virtue of the specific standard – especially in the field of mobile telecommunications, the shift towards smartphone and open source platforms ignites market rivalries due to the prevalent network effects. Owners of one or more SEPs may leverage their market dominance to hold-up implementers, prevent them from switching into competing technologies and adversely impact conditions in the downstream markets. In this context, the relationship of the EU regulator with the SSOs is a complex one. The EU approach has been rather pragmatic, limiting harmonisation to the adoption of essential safety requirements while providing guidance and safeguards to avoid anti-competitive practices in the standard-setting process. Subsequently, the rational approach of antitrust and enforcement authorities not to interfere directly with the standardization process via liability threats against an SSO's failure to implement its IPR policy or against the participant firms' misconduct during the standardization process leaves the relevant SSOs with additional flexibility and tools to improve governance in the system.

Making use of that flexibility, IEEE-SA has recently updated its IPR policies to provide a standards-specific guidance about what could be considered a reasonable royalty rate.

---

60 Back in 2012, the European Commission's Vice President for Competition Policy said that "there is a growing consensus on both sides of the Atlantic on the damage that the misuse of standard-essential patents can do to competition" and that the European Commission's receipt of "many complaints related to standards-essential patents also shows that there is a great need for guidance."

61 In any case, one cannot say as a general matter that either maximizing patent owner participation or maximizing user adoption is always the better policy choice; so *Meyer,* US Department of Justice, How to Address "Hold Up" in Standard Setting Without Deterring Innovation: Harness Innovation by SDOs, 2008; available at www.justice.gov/atr/public/speeches/234124.htm.

62 For the reasons behind the lack of traction of ex ante policies among SSOs, see *Contreras,* Technical Standards and Ex Ante Disclosure: Results and Analysis of an Empirical Study, Jurimetrics, Vol. 53, No. 1, (2013).

63 *Karachalios* Innovation in a European Digital Market – the Role of Patents (conference material), 2015. See also *European Commission,* Expert Group on Patent Aggregation, Report 2015, p. 38: ICT standards are becoming enabling technologies for many areas of increasing societal importance, such as smart grids and energy supply, e-health and intelligent transport systems – every sector where so-called "smart-systems" are introduced. As a result, the requirements (from the demand side) for essential patents are changing considerably, and the need for access to them is increasingly critical.

According to the new rules, "reasonable rate" shall mean appropriate compensation to the patent holder for the practice of an essential patent claim excluding the value, if any, resulting from the inclusion of that essential patent claim's technology in the IEEE Standard. In other words, the patent holder is compensated, but not for appropriating for itself the network effect of the standard. The update provides additional clarity by recommending consideration of three factors in determining a reasonable rate but these factors are not mandatory. Parties (and, in litigation, courts) are free to consider other factors. The three factors are: (1) the value contributed "to the value of the relevant functionality of the smallest saleable Compliant Implementation that practices the Essential Patent Claim," (2) the value contributed "in light of the value contributed by all Essential Patent Claims for the same IEEE Standard practiced in that [smallest saleable] Compliant Implementation," and (3) "Existing licenses" that "were not obtained under the explicit or implicit threat of a Prohibitive Order" and "otherwise sufficiently comparable" circumstances and resulting licenses.[64]

IEEE sought and obtained clearance for the amendments from the US Department of Justice, which affirmed that the amendments have the potential to benefit competition and consumers by facilitating licensing negotiations, mitigating hold-up and royalty stacking, and promoting competition among technologies for inclusion in standards[65]. Not surprisingly, the changes of the IEEE patent policies have sparked a vigorous public debate. At the same time, they have been welcomed by many as a much-needed clarity to the murky world of FRAND commitments. Whether other SSOs will follow the example and clarify their objectives remains to be seen.

5.2. Controversy of FRAND licensing

Lack of clarity

The lack of clear guidance in the IPR policies of most SSOs does not undermine the importance of FRAND commitments. From an SSO perspective, FRAND obligations seek to mitigate the complexities and the frictions in the system in order to render essential technologies globally accessible. From a corporate perspective, FRAND licensing schemes are designed to foster innovation via standards by providing confidence and balance of trust. From a user perspective, FRAND agreements prevent patent holders from seeking royalties substantially in excess of the value a technology had prior to its incorporation into a standard.

The FRAND controversy is particularly accentuated in the field of standard-essential patents. Underlying trends include the increasing number of SEP from an increasing number of players, evolving licensing practices of IP specialists firms, exponential smartphone litigation as well as economic arguments pertaining to IP fragmentation, royalty stacking, ex post hold-ups and hold-outs. Amidst the dynamic environment between open standards that level the playfield, collaborative innovation based on consensus around the adoption of a specific standard and the IPR policies of SSOs, the significance of FRAND principles lies in the balance of interests; it does not offer a formula but a framework for sharing value while reducing negotiation costs[66], thus combining both the

---

[64] *Lindsay/Karachalios*, Updating a Patent Policy: The IEEE Experience, Competition Policy International, Antitrust Chronicle, March 2015 (2).

[65] See the relevant Business Review Letter at http://www.justice.gov/sites/default/files/opa/press-releases/attachments/2015/02/02/ieee_business_review_letter.pdf

[66] *Ménière,* Fair, Reasonable and Non-Discriminatory (FRAND) Licensing Terms – Research Analysis of a Controversial Concept (conference material), 2015. Standard essential patents account for 11% of the litigated US patents. However, litigation in the smartphone industry is primarily driven by patents that are not related to the standards, i.e. on implementation or design specific

benefit of flexibility in the negotiation process and the risk of ambiguity in the interpretation of the respective commitments.

Pertinent questions revolve around the current challenges of patent-intensive industries and whether EU rules and policies are fit enough to support future economic growth in the particular field. Prevailing practices around SEPs vary from industry to industry, with participants in a number of SSOs preferring to avoid royalty-bearing standards (e.g. in the Internet field), while others tend to seek royalties (e.g. in the case of consumer electronics). In the mobile sector, portfolios are strengthened through acquisitions to include non-SEP or so-called "softer" patents with highly popular design elements that competitors claim to be market essential in order to achieve access[67]. To the complexity adds the convergence of consumer electronics, information technology and telecommunications, which blurs industry boundaries and subsequent distinctions based on the technology area and the impacted sectors[68]. Also, information asymmetries and high transaction costs incite divergent views over the meaning of FRAND licensing terms and royalty determination, whereas differences in the enforcement regimes, including injunctive relief, across various national jurisdictions present IP strategists with many unknowns. These controversies are further fuelled with economic arguments regarding the consequences of SEP fragmentation (royalty stacking) and power imbalances in the technology distribution (hold-up and hold-out effects).

A product of these dynamics, the main challenges for both standard-developers and adopters are tied to the interpretation of FRAND commitments, royalty definition, transfer issues and the increased risk of litigation:

Developing a set of common principles concerning the determination of royalty rates and royalty bases can provide a much-needed indicator for measuring the compatibility of a licensing agreement with the concept of FRAND. Although the recent changes in the IEEE's IPR policy add some degree of clarity, SSO policies remain widely vague in this respect. In addition, the limited scope of the Guidelines for the Assessment of Horizontal Cooperation Agreements and European case law do not or have not yet provided the system with relevant benchmarks or sufficient insights on best practices. With regards to the patent valuation as a base for royalty calculation, the multitude of patents embedded in a digital (ICT) product - smartphones, PCs, tablets, IoT devices typically combine thousands of patents - makes it difficult to apportion value to a SEP in relation to the other patents and contributions embedded in an end-product. Where small elements of multi-component products are accused of infringement, calculating a royalty on the entire product carries a considerable risk that the patentee will be improperly compensated for non-infringing components of that product. When the patent value is measured according to the value of the underlying technology, should some standards be considered more central to the implementation of the relevant functionality than other contributions to the product? How is essentiality defined in the new context and how is it factored in the apportionment of

---

features of mobile devices. Moreover, litigation outcomes are driven by patent quality rather than the type of patents (SEPs or not); see *Gupta/Snyder,* Smart Phone Litigation and Standard Essential Patents, Hoover IP[2] Working Paper Series No. 14006, 2014, p.13.

