



# Patents and Standards

**A modern framework for IPR-based standardization**

**FINAL REPORT**

A study prepared for the European Commission  
Directorate-General for Enterprise and Industry



**This study was carried out for the European Commission  
by**



and



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# Preface

This study was commissioned by the European Commission within the context of the Framework Contract for Industrial Competitiveness and Market Performance – ENTR/90/PP/2011/FC. The study was granted to the ECSIP consortium and its subcontractors and individual experts.

Responsible for the management of the project and overall analysis are Professor *Marcel Canoy*, *Nicolai van Gorp*, *Laura Birkman*, and *Patrick de Bas* (Ecorys). The core-team further consists of *Rudi Bekkers* (Eindhoven University of Technology), *Volter Lemstra* (TUDelft), *Yann Ménière* (MINES ParisTech), *Rolf Zeldenrust*, *Bart Voogt*, and *Isabel Sainz* (Ecorys Netherlands).

Furthermore, the team responsible for the data analysis consisted, next to Rudi Bekkers and Yann Ménière, of *Önder Nomaler* (Eindhoven University of Technology), *Justus Baron* and *Tim Pohlman* (both associated with Mines ParisTech), and *Arianna Martinelli* (Scuola Superiore Sant'Anna, Pisa).

Quality control was provided by Professor *Jan Smits* (Eindhoven University of Technology) and *Arnold Verbeek* (Idea consult).

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**The opinions expressed in this Study are those of the authors and do not necessarily reflect the views of the European Commission.**



# Executive Summary

## Introductory remarks

### Context of the study

Efficient licensing of intellectual property rights (IPR) is crucial for achieving broad and rapid diffusion of innovation. To ensure that Europe is well positioned in today's global competitive environment, unnecessary barriers in the market for IPR licensing need thus to be removed. This requires a successful balancing of the incentives to invest in innovation against the benefits for the economy at large of a wide diffusion of knowledge. Of special interest in this context is the licensing of patents on technologies that are included in standards as an efficient licensing of these patents is key to the success of the standard. The licensing of such standard essential patents (SEPs) is however prone to market failures such as externalities (positive and negative), information problems, market power and free-riding. The various forms of market failure can result in barriers obstructing the efficient licensing of SEPs and can thus hinder the realization of the economic and societal benefits of the affected standards.

### Topic and objective of the study

The principle objective of this study is to collect quantitative and qualitative data on IPR-based standardization, with a focus on identifying barriers for efficient licensing of SEPs and on possible solutions to these barriers. The analysis is based on a review of the IPR and standardization framework in four industries: communication technology, consumer electronics, automotive and smart grids. The study identifies a range of options to lower barriers to SEP licensing and assesses these in terms of costs, benefits, and effectiveness. This report should aid the European Commission in its attempts to improve the European governance of SEP licensing arrangements. It can also be useful in the (ongoing) work of standard setting organizations on their IPR policies and rules.

### Methodology and added value of the study

The study draws on the existing literature and previous studies. A total of 37 interviews with practitioners have been performed to gather quantitative and qualitative insights into pertinent aspects. The study also draws on the OEIDD database of SEP disclosures to generate quantitative insights into *inter alia* the rate of SEP disclosure, types of disclosures, patent pools, ownership transfers and SEP litigation.

Much of the existing research on SEP licensing focuses on the telecommunication industry. The present study aims to go beyond this traditional focus and covers three additional industries (consumer electronics, automotive and smart grids) chosen for their reliance on standards that may include patented technologies and for their complementarity to the telecommunication industry. The study is broader than some of the existing research, notably the previous study commissioned by the EC<sup>1</sup>, in its examination of a full range of possible improvements to the current rules governing patent-based standardization. In the search for possible improvements it reviews ideas discussed among stakeholders and also adds an 'out-of-the-box' exercise by taking on board the experiences and lessons learned from other industries.

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<sup>1</sup> Knut Blind et. al., Study on the interplay between standards and intellectual property rights (IPR), 2011.