[67] Apple's success in relation to the "slide-to-unlock" patent is illustrative of this. Traditionally patents for mobile phones and similar devices tend to focus on the core technology of those devices, such as 3G or connectivity with other devices, rather than "softer" features related to the functionality and the way users interact with the device. Apple has adopted an innovative strategy by obtaining patents for such user interface features, that embody the essence of what the customer perceives as superior performance, and successfully enforcing them against its rivals.

[68] *Maskus/Merrill (ed.),* Patent Challenges for Standard-Setting in the Global Economy: Lessons from Information and Communication Technology, 2013, p. 53.

value? Furthermore, when we shift our frame of reference to larger IP portfolios, the evaluation process should take into account additional parameters due to the fact that the value of a standalone patent is different than its incremental value as part of the patent bundle. Should the patent value then count more than the sum of its parts?

Although there are several techniques applicable for calculating the value of SEPs or of patents that are complementary to the value of products that implement a standard[69], there is need for a common methodology, coupled with a more granular approach to the complexities of the underlying technology, i.e. acquiring additional information on specific technology characteristics than what is typically available. An informed examination of the particularities of the individual case would allow a deeper understanding of how the specific patented technology fits to the specific licensed product. In this respect, it would be interesting to watch how the recent IEEE policy suggestions will shape future practice. The recommendation around the smallest saleable patent practicing unit addresses, for instance, microchip components embedded in a licensed end-product where the standard typically combines the functions of wireless connectivity and low power consumption. What benefit the specific product derives from the patented standard may depend on the functionality of the patent as well as on the importance of that functionality to the licensed product. Depending on its functionality, an end-product may benefit from a patent covering wireless connectivity, but could do without the power-saving feature if it is a stationary end-product powered from a wall outlet (the end-product may include the power-saving functionality solely because it is built into the microchip or because the end product must have that functionality in order to advertise that the product is fully compliant with the standard). The situation is different when the end-product is a mobile device which benefits substantially from extended usability between charges[70]. This is one of the many examples that illustrate the complexities at hand, revealing unknowns about how patent practitioners will strategically position themselves within the range from FRAND ambiguity over to blanket solutions. Also for such reasons, IEEE decided to offer a recommendation but not to mandate a royalty base, and left it to negotiating parties or courts to decide, depending on the circumstances.

JRC report 'Fair, Reasonable and Non-Discriminatory (FRAND) Licensing Terms; Research Analysis of a Controversial Concept'[71]

The complexity of standards in Information and Communication Technology (ICT) creates a tension between the need to reward the owners of Standard Essential Patents (SEPs) that may cover standard specifications and the need to make standards available to all for public use. In the last few years, this tension has crystallized into a difficult debate on licensing principles that must be Fair, Reasonable and Non-Discriminatory (FRAND or FRAND licensing). The purpose of this report is to provide a balanced account of the current controversy relating to the FRAND licensing of standard essential patents and to explore future research topics in this area. It draws on the arguments that arose at an expert workshop held under Chatham House rules at the Institute for Prospective Technological Studies (IPTS) in 2014 and on an extensive review of the related literature.

---

69 For an overview thereof see *Ménière,* Fair, Reasonable and Non-Discriminatory (FRAND) Licensing Terms - Research Analysis of a Controversial Concept, 2015, pp. 16; GRUR, Comments to the Commission's Public Consultation on Patents and Standards – A modern framework for standardization involving intellectual property rights, 2015, pp. 18.

70 Cf. how the situation is exemplified by *Long,* IEEE's Controversial Proposed IPR Policy Amendments, 3.02.2015, available at http://www.essentialpatentblog.com/2015/02/ieee/.

71 *Ménière,* Fair, Reasonable and Non-Discriminatory (FRAND) Licensing Terms - Research Analysis of a Controversial Concept, 2015, forthcoming.

Further concerns involve transfer issues and the question of whether FRAND commitments made by initial SEP owners can effectively bind subsequent owners upon the sale of a patent. Many SSO policies are currently silent on whether and how FRAND commitments can be enforced following the transfer of the SEP to a third party. In this respect, the increasing number of SEPs and SEP-related transactions in the emerging IP market accentuates the lack of legal certainty and transparency that follows subsequent patent re-assignments[72]. In a robust and effective IP system standard adopters should be able rely on a licensing commitment. SEP-holders that are already tied to a licensing commitment should not be able to evade this commitment by simply transferring the patent in question[73]. To this effect, the possibility of tracking the transfer of patent ownership could help mitigate information asymmetries and the risk of ensuing transaction costs.

Finally, standard-based companies find themselves charged with higher transaction and litigation risks. This is due to a series of factors: emerging "mega" licensing trends, the strategic role of SEPs for large portfolio holders, royalty stacking and cumulative licensing fees, the fragmentation of SEP portfolios and their subsequent re-bundling in the hands of NPEs that actively engage in patent litigation. Also, given the different approaches of national jurisdictions to injunctive relief and in the light of recent developments in the relevant case law, there is no guarantee that injunctions against infringement will be obtained[74].

Policy responses

Recognizing that SEP licensing and standardization are crucial to the rapid diffusion of innovative technologies, the European Commission, DG Enterprise and Industry, commissioned a fact-finding study on the interplay of patents and standards, entitled "Patents and Standards - A modern framework for IPR-based standardization".

ECSIP study on Patents and Standards[75]

The ECSIP study on patents and standards analyses the rules, practices and barriers to efficient SEP licensing across four standards-based industries, namely communications technology, consumer electronics, automotive and smart electricity grid. It identifies two types of barriers to efficient SEP licensing: barriers stemming from a lack of transparency and barriers stemming from business behaviour towards SEPs. The study provides an "out-of-the-box" approach by taking on board the experiences and lessons learned from non-standard dependent industries and examining the extent to which relevant arrangements for smooth licensing can be transferred or adjusted to the particularities of SEP-dependent industries. Potential measures towards improved transparency in the field include redefining the scope of disclosure through a stricter regime and limited use of blanket disclosures, improving substantiation and regular updates on essentiality; and collecting licensing-related information in databases.

As a follow up on the ECSIP study, the European Commission launched a Public Consultation in October 2014 with the aim to gather views on the performance of the current framework for patent-related standardization. The relevant questionnaire addresses

---

[72] *Ménière,* Fair, Reasonable and Non-Discriminatory (FRAND) Licensing Terms - Research Analysis of a Controversial Concept, 2015, p. 5.

[73] Cf. GRUR, Comments to the Commission's Public Consultation on Patents and Standards – A modern framework for standardization involving intellectual property rights, 2015, p. 11.

[74] For a detailed overview see the AIPPI Report "Availability of injunctive relief for FRAND-committed standard essential patents, incl. FRAND-defense in patent infringement proceedings", 2014.

[75] ECSIP, Patents and Standards - A modern framework for IPR-based standardization, Study for the European Commission, 2014.

many of the controversies at the interface of patents and standards, seeking equilibria and correctives for the intricacies of the system. Improvements to the rules and practices that govern standardization, patent declaration systems, the facilitating role of patent pools/public authorities/SSOs, principles and methods useful for the implementation of FRAND terms and alternative dispute resolution mechanisms are taken into account as appropriate policy measures with the potential to ensure that standardization remains efficient and adapted to the fast-changing economic and technological environment[76]

In response to hold-up scenarios and the abuse of dominant position by SEP holders, competition law may provide additional levers. Competition concerns mainly arise when patent owners use patents in ways that subvert the objectives of patent rights and are inconsistent with their essential function. The question, under which conditions the implementer of a standard can avoid injunctive relief or similar orders of exclusion for infringement of a FRAND-committed standard essential patent, is currently one of the most contentious issues at the intersection of patent and competition law. In this regard, it is asked under which conditions an injunction, which is based on the infringement of a single patent but targets a complex end-product implementing 1000s of patents, can be considered fair and equitable; and how these conditions can avert detrimental implications for the innovation process which gets stalled because of one "brick"[77].

AIPPI Report on Patents and Standards[78]

Following intensive work, the AIPPI Committee on Patents and Standards has published a report that looks into the specific conditions under which injunctions are enforceable against the infringement of a standard essential patent that is subject to a mutually agreed FRAND commitment. The report assesses the legal situation in major jurisdictions, including the US, EU, Germany, the Netherlands, France, Italy, UK, China, Japan, South Korea and India. While the exact conditions under which a license seeking party can avoid an injunction for the infringement of a FRAND-committed SEP may vary in the individual jurisdictions, there is increasing consistency in their practices when it comes to evaluating the parties' behaviour in FRAND disputes in the light of good faith. According to the report, the mere act of seeking injunctive relief from a court of law for infringement of a FRAND-committed standard essential patent in and of itself, or the threat of doing so, should not automatically be considered as a competition law violation.

Although a potential licensee's willingness to be bound by a third party determination for the terms of a license is here of relevance, the report emphasizes that it is at the discretion of the court to take into account further factors on a case-by-case basis when evaluating the parties' conduct and deciding on the an injunctive relief. In this respect, it is recommended that injunctive relief should not be granted for infringement of a SEP, if the patentee has failed to comply with its obligations under FRAND. This means that, in any event, the court would have to consider FRAND before issuing an injunction.

In 2014, the European Commission decided on the enforcement of FRAND-encumbered SEPs in two antitrust cases. In the first case, *Motorola* had sought to enforce an injunction against Apple before a German court on the basis of the smartphone GPRS standard

---

[76] For further information see http://ec.europa.eu/enterprise/policies/industrial-competitiveness/industrial-policy/intellectual-property-rights/patents-standards/public-consultation.

[77] So *Porath,* Intel Perspectives on Patenting and Digital Markets – Innovation, Growth and Employment (conference material), 2015.

[78] The Q222 Report by the AIPPI Committee on Patents and Standards, 2014, is available at https://www.aippi.org/download/commitees/222/Report222Report+Congress+Toronto+2014English.pdf.

although Apple had agreed to take a license and be bound by a determination of the FRAND royalties by the relevant German court. Specifically, Motorola had required Apple to give up its right to challenge the validity of the SEP or any potential infringement. The Commission identified an abuse of a dominant position prohibited by EU law and ordered Motorola to eliminate the negative effects of its conduct[79]. Similarly, the Commission's commitment decision in the second antitrust case was propelled by *Samsung*'s efforts to seek injunctive relief before courts in various European Member States against Apple based on claimed infringements of its 3G SEPs. Samsung committed not to seek injunctions for five years in Europe on the basis of SEPs for smartphones and tablets against any potential licensees who agree to accept a specified licensing framework. Samsung's commitments consist of a mandatory negotiation period of up to 12 months and, if the negotiation fails, a determination of FRAND terms by a third party – either by a court, or if mutually agreed, by arbitration[80].

While both decisions provide a "safe harbour" for willing licensees, the Commission made clear that the "willingness" of a licensee having the binding FRAND terms determined by a third party in the event of a dispute will still have to be defined on a case-by-case basis. In response to the regulatory attention in the field of standards, the principle of safe harbour as well as alternative proposals, e.g. reinforcing the existing FRAND framework or adopting a principle level approach that explicitly enshrines the duty of good faith and the principles of fair dealing in the IPR Policy, are currently discussed among the various SSOs towards the revision of their policies[81]. Although consensus is yet to be achieved, the ongoing consultations denote an increasing recognition that the adoption of a more balanced approach in the long haul will safeguard good faith in the negotiations and mutually satisfactory terms in the agreements.

Additional clarity is expected from the Court of Justice of the European Union (CJEU) in re *Huawei v. ZTE* with regards to the question whether the behaviour of an SEP-owner, which has given a commitment to a standardisation body to grant third parties a FRAND-license but makes a request for corrective measures or brings an action for a prohibitory injunction against an infringer, constitutes an abuse of its dominant position under Article 102 TFEU[82]. This is a situation where the SEP-holder has not honoured its commitment even though the infringer has shown itself to be objectively ready, willing and able to conclude such a licensing agreement[83]. The CJEU opinion will have an EU-wide impact on SEP-related infringement antitrust cases with a binding effect on the European Commission. The preliminary ruling is also expected to have ramifications for the future of Patent Assertion

---

79 European Commission, DG Competition, Decision of 29 April 2014, C(2014) 2892 final, *Motorola Mobility Inc.*

80 European Commission, DG Competition, Commitment Decision of 29 April 2014, C(2014) 2891 final, *Samsung Electronics Co., Ltd., et. al.*

81 See e.g. ETSI News, 25.07.2014 ("ETSI IPR committee continues discussions on injunctive relief"), at http://www.etsi.org/news-events/news/812-2014-07-news-etsi-ipr-committee-continues-discussions-on-injunctive-relief.

82 For an overview of the EU proceedings before both the ECJ (Huawei case) and the European Commission (Motorola and Samsung cases) see *Jones,* Standard-essential patents: FRAND commitments, injunctions and the smartphone wars, 10(1) European Competition Journal 1-36, King's College London Law School Research Paper 2014-19 (2014).

83 The Düsseldorf Regional Court ("Landgericht Düsseldorf"), which rules on more patent infringement cases than any other court in Europe decided to refer to the CJEU five fundamental questions concerning the availability of remedies - primarily injunctive relief - to holders of FRAND-pledged SEPs prevailing in patent infringement actions; *Huawei Technologies Co. Ltd v. ZTE Corp., ZTE Deutschland GmbH*, Opinion of Advocate General Wathelet, delivered on 20 November 2014, Case C-170/13.

Entities (PAE) practices. In particular, concerns are voiced over possible abuse of the enforcement system and the UPC procedure by PAE[84]. There is arguably a need for appropriate rules and policies that will enhance transparency and predictability in IPR transactions.

5.3. Role of patent pools

Patent pools are regarded as an organisational approach in which two or more patent owners make their patents available as a bundle for a pre-defined (and openly publicized) price to any interested party[85]. In the ICT space, where products are highly modularized and interoperability is a critical component, patent pools have the potential to provide greater access to essential patents for practicing a certain standardized technology, usually through a joint venture, which administers the patent pool. This model promotes the dissemination of technology twofold: it circumvents the individual licensing process, providing an opportunity to patent owners to expand the market for their products and the spread of the patented technology therein; at the same time, it enables potential licensees to access necessary patents for complex products in a relatively efficient manner. Patent pools built around a technical standard collect or aggregate all of the patents that are most important for the purpose in question, thereby benefiting both the members of the pool and their licensees. The pool thus offers a solution to the phenomenon of dispersed patent ownership[86]. For the users of the technical standard, these patent pools provide a one-stop solution for licensing in the full bundle of required standard-essential patents (which are owned by different entities) in a single transaction with significant cost reductions for both parties involved. For patent owners, patent pools that license SEPs are an opportunity to fulfil their obligations to standard-setting organisations by offering access to their patents on FRAND licensing terms. Among the factors that render the participation in a patent pool attractive are the complementary technologies and substitutes (i.e. non-blocking alternative technologies) included in pool as well as the additional investment incentives, incl. royalty distribution schemes and the applicable numeric proportionality rules. At the same time, asymmetries among pool members, inadequate pooling arrangements and the free-riding behaviour of individual SEP holders that charge royalties higher than the royalty set jointly by the pool for the patent bundle can result in the failure to build an inclusive patent pool. The free-riding problem in pool formation also explains why patent pools, if formed at all, are often formed rather late in the standardization process and why they are smaller and less inclusive than what would have been socially optimal[87].

Thanks to their ability to solve the complements problem and accelerate technology development in a cost-effective manner, patent pools are generally viewed as facilitators of the system and therefore enjoy wide support - provided that the pro-competitive effects outweigh the anti-competitive effects[88]. Pools are considered pro-competitive insofar as patent holder license the patents to non-members of the pool on appropriate terms. In addition, the price effect of patent pools can only be beneficial as long as they allow for independent licensing outside the pool. Their "patent clearance" and one-stop licensing mechanisms are particularly (economically and socially) desirable when there are mutually

---

84 EPO, ESAB Statement on the Unitary Patent and the Unified Patent Court, 2013, p. 2.

85 ECSIP, Patents and Standards - A modern framework for IPR-based standardization, Study for the European Commission, 2014, p. 54.

86 *European Commission,* Expert Group on Patent Aggregation, Report 2015, p. 33: see also Yanagisawa/ *Guell163*ng Patent Marketplace, OECD 2009.