## Innovation, standardisation, patenting and licencing

### Innovation driven by patenting, licensing and standardization

Patent protection drives innovation by incentivizing investment in R&D. Patent protection allows the innovator to receive return on his investment by using the innovation himself or by licensing the patent to other companies. Standardization drives innovation by establishing interoperability between products and by facilitating market adoption of innovative technologies. Licensing and standardization are forms of collaboration. To get maximum benefits for society they may need to overcome potential market failures, such as information asymmetry, market power and externalities.

In Europe, patents are granted by national patent offices and the European Patent Office (EPO). Once a minimum of 13 EU countries ratify the Agreement on a Unified Patent Court, the EPO will be able to grant patents with direct validity in all participating countries. Standards are developed in formal Standard Setting Organisations (SSOs) as well as in less-formal fora and consortia. Among the formal standardization bodies are the three European SSOs, that is the European Committee for Standardization (CEN), the European Committee for Electrotechnical Standardization (CENELEC) and the European Telecommunication Standards Institute (ETSI).

European SSOs are governed by the EU acquis and are regularly mandated by the European Commission to produce certain standards known as European Norms (ENs). All standardization bodies have to comply with competition law. In particular, the Guidelines on Horizontal Co-operation Agreements comprise specific guidance for standardization<sup>2</sup>.

### IPR policies of standard setting organizations

Most standard setting bodies have adopted written policies to govern situations where standards comprise patent-protected technologies. In such situations, efficient licensing of the related patents is a precondition to the success of the standard. IPR policies aim at efficient SEP licensing and usually comprise both disclosure and licensing commitments.

Disclosure rules specify under which conditions members or participants of the SSO are required to inform the organisation that it owns IPRs that are essential to the standard, or may become essential when the final standards text is adopted. Licensing commitments ensure that licenses for patents with essential claims are available to all implementers, or that these patents will not be asserted against implementers of a standards-compliant product.

The most common licensing commitment is a commitment to license on fair, reasonable and non-discriminatory (FRAND) terms. The current IPR policies of SSOs leave the specification of what constitutes FRAND to bilateral negotiation and the Courts.

### Four industries with IPR-based standardization

The study examines the standardization and licensing practices in four industries in which standardization plays an important role and in which standards comprise patented technologies: telecommunication, consumer electronics, automotive and electricity. These industries have been chosen to be complementary in terms of starting point as well as allowing to capture the trend of

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<sup>2</sup> Commission Notice 2011/C 11/01.

technological development and convergence. The industry-specific analysis underpins the subsequent horizontal analysis of barriers and solutions.

### **Telecommunication industry (mobile telephony)**

The area of mobile telecommunication (including mobile data) is the industry where the issue of patent-based standardization is most prominent. This is driven by heavy industry reliance on standardization (notably the main 2G (GSM), 3G (UMTS) and 4G (LTE) standards, but also WIFI standards) which comprises a great number of R&D intensive innovations protected by patents. New entrants have displaced the traditional device makers, which has resulted in a divergence between patent ownership and standard implementation. The traditional practice of cross-licenses of SEPs between vertically integrated companies thus corresponds less and less to industry needs and the new business practices of monetizing SEPs directly or indirectly by sale put IPR rules of the relevant SSOs (ETSI, IETF, IEEE) to the test. Difficult SEP-licensing negotiations and resulting litigation seem widespread.

### **Consumer electronics industry (video and audio recording and reproduction)**

Standardization in the consumer electronics industry is mainly done in consortia. Standards for video and audio recording and reproduction (such as MP3 for music, JPEG for photo, H.264 for video) often compete against each other and the success of the standard in this competition is an important driver behind the strategies of the companies involved. Patent pools are a common tool to organize the licensing of standard related patents.

### **Automotive industry (smart mobility)**

The automotive industry is highly standards-based, with standards being developed in ISO, ETSI and SAE International. In the smart dimension of the industry, there are a number of competing standards such as in car entertainment platforms. A range of new players has emerged in the "smart dimension" of the automotive industry. Investment in R&D into the "smart dimension" is split between these new players and the original equipment makers. IPR resulting from collaborative R&D projects is managed in line with the "Holst model". This model aims at free usage of the pooled IP as the main remuneration for contribution but has recently come under pressure.