87 *Schmidt,* Standards, Innovation Incentives, and the Formation of Patent Pools, GESY Discussion Paper No. 342 (2010), p. 19.

88 ECSIP, Patents and Standards - A modern framework for IPR-based standardization, Study for the European Commission, 2014, p. 54.

blocking patents that are essential for a particular purpose and standards need to reach a critical mass; it may, however, result in anticompetitive practices if abused by a dominant company to obtain a uniquely privileged position at the expense of other companies. Specifically, patent pools may be used to restrict competition between the licensors that participate in the pool and serve as a price-fixing mechanism or force licensees to purchase patents that they normally would not have licensed (if the pool is exclusive)[89].

Report of the Expert Group on Patent Aggregation[90]

The latest research carried out by the European Commission's Expert Group on Patent Aggregation provides a comprehensive view on how the European competition authorities will approach pools in the light of competition rules. Based on the principle that, if patents need to be aggregated, it must be for an identifiable purpose, the study supports the case of promoting mission-oriented patent pools established specifically to advance or accelerate the development or deployment of solutions to social changes and where there is a clear market failure[1]. Additional recommendations to the European Commission involve antitrust guidance on the formation of pools and the licensing practices: patent pools may include substitutable patents, if deemed necessary, and companies participating in SSOs should be allowed to discuss SEP royalty levels with other patent owners, even if there is no pool or a plan for it. The latter is expected to promote transparency and licensing practices with mutually satisfactory terms.

As with the aforementioned controversies associated with FRAND licensing, challenges associated with the operation of patent pools involve the determination of essentiality, patent valuation, costs of validity checks and issues on revenue sharing among the members of the pool. Depending on its business model, a patent pool with the mission to manage SEP portfolios and distribute royalties to its members-patent holders may initiate the process by calling for essential patents for a certain technology standard. Interested parties with patents believed to be essential to the technology standard submit those patents to the pool for an independent evaluation of essentiality. What follows is a definition of the licensing terms, including license fees and dividends of profit, and the acquisition of exclusive licenses by the patent pool, which offers a joint license of its patent portfolio to potential customers in a single transaction[91]. As part of a patent pool's mission to evaluate and maximize the value of IP assets, a FRAND royalty rate can be defined based on the value of end-products while the cost of IP remains proportionate to the protected function. The royalty fee can only be related to the specific SEP and not to ex ante estimations or similar forecasts prior to market deployment. In the end, the balance of interests – critical to the mission of patent pools - requires a win-win solution between the benefit that the producer has on the market and the upfront costs born by the innovators[92].

As an overall assessment that takes into account the complexities and open questions related to their role and function, patent pools are not a panacea; rather, they qualify as a policy tool towards improved licensing conditions, transparency and accelerated diffusion of socially significant technologies. At this stage, the practicalities of a supporting mechanism for patent pools, including funding aspects, are difficult to discern. In any case, a possible

---

89 For an overview of anti-competitive situations that may arise around the practices of patent pools see *EPO ESAB*, Report on Patent Aggregation, 2014, p. 12.

90 European Commission, Expert Group on Patent Aggregation, Report 2015.

91 This is the business model of SISVEL which has the exclusive worldwide right to license patents related to MPEG Audio technology standards owned by six companies including Philips and France Telecom. Sisvel consists of over 100 engineers and other professionals. It has aggregated over 110 patent portfolios and facilitated approx 1500+ license agreements.

92 *Dini,* Patenting, Standardisation and Licensing – The view of SISVEL (conference material), 2015.

promotion should examine a number of factors on a case-by-case basis, including the individual pooling approach in its particular context[93].

[93] Cf. *European Commission,* Expert Group on Patent Aggregation, Report 2015, p. 42; GRUR, Comments to the Commission's Public Consultation on Patents and Standards – A modern framework for standardization involving intellectual property rights, 2015, p. 17.

6. PROSPECTS OF POLICY-DRIVEN RESEARCH

Policy imperatives pose a number of interesting and difficult questions for researchers and policymakers. Available empirical evidence has yielded many important insights with regards to a series of issues: patent aggregation, impact of Intellectual Property (IP) on the European Union's economic growth and employment, impact of IP on the performance of firms (pending), contribution of the world-leading R&D investors to economic growth and their patenting strategies, strategic use of patents, economic effects of software patents in Europe, licensing of standard-essential patents and the role of patent pools. We have, however, only scratched the surface of the mechanics behind the innovation engine. In order to fill the research gap, additional survey data on patenting should be channelled into policy formulation. Tailored analysis of the following issues will not only help us to understand the evolving IP marketplace and assign cost and effect, but also to navigate complexity and take effective action. The present report identifies a set of issues and framework conditions that are amenable to future research efforts and policy considerations. Some of them, such as interoperability, standardisation and standard essential patents are closely related to what the European Commission identified as essential elements of a Digital Single Market[94]. Other issues are horizontal issues determining the general framework conditions for patenting, which are important generally - not only in the context of a Digital Single Market.

6.1. Issues of specific interest in the context of a Digital Single Market

***Transparency and information access**:* Access to technical information related to new technologies, patent disclosures, prior art, standards, contractual schemes for patent licensing, sales terms and changes in patent ownership can support the dissemination of best practices, optimize resource allocation, reduce operative and transaction costs and help companies unlock unused potential or scale innovation. Technical knowledge and patent data is collected and organized by, or entrusted to patent authorities, public institutions, firms, IP brokers, patent pools, open source and various platforms for collaboration, exchange and licensing. In the field of standardization, relevant documentation is lodged with the respective Standard Setting Organisations (SSOs) and their members. The challenges are how to link existing data collections, what type of data should be made accessible and how to create the right incentives for various stakeholders to disclose and share this sort of information without losing control over their assets, competitive edge or market stakes. The complexity of these issues, which are practical (ICT infrastructure, smart linking of data repositories), political (interest groups) or strategic (secrecy around firm-specific capabilities and proprietary knowledge), brings us back full circle to the role of interoperability and open data systems. These constitute a fundamental cornerstone of policies that aspire to securing the future of innovation and restoring trust in the system through transparency, accountability and unfettered competition.

Software and the interplay of IP with open innovation: The interplay between open innovation and proprietary knowledge is a core element of the innovation process in the field of ICT technologies. Albeit subject to its own rules and procedures, open source is intricately linked with the patent system in the sense that both systems are designed to facilitate technology diffusion and bring codified knowledge to the public. The dependency

[94] As laid out in the Commission staff working document: A Digital Single Market Strategy for Europe – Analysis and Evidence: http://ec.europa.eu/priorities/digital-single-market/docs/dsm-swd_en.pdf

of open source on proprietary core technology is particularly pronounced in the field of cumulative innovation and software development. Here, early access to technical information allows innovators to build on each other's results and create significant synergies down the road. The diversity and evolution of the open source model and, more specifically, the incentives, procedures and comparative advantages it embodies are of particular interest here. The reciprocity and synergies derived from open source practices transform the way research and development take place. They establish platforms where technology is intended to be recombined and built upon through an expedient and cost-efficient innovation process that is up to speed with the accelerated pace of computer, telecommunication and internet technologies. As with the collaborative model practiced by patent pools, it would be expedient to explore the governance strategies and transferability of open source schemes into settings where knowledge exchange among various stakeholders and non-homogenous systems is key[95].

In these scenarios of open innovation, it would be interesting to observe the various roles of IP and how firms could use patents as valuable informational tools to signal development preferences and research activities to the public – this information may then facilitate innovative collaboration (e.g. in the case of patent[96]) or foreclose it. Closely tied to this are policy debates concerning the contribution of patents to the facilitation of information disclosure, the key differences between the disclosure policies (final versus intermediate disclosure[97]) and how pivotal these policies are for the long-term relevance of the patent system for ICT innovation. Open innovation literature lacks studies in the IP context and future research should be able to address the void[98].

Furthermore, the software industry provides the perfect laboratory to observe the coexistence of different practices of innovation and knowledge diffusion. As the new digital economy has put the importance of software for ICT-based innovation and economic growth in the spotlight, we are urged to reassess the standard of patentability and patent disclosure for computer-implemented inventions under the current system. What is the impact of accelerated technology convergence on software? How do economic and market

---

95 An initial attempt to address the research void in large-scale, quantitative surveys on open innovation initiatives - from the perspective of large firms - is undertaken by *Chesbrough/Brunswicker,* Managing Open Innovation in Large Firms, Survey Report on Open Innovation, Fraunhofer Institute for Industrial Engineering, 2013.

96 Patent pledges are voluntary public commitments by patent holders who provide assurance to developers and users of software and related technologies that they will not sue them for patent infringement, provided they comply with certain terms and conditions. The best-known of these patent pledges are FRAND commitments, but patent pledges have been appearing in settings well beyond standard-setting, including open source software, green technology and the life sciences. For a taxonomy of patent pledges see *Contreras,* Patent Pledges, Arizona State Law Journal (forthcoming 2016); *Contreras,* A Market Reliance Theory for FRAND Commitments and Other Patent Pledges, Utah Law Review (forthcoming 2016). For the role of patents as informational tools in patent pledge contexts see *Asay,* Patent Pledges – Global Perspectives on Patent Laws Private Ordering Frontier, Edward Elgar paper (forthcoming). With regards to the benefits that patent pledges can have to the open source software community and standard entry, see *Wen et al.,* Opening up IP Strategy: Implications for Open Source Software Entry by Start-Up Firms, 2015 (forthcoming).

97 For recent empirical evidence on the comparative advantages of intermediate versus final disclosure policies in fostering innovation see *Boudreau/Lakhani,* "Open" disclosure of innovations, incentives and follow-on reuse: Theory on processes of cumulative innovation and a field experiment in computational biology, Elsevier paper no. 0048-7333 (2014).

98 Some future direction for research is provided by *Hossain,* Open Innovation and Intellectual Property – the Double-Edged Sword, 2012.

factors explain changes in the propensity to patent in the field of software? Which best practices can we transfer from similar "open" systems, knowledge commons or ad hoc contracted frameworks? The Human Genome Project (HGP), for example, approaches knowledge disclosure and related trade-offs in innovative ways, e.g. by enticing innovators into collaboration and openness through various incentives and research funding[99]. Research efforts in the area of software are not without challenges, the main one being the ability to capture precise information relevant to the questions of what is being patented, by whom, where and for how long.

***FRAND licensing terms and the opaqueness of the standardization process**:* In the absence of solid empirical evidence on royalty stacking and hold-up problems, the debate on fair, reasonable and non-discriminatory licensing terms (FRAND) will remain strongly polarized because it focuses essentially on theoretical arguments. This approach may be misleading because theoretical arguments are usually derived from simplistic assumptions about the mechanisms of royalty determination such as the existence of a unique public royalty price for all implementers, or the absence of delay between the adoption of a standard and the licensing of the related standard-essential patents (SEPs).

An obvious research avenue is therefore to study concrete SEP licensing practices and their impact on the transparency of patent markets, competition and innovation in the field of ICT in Europe. More specifically, research would have to provide a comprehensive overview of historic cases of how FRAND licensing terms have been defined up until now. Relevant analysis should also focus on the different factors that come into play during the procedures that establish essentiality and determine the outcome of bilateral FRAND negotiations. The most important of these factors are the quality of the respective patent portfolios, strategic considerations and the applicable legal/judicial framework.

Research of this kind would make it possible to better weight the different arguments on the limitations of the FRAND principles and to formulate recommendations for their clarification. Theoretical approaches would clearly benefit from taking these factors into account. However, the main challenge lies in the production of relevant and solid empirical evidence. Addressing this empirical challenge seems difficult without further support from policymakers, SSOs and/or the companies involved in standard setting and Standard-Essential Patent licensing – SSOs have so far left the interpretation of FRAND to courts and regulators. What are the common patterns and trade-offs in FRAND negotiations? What policies are needed to ensure a level playing field, cost-efficient uptake of standard-related technology as well as participation of SMEs in the negotiations? Identifying best practices will shed light on the meaning of FRAND terms and help enhance transparency in the system.

The joint development of standards by SSO members and the complex dynamics behind the standard definition process represent another underexplored field. At this stage, priority should be given to the collection of empirical evidence on SSOs and, more specifically, the processes and instruments related to internal governance such as membership rules, decision processes, IPR policies. Research should document the distinctive characteristics of existing SSOs and highlight their formation and evolution over time. It should also enable the classification and benchmarking of different types of SSOs, their organizational structures and their impact on industry and innovation[100]. At a later stage, research could

---

[99] See in respect to HGP, *Contreras,* Bermuda's Legacy: Policy, Patents, and the Design of the Genome Commons, 12 Minnesota Journal of Law Science & Technology 61 (2011).

[100] On the shortcomings of existing studies on the impact of standardization and standards on innovation, see *Blind,* The Impact of Standardization and Standards on Innovation, Nesta Working Paper No. 13/15, Fraunhofer FOKUS, 2013.

also gather empirical evidence on how SSOs attract members, how they interact with each other and also how standards consortia could efficiently support collaborative innovation or address emerging concepts of open standard in the long run.

Patent pools and collaborative practices: Patent pools are gaining momentum as successful licensing models and collaborative IPR arrangements. They enable easy and timely access to knowledge, exploit patents that would have otherwise remained unused or of limited value, simplify transaction logistics and free up new paths for the acceleration and adoption of innovative solutions. What is the economic rationale and the benefits of collaborative ecosystems and clearinghouse mechanisms on innovation and the overall economy? How do these platforms pool technical knowledge and transaction costs? How do they collect, organize and share relevant licensing information? What type of incentives do they provide and which companies do they attract? Given that patent pools are generally perceived as beneficial for the intellectual property markets, it would be of interest to study concrete examples of efficient patent pooling and their effects on patenting incentives and draw on relevant benchmarks to further facilitate technology transfer in the ICT field[101]. However, from a policy perspective, the facilitation of technology diffusion requires control of free-riding behaviour and royalty stacking through a proper balance of competition, patent law and policy tools. Pricing policies, revenue distribution and the essentiality evaluations of essentiality deserve particular attention in this context. Not only the afore-mentioned patent assertion entities but also certain types of patent pools run the risk of disrupting markets and undermining unfettered competition.

6.2. Issues of wider interest in the context of a Digital Single Market

Patent quality and scaled-up technologies drive new business models and affect the way firms manage their assets. This leads to the bundling of patents in large portfolios for various strategic uses – from blocking and commercialization to their use as a bargaining chip in the negotiations preceding complex transactions, strategic alliances and licensing agreements. At the intersection of IP and strategy, patents become a lens for portfolio management, a tool for collaboration in view of convergent technologies and product complexities, and a multiplier of the value of the invention through new diffusion channels. On the flip side, strategic patenting by large corporations and the resulting patent thickets, technological complexity and the interlocking fields of intellectual property, standardization and competition impose a series of challenges on the governance processes around innovation. This strategic, portfolio-oriented behaviour of applicants that leverages complementarities between patents appears to contrast with the technical silos of the patent offices and their focus on individual patents as the unit of analysis and examination[102]. Starting from the premise that the success of the patent system in a digital single market depends on its quality[103] and adaptability, it would be relevant to monitor the

---

[101] See in this direction the recent empirical analysis by *Baron/Pohlmann,* The Effect of Patent Pools on Patenting and Innovation – Evidence from Contemporary Technology Standards, 2015.

[102] See in this respect *Harhoff et al.,* The Strategic Use of Patents and its Implications for Enterprise and Competition Policies, 2007, p. 77: "This view of patents which emerges from patenting strategies in complex product industries differs from the traditional view of patents in emphasizing the institutional context in which patent applications are made and patents are granted."