### **Electricity grid industry (smart grids and smart metering)**

Standards are of key importance to the electricity grid industry and ensure interconnection and interoperability. Standards are developed in CEN, CENELEC, ETSI and IEC with important elements, such as smart utility meters, based on EU mandates. Grid operators as the main implementers pay for embedded patents as part of the equipment procurement process. Separate licensing is rare. Patent application numbers in this area are however rising fast and the spread of communication and information technology will confront the industry with new players following different IPR strategies than the current ones.

## **Barriers to efficient SEP licensing**

The study analyses the principal problem of efficient SEP licensing and the technological trends and changes in the patent landscape that the current rules and institutions which govern this problem face. The focus is on practical aspects and this study should be interpreted as a source of inspiration to improve current rules and institutions.

### **The principal problem to be solved**

SEP licensing is efficient if licenses are concluded with minimum of search, negotiation and dispute resolution costs to both parties and on terms that guarantee the technology contributor a fair return

on his investment while enabling the implementer to use the standard at reasonable costs and on a level playing field. SEP licensing becomes more difficult with increasing number of SEPs as well as with increasing numbers of patent holders and of patent users. There is a clear and pronounced upward trend in these numbers.

The difficulty exists both for patent holders as well as for implementers: Lack of transparency raises search, negotiation, and dispute resolution costs on both sides. The risk of opportunistic behaviour of the other side exists both for patent holders as well as patent users and harms in each case not only the other side, but via an externality also the entire industry (e.g. an excessive payment to one patent holder will diminish the revenue available to other innovators; non-payment by one implementer will harm other implementers by giving it an unfair competitive advantage). The problem of royalty stacking exemplifies this interdependence: Due to externalities, the individual setting of royalty rates by a large number of SEP owners can result in a combined royalty burden that is equally detrimental to patent holders.

### **Lack of transparency regarding SEPs**

A lack of patent transparency (including asymmetric information) is a key issue inhibiting efficient licensing. Transparency is crucial at two moments in time: Before adoption of the standard it allows standardization participants to make an informed choice. After adoption of the standard it forms the basis of clear licensing agreements. Patent transparency relates to the existence of a patent but also its scope, validity, ownership and enforceability.

To achieve patent transparency SSOs have adopted rules obliging ex ante disclosure of SEPs and they maintain databases on what has been disclosed. The SEP declaration system and the databases used for this purpose are the cornerstone of SSO efforts to increase patent transparency. They currently have however a number of limitations which this study analyses, such as a limited level of detail of patent declarations, a limited accuracy in terms of validity, essentiality and enforceability of the declared patents and no mechanism to ensure the updating of their content.

### **Problems related to specific business behaviour towards SEPs**

Basing standards on patented technologies creates a number of risks of opportunistic behaviour which the system has to safeguard against. These safeguards must prevent specific cases of opportunistic behaviour. The study analyses notably patent ambushes and submarining, hold-up and reverse hold-up, categorical discrimination against new entrants and unsolicited bundling of SEPs with other patents.

The IPR rules must however also cope with a constantly changing technological and patent landscape and changes in business behaviour. The study thus examines the vertical dis-integration of companies giving rise to a divergence of SEP ownership on the one hand and standard implementation on the other, the increased transfers of ownership of SEPs with a higher emphasis on monetizing patents and an increased rate of SEP litigation.

### **Possibilities for improving the system**

The study reviews and analyses a total 15 specific options to improve the current system governing patent-based standardization. These are the following ideas:

### Improvements to the patent declaration system

As a set of measures to target the lack of patent transparency by fine-tuning the current patent declaration system, the study has analysed the following options:

- Updating patent declarations at key events, such as the adoption of the standard, the granting of the SEP, the invalidation or expiry of the SEP, the transfer of ownership;
- More precise and thus informative patent declaration, notably as regards information to substantiate essentiality;
- Checking essentiality of declared patents as a matter of routine;
- Entering licensing information in SSO database;
- Limiting the use of blanket disclosures, currently allowed by some SSOs;
- Notification of transfer of SEP ownership by recordation;
- Increased collaboration between SSOs and patent offices by linking the respective databases; to improve the usefulness of SSO databases in a cost efficient manner and also to allow patent examiners better access to prior art material.