[103] Patent quality is defined as the degree to which a patent satisfies the statutory patentability requirements, leaves little doubt as to its breadth, and discloses information that enables a person skilled in the art to implement that protected invention; EPO Report on Patent Quality, 2012, p. 8.

impact of the exploding number of patent filings and Asian documentation on competition and patent quality. Patent quality can weed out trivial patents, reduce the impact of patent thickets, provide clarity and "cool down" an overheated patent system. Quality starts with the process of patent examination and appropriate patent office policies that discourage insufficient, trivial or underdeveloped applications. Given that law, technology and business are becoming increasingly interwoven in the new digital economy, patent offices will be expected to continue working towards a common approach to the high quality standards of examination and increased consistency in application of the patentability criteria. Equally, the patent system should not only be expected to reward those inventions that fulfil the statutory requirements, but it should also facilitate the dissemination of technical information by aligning resources and incentives. Future research could also provide granting authorities with policy measures that may help mitigate the harmful implications of strategic patenting (e.g. fee restructuring in the post-grant stage) or steer applicant behaviour in a socially beneficial direction[104].

***IP markets**:* Patents are reaching out into information, telecommunication and service-based industries, cutting across traditional sectors and technology silos. At the same time, IP power is concentrated in the hands of a few incumbents or agglomerated in a few innovation hubs of excellence (the Silicon-Valley model), revealing power imbalances among firms and growth differentials across various EU regions. Economies of scale and the globalization of markets enhance the spatiality of intellectual property through the decentralization of research activities, the dispersion of patent ownership and the detachment of the invention from the innovator. Market inefficiencies and information asymmetries test the elasticity of the system and its self-correction mechanisms, triggering the coexistence of apparently opposing trends and notions: monopoly, marketability, monetization, concentration, decentralization, convergence, separation, dispersion, spillovers, exchange, collaboration, clustering, aggregation, pooling, open innovation. As these complex dynamics articulate knowledge, governance and complementarity needs, it is expedient to study the origins and activity range of patent brokerage, the industries and market structures in which patent aggregators thrive and, most importantly, the value they create between technology demand and supply. The impact of current licensing and patent aggregation models on the European ICT market should also be measured, and their potential benefits for improved technology transfer and knowledge flows should be explored. More specifically, what is the economic impact of the new IP intermediaries on transactions and litigation? What are the ramifications of their activities for competition and patent quality? How does the lack of transparency weigh on the market in terms of potential infringements, higher transaction costs and higher costs for dispute resolution?

***Evolving licensing practices**:* A vast array of licensing practices are becoming instrumental for appropriating returns on R&D investments and generating additional value from IP. The general increase in licensing activity goes hand in hand with the creation of global research clusters and large strategic portfolios. In this respect, it is important to better understand the scope, terms, and efficiencies of current licensing mechanisms and assess their implications for the current design of the patent system. What is the impact of emerging licensing strategies on knowledge transfer and the overall economy? How could policymakers extract or leverage best practices among the existing licensing types in order to facilitate knowledge diffusion and collaborative innovation?

---

[104] See *Harhoff et al.,* Languages, Fees and the International Scope of Patenting, CEPR Discussion Paper No. DP7241 (2015).

Patent aggregation and the emerging secondary patent market: Emerging intermediaries and entities have reshaped the secondary markets for IP. New licensing platforms and governance models have been set up to facilitate access to bundles of previously dispersed technologies and execute the relevant transactions. Their practices leverage market imperfections and information asymmetries to build a financial and assets market that promotes patent trade and reduces transaction, operative and research costs. These forms of patent aggregation underpin the increasing recognition that the true value of an invention lies not only in its diffusion, but also in bundling it with other assets – the value of the sum being higher than of its parts. From this perspective, patent aggregation as such is beneficial both in terms of market efficiencies and societal welfare. It offers more opportunities for inventors to generate revenue from their patents, but also enables relatively small actors to synchronize their actions, increase bargaining power and reduce litigation exposure.

However, certain forms of patent aggregation involve entities that enforce patents without utilizing them. These entities aggregate a divergent patent portfolio in order to engage in hold-up and litigious practices. They have been referred to in the literature as non-practicing entities (NPE), patent assertion entities (PAE), patent monetization entities or patent trolls. Their business model is heavily based on generating revenues through mass acquisition of patent portfolios and the subsequent assertion of the embedded IP against practitioners of this technology. The related revenue streams thus vary significantly, taking the form of royalties, licensing fees, litigation damages and infringement settlement fees.[105]

The economics of patent aggregation and the sphere of practicing and non-practicing activities in Europe are largely unexplored and unpredictable. The quality, value and impact of the aggregated patents and portfolios differ significantly in the hands of the diverse practitioners in the patent marketplace. Given the wide typology of patent aggregation, it would be of great value to study the respective governance and pricing models, the justification of their presence in the innovation ecosystem and their multiple effects on technology transaction and diffusion. This would involve gathering systematic information on how patent aggregators source, package and exploit acquired knowledge, establish complementarities, pool costs, mediate conflict, enhance transparency and facilitate information exchange and social interactions. For instance, technology transfer may benefit from patent aggregation and from entities that facilitate licensing, cross-licensing and other services to innovators or patent users.[106] On the flip side, excessive litigation and coercive practices that force potential infringers to take a license under the threat of litigation are negatively disruptive and overly resource-consuming for the innovation system, leading to a loss in social welfare and patent incentives. Currently, PAE account for the majority of patent litigation in the US and are less active in the EU. However, possible abuse of the new procedure before the Unified Patent Court by non-European PAE and the subsequent spillovers of their aggressive activities into the EU market have caused uncertainty. In view of the above, what would be the role and impact of intermediaries and agent-based models on innovation diffusion, technology transfer and the European ICT markets? What policy or legislative options at national or EU level could foster the potentially beneficial impact of patent aggregation, while mitigating the negative effects

[105] *Schwartz/Kesan*, Analyzing the role of non-practicing entities in the patent system, 99 Cornell Law Review 425 (2014). Cf. also *Lemley/Melamed,* Missing the Forest for the Trolls, 113 Columbia Law Review 2117 (2013).

[106] Cf. *European Commission*, Expert Group on Patent Aggregation, Report 2015.

associated with disruptive or litigious PAE activities? Are the negative effects of PAE likely to outweigh their potential benefits?[107]

Small and medium sized enterprises (SMEs): The access of SMEs to technical knowledge and their use of IPR have been under the radar of policymakers at national and European level for a long time. However, digitization and technological complexity bring the relevant policies to a new level by amplifying the constraints small actors normally confront in competitive markets. What is the impact of current trends and trajectories on the performance of small firms and their incentives to innovate, given funding challenges, enhanced competition and higher litigation exposure? What are the SME-specific challenges in markets with low barriers to entry but a-winner-takes-all mentality? How do successful SMEs innovate and how do they patent? How could future policy help SMEs create and sustain a competitive advantage against large incumbents and also allow them full participation in standardization processes and relevant patent pooling activities? How could collaborative networks and innovation intermediaries such as patent pools and open source help support SMEs in specific industries? Finally, linking the outcomes of these economic analyses to comparable data from several EU countries could provide additional insights for policy formulation and programme support at both EU and regional level.

The Unitary Patent System and the Unified Patent Court (UPC): The UPC is regarded as a game changer with significant ramifications for the harmonization process. However, concerns have been voiced over how the UPC will affect the current ecosystem from an enforcement perspective and the challenges at the implementation stage. The way companies assess the impact of the new Court on their patent strategy depends largely on the diversity and size of their IP portfolios, business models, corporate culture and the competition dynamics in the specific sector. Whether the benefits (or risks) of a centralized decision on patent validity is chosen or not, will partly depend on how companies assess the strength of their patents in any particular case and how the calculated risk of "putting all their eggs in one basket" is aligned with overall business strategy. In other words, could the economics of a single enforcement action outweigh the risk of Europe-wide invalidation? How does the heterogeneity in the efficacy of the national patent systems explain firm strategy in platform-based markets?

With regard to the patentability threshold for software patents, there is widespread uncertainty over whether the UPC will follow the European Patent Office practice on computer-implemented inventions or adopt a different approach. Given that the UPC will start building its case law in a few years from now, applicants for software patents may well consider seeking protection with the national patent authorities and jurisdictions and, with it, a certain degree of predictability in their established practice and jurisprudence. Along with software patentability, the impact of the Unitary Patent System on the ICT sector and the relevant patenting strategies remains a big unknown due to the particularities and complexities of the specific industries. Equally, how the emerging framework of the Unitary Patent System will shape innovation processes and policies in the near future is still subject to speculation and scenario building. However, it will certainly feature prominently in the EU agenda for innovation. After the new system has been embedded in the European innovation ecosystem, it would be relevant to measure its impact on R&D in the field of ICT and its successes, especially in terms of cost-efficient litigation and improved access of SMEs to IP markets and technology.

[107] Cf. a recent study in this direction: *Kwon/Motohashi,* Effect of Non-Practicing Entities on Innovation Society and Policy, IAM Discussion Paper Series #033 (2014).

The role of IPR enforcement for innovation in ICT markets: Successful IPR policy is built on reliable and affordable enforcement mechanisms. Is the current European IPR enforcement system fit for purpose in the new digital economy? How important is the economic impact of IPR infringement in markets that are partly based on open access and collaborative practices?[108] How much harmonization can the system afford, given that the one-size-fits-all pattern can hardly take into account the various degrees of product complexity in certain technology areas or the unique constellations across the different IP markets? What possible remedies are there against dysfunctional enforcement and how efficient is the procedural instrument of injunctive relief in this context?[109] Moreover, in the context of standard setting, what is the economic importance of injunctive relief? Information asymmetries and high transaction costs incite divergent views over the meaning of FRAND licensing terms and royalty determination, whereas differences in the enforcement regimes, including injunctive relief and claim interpretation, across various national jurisdictions present IP strategists with many unknowns. These controversies are further fuelled with economic arguments regarding the consequences of standard-essential patent fragmentation (royalty stacking) and power imbalances in technology distribution (hold-up and hold-out effects). The question, under which conditions the implementer of a standard can avoid injunctive relief or similar orders of exclusion for infringement of a FRAND-committed standard essential patent, is currently one of the most contentious issues at the intersection of patent and competition law. In this regard, the question arises under what conditions an injunction, which is based on the infringement of a single patent but targets a complex end-product implementing thousands of patents, can be considered fair, reasonable and non-discriminatory. We must also ask how these conditions can avert detrimental implications for the innovation process, which could stall because of one "brick".

[108] With regards to the implications of IPR enforcement actions on the model of open source software adoption and diffusion see the research by *Wen et al.,* The Impact of Intellectual Property Rights Enforcement on Open Source Software Project Success, ICIS 2010 Proceedings. Paper 187 (2010).

[109] Quantitative analysis suggests that injunctive relief with a suitable leniency zone restores the balance of power in hold-up cases and induces the ex ante value of the SEP; see *Choi,* FRAND Royalties and Injunctions for Standard Essential Patents, CESifo Working Paper No. 5012, 2014, p. 19.

References

Allen & Overy, UPC Benchmark Study – Opt in / Opt out, where do you stand?, 2014.

AIPPI, Availability of injunctive relief for FRAND-committed standard essential patents, incl. FRAND-defence in patent infringement proceedings, Report 2014.

AIPPI, Committee on Patents and Standards, Report 2014, available at: https://www.aippi.org/download/commitees/222/Report222Report+Congress+Toronto+2014English.pdf.

Arora, A./Fosfuri, A./Gambardella, A., Markets for Technology: The Economics of Innovation and Corporate Strategy, Cambridge and London: MIT Press, 2001.

Asay, C., Patent Pledges – Global Perspectives on Patent Laws Private Ordering Frontier, Edward Elgar paper (forthcoming).

Bakels, R./ Ghosh, R. A./Torrisi, S./Thoma, G., Study of the effects of allowing patent claims for computer-implemented inventions, Final Report and Recommendations, 2008.

Baron, J./ Pohlmann, T., The Effect of Patent Pools on Patenting and Innovation – Evidence from Contemporary Technology Standards, 2015, available at www.law.northwestern.edu/research-faculty/searlecenter/innovationeconomics/documents/Baron_Pohlmann_effect_of_patents.pdf

Blind, K., The Impact of Standardization and Standards on Innovation, Nesta Working Paper No. 13/15, Fraunhofer FOKUS, 2013.

Blind, K./ Edler, J./ Schmoch, U., Patents in the Service Industries, Fraunhofer Institute Systems and Innovation Research (ISI), Report 2003, available at ftp://ftp.cordis.europa.eu/pub/indicators/docs/ind_report_fraunhofer1.pdf.

Boehm, M., The Open Source Community as a Consumer of the Patent System – 5 Problems with Software and Patents for the Open Source Communities' Perspective (conference material), 2015.

Boudreau, K. J./ Lakhani, K. R., "Open" disclosure of innovations, incentives and follow-on reuse: Theory on processes of cumulative innovation and a field experiment in computational biology, Harvard Business School Technology & Operations Mgt. Unit Working Paper No. 14-002 (2014), available at SSRN: http://ssrn.com/abstract=2288746 or http://dx.doi.org/10.2139/ssrn.2288746.

Chesbrough, H./ Brunswicker, S., Managing Open Innovation in Large Firms, Survey Report on Open Innovation, Fraunhofer Institute for Industrial Engineering, 2013.

Choi, J. P., FRAND Royalties and Injunctions for Standard Essential Patents, CESifo Working Paper No. 5012, 2014, available at https://ideas.repec.org/p/ces/ceswps/_5012.html.

Contreras, J. L., Technical Standards and Ex Ante Disclosure: Results and Analysis of an Empirical Study, Jurimetrics, Vol. 53, No. 1 (2013), available at SSRN: http://ssrn.com/abstract=2249926.

Contreras, J. L., Bermuda's Legacy: Policy, Patents, and the Design of the Genome Commons, 12 Minnesota Journal of Law Science & Technology 61 (2011).

Contreras, J. L., Patent Pledges, Arizona State Law Journal (forthcoming 2016).

Contreras, J. L., A Market Reliance Theory for FRAND Commitments and Other Patent Pledges, Utah Law Review (forthcoming 2016).

Dernis, H./ Dosso, M./ Hervás, F./ Millot, V./ Squicciarini, M./ Vezzani, A., World Corporate Top R&D Investors: Innovation and IP bundles. A JRC and OECD common report, 2015, Luxembourg: Publications Office of the European Union.

Dini, Patenting, Standardisation and Licensing – The view of SISVEL (conference material), 2015

ECORYS, FWC Sector Competitiveness Studies - Competitiveness of the EU SMEs in the ICT services industry, Report 2009, available at http://ec.europa.eu/enterprise/sectors/ict/files/study_report_ict_services_en.pdf.

Ericsson, Mobility Report of June 2015, available at www.ericsson.com/res/docs/2015/ericsson-mobility-report-june-2015.pdf

European Commission, A Digital Agenda for Europe, COM (2010) 245.

European Commission, A Digital Single Market Strategy for Europe - Analysis and Evidence, SWD(2015)100, available at http://ec.europa.eu/priorities/digital-single-market/docs/dsm-swd_en.pdf.

European Commission, Expert Group on Patent Aggregation, Report 2015, available at http://ec.europa.eu/research/innovation-union/pdf/expert-groups/report_of_the_expert_group_on_patent_aggregation_-_2015.pdf.

European Competitiveness and Sustainable Industrial Policy Consortium (ECSIP), Patents and Standards - A modern framework for IPR-based standardization, Study for the European Commission, 2014.

European Parliament, Mapping the Cost of Non-Europe 2014-1019, July 2014, available at http://www.europarl.europa.eu/.

European Patent Office, Annual Report 2014, available at www.epo.org.

European Patent Office, Workshop on Patent Thickets, initiated by the EPO Economic and Scientific Advisory Board, 26 September 2012 (cited as: EPO Report on Patent Thickets).

European Patent Office, Workshop on Patent Quality, initiated by the EPO Economic and Scientific Advisory Board, 7 May 2012 (cited as: EPO Report on Patent Quality).

European Patent Office, Economic and Scientific Advisory Board (ESAB), Statement on the Unitary Patent and the Unified Patent Court, 3.12.2013/4.12.2013.

European Patent Office, Economic and Scientific Advisory Board (ESAB), Report on patent aggregation and its impact on competition and innovation policy, 25 November 2014 (cited as: *EPO ESAB*, Report on Patent Aggregation).

Frietsch, R./ Neuhäsler, P./ Rothengatter, O., SME Patenting – An Empirical Analysis in Nine Countries, Fraunhofer Institute Systems and Innovation Research (ISI), 2013.

Graham, S./ Vishnubhakat, S., Of Smart Phone Wars and Software Patents, Journal of Economic Perspectives, 27(1): 67-86, 2013.

Graham, S./ Merges, R. P./ Samuelson, P./ Sichelman, T., High Technology Entrepreneurs and the Patent System: Results of the 2008 Berkeley Patent Survey, 24(4) Berkeley Technology Law Journal 255 (2009).

GRUR (German Association for the Protection of Intellectual Property), Comments to the Commission's Public Consultation on Patents and Standards – A modern framework for standardisation involving intellectual property rights, 2015.

Gupta, K./ Snyder, M., Smart Phone Litigation and Standard Essential Patents, Hoover IP² Working Paper Series No. 14006 (2014), available at http://hooverip2.org/ip2-working-papers/.

Harhoff, D./ Hall, B. H./ von Graevenitz, G./ Hoisl, K., Wagner, S., The strategic use of patents and its implications for enterprise and competition policies, 2007, available at http://www.en.inno-tec.bwl.uni-muenchen.de/research/proj/laufendeprojekte/patents/stratpat2007.pdf.

Harhoff, D./ Hoisl, K./ van Pottelsberghe, B., Languages, Fees and the International Scope of Patenting, CEPR Discussion Paper No. DP7241 (2015), available at SSRN: http://ssrn.com/abstract=1372561.

Hofkens, P., Innovation in the European Digital Single Market – the view of Ericsson (conference material), 2015.

Hossain, M., Open Innovation and Intellectual Property - The Double-Edged Sword (2012), available at SSRN: http://ssrn.com/abstract=2170988.

Jones, A., Standard-essential patents: FRAND commitments, injunctions and the smartphone wars, 10(1) European Competition Journal 1-36, King's College London Law School Research Paper 2014-19 (2014), available at SSRN: http://ssrn.com/abstract=2394495.

Karachalios, K., Innovation in a European Digital Market – the Role of Patents (conference material), 17 March 2015.

Kwon, S./ Motohashi, K., Effect of Non-Practicing Entities on Innovation Society and Policy, IAM Discussion Paper Series #033 (2014), available at SSRN: http://ssrn.com/abstract=2606678.

Lemley, M. A./ Melamed, A. D., Missing the Forest for the Trolls, 113 Columbia Law Review 2117 (2013).

Lindsay, M. A./ Karachalios, K., Updating a Patent Policy: The IEEE Experience, Competition Policy International, Antitrust Chronicle, March 2015 (2).

LINUX, Collaborative Development Trends Report, 2014, available at www.linuxfoundation.org.

Long, D., IEEE's Controversial Proposed IPR Policy Amendments, 3.02.2015, available at http://www.essentialpatentblog.com/2015/02/ieee/.

Maskus, K./ Merrill, S. A. (ed.), Patent Challenges for Standard-Setting in the Global Economy: Lessons from Information and Communication Technology, 2013.

Mattioli, M., Power and Governance in Patent Pools, 27 Harvard Journal of Law & Technology 421 (2014).

Ménière, Y., Fair, Reasonable and Non-Discriminatory (FRAND) Licensing Terms – Research Analysis of a Controversial Concept (conference material), 2015.

Ménière, Y., Fair, Reasonable and Non-Discriminatory (FRAND) Licensing Terms - Research Analysis of a Controversial Concept, 2015.

Meyer, D. L., US Department of Justice, How to Address "Hold Up" in Standard Setting without Deterring Innovation: Harness Innovation by SDOs, 2008, available at www.justice.gov/atr/public/speeches/234124.htm.

Neppel, C., Intellectual Property for Software – a view from the EPO (conference material), 2015.

Noel, M./ Schankerman, M., Strategic Patenting and Software Innovation. Journal of Industrial Economics, 61: 481–520, 2013.

Neuhäusler, P./ Frietsch, R./ Rothengatter, O., Patentierung computerimplementierter Erfindungen – Aktuelle Rechtslage und ökonomische Implikationen**,** Fraunhofer ISI Discussion Papers Innovation Systems and Policy Analysis No. 46 ISSN 1612-1430 Karlsruhe, March 2015; German text available at http://www.isi.fraunhofer.de/isi-wAssets/docs/p/de/diskpap_innosysteme_policyanalyse/discussionpaper_46_2015.pdf (English translation to be published at 4ipcouncil.com).

Organisation for Economic Co-operation and Development (OECD), Measuring the Digital Economy – a New Perspective, 2014, available at http://www.oecd.org/sti/measuring-the-digital-economy-9789264221796-en.htm.

Office for Harmonisation in the Internal Market (OHIM)/ European Patent Office, Intellectual property rights intensive industries: contribution to economic performance and employment n the European Union Industry-Level Analysis Report, September 2013, available at http://www.epo.org/service-support/publications.html?id=87 (cited as: OHIM-EPO Study).

Philpott, G., Trends in patenting digital technologies at the EPO (conference material), 2015.

Porath, R., Perspectives on Patenting and Digital Markets – innovation, growth and employment, A view from Intel (conference material), 2015.

Raes, S., Innovation, Patenting, Standardisation and Licensing – A view from ORANGE (conference material), 2015.

Sadowski, B. M./ Whalley, J., Schumpeterian Patterns of Innovation in the ICT Eco-System: Evidence from the FT 500 (2015, forthcoming).

Sage, J., Innovation in the Digital Single Market – the Role of Patents (conference material), IBM, 2015

Samuels, J., Patent Trolls are mortally wounded, 20 June 2014, available at http://www.slate.com/articles/technology/future_tense/2014/06/alice_v_cls_bank_supreme_court_gets_software_patent_ruling_right.html.

Schmidt, K. M., Standards, Innovation Incentives, and the Formation of Patent Pools, GESY Discussion Paper No. 342 (2010).

Schwartz, D. L./ Kesan, J. P., Analyzing the role of non-practicing entities in the patent system, 99 Cornell Law Review 425 (2014).

Torrisi, S./ Gambardella, A./ Giuri, P./ Harhoff, D./ Hoisl, K./ Mariani, M., Used, Blocking and Sleeping Patents: Empirical Evidence from Large-Scale Inventor Survey (PATVAL 2), 2014 (forthcoming).

Torrisi, S., Used and Unused Patents, 2015 (conference material).

Wen, W./ Forman, C./ Graham, S., The Impact of Intellectual Property Rights Enforcement on Open Source Software Project Success, ICIS 2010 Proceedings. Paper 187 (2010), available at: http://aisel.aisnet.org/icis2010_submissions/187.

Wen, W./ Ceccagnoli, M./ Forman, C., Opening up IP Strategy: Implications for Open Source Software Entry by Start-Up Firms, 2015 (forthcoming), available at https://scheller.gatech.edu/directory/faculty/ceccagnoli/pubs/Wen%20et%20al-ms.pdf.

World Economic Forum, Global Information Technology Report 2015 – ICTs for Inclusive Growth, available at: www3.weforum.org.

Yanagisawa, T./ Guellec, D., The Emerging Patent Marketplace (2009), OECD Science, Technology and Industry Working Papers, 2009/09, OECD Publishing. http://dx.doi.org/10.1787/218413152254.

European Commission
EUR 27344 EN – Joint Research Centre – Institute for Prospective Technological Studies

Title: Innovation in the European Digital Single Market: The Role of Patents. Thematic Report on the Brussels Conference, 17 March 2015

Author: Chryssoula Pentheroudakis

Luxembourg: Publications Office of the European Union
2015 – 59 pp. – 21.0 x 29.7 cm

EUR – Scientific and Technical Research series – ISSN 1831-9424 (online)
ISBN 978-92-79-49552-6 (PDF)
doi:10.2791/991874

LF-NA-27344-EN-N

JRC Mission

As the Commission's in-house science service, the Joint Research Centre's mission is to provide EU policies with independent, evidence-based scientific and technical support throughout the whole policy cycle.

Working in close cooperation with policy Directorates-General, the JRC addresses key societal challenges while stimulating innovation through developing new methods, tools and standards, and sharing its know-how with the Member States, the scientific community and international partners.

Serving society
Stimulating innovation
Supporting legislation

doi:10.2791/991874

ISBN 978-92-79-49552-6

Publications Office