### Promotion of patent pools

Patent pools provide a one-stop solution for licensing a bundle of standard essential patents owned by different entities, thereby aiming to mitigate transaction costs, avoid royalty stacking and create a level playing field. Given these benefits the study has examined the following aspects:

- Strengthening the relation between SSOs and pools;
- Providing incentives to SEP holders to participate in patent pools;
- Encouraging entities such as universities and SMEs to participate in patent pools.

### Providing efficient dispute resolution mechanisms

Efficient SEP licensing also requires efficient mechanisms to resolve disputes where these occur. The study has thus examined the following aspects:

- The benefits and costs of providing such dispute resolution mechanisms and of the different types of dispute resolution mechanisms (arbitration, mediation, "med-arb", mini-trials);
- The integration of dispute resolution mechanisms into the standardization process and the incentive for participants to use them;
- The substantive and procedural aspect of setting up such dispute resolution mechanisms.

### Clarifying FRAND royalty rate and royalty base

The commitment to licence SEPs on FRAND terms is widespread. However, the notion of FRAND is in general not defined by the IPR policies of SSOs. The study focuses on achieving a higher degree of clarity on two aspects, for the benefit of negotiating parties as well as adjudicators:

- The royalty rate which could be defined in relation to its economic value, its ex ante value before standard adoption or the incremental value over competing technologies;
- The royalty base which could refer to the final product or to the component implementing the patent and the related question on the step in the value chain where licensing occurs.

### Transfer of SEP ownership

Safeguards such as the commitment to licence on FRAND terms oblige directly only the initial patent owner having declared the patent as essential. In case of a subsequent transfer of the ownership of this patent the subsequent owner must be bound as well. This can be done by defining or strengthening SSO rules that bind subsequent owners of SEPs to the initial FRAND commitments or by promoting the use of a License-of-Right system to ensure that commitments to licence SEPs on a reasonable and non-exclusive basis are tied to the patent itself, whoever its owner.

### Improved guidance on inclusion of patented technologies

Finally, the study examines the need for improved guidance to those who adopt standards on the inclusion of patented technologies in the respective standard. The benefit of such guidance would lower the number of SEPs and increase the quality of the remaining SEPs thereby providing incentives for real innovators to engage in R&D and reduce unnecessary costs (both royalties and otherwise) associated with over-inclusion of technologies and complexity of standards. It may also reduce the costs associated with oligopolistic competition in the upstream market for necessary technologies and promote the adoption/uptake of the standard.

### Potential solutions stemming from non-standard dependent industries

The study also examines the patenting and licensing practices in four additional industries: chemicals, diagnostics, mechanical engineering and nano-technologies. These four industries rely less on standardization but are, at least in key parts, characterised by high levels of R&D, significant patenting and a high degree of complementarity between patents.

The study examines how these industries deal with problems of patent transparency and patent thickets and identifies innovative and collaborative solutions that could be instructive for the standardization context, such as:

- Augmented patent databases create added value by the "crawler-based" and thus automatic generation of content and its unified presentation. Additional functionalities include inter alia alerts, links, grouping of patents;
- Technology exchange clearing houses provide standardized services to support bilateral licensing negotiations;
- Publicly funded landscaping provides examples of transparency enhancing interventions into specific areas of public interest;
- Crowd-sourced validity checks reduce the costs of validity checks by organizing, for example via a wiki, and incentivizing the larger expert community to perform these checks;
- Non-profit patent pools can be instructive as experience with public funding of patent pools;
- Managed IP-exchanges break down IP into unit licence rights and offer stock exchange trading of these, thereby avoiding costly design of individual license agreements and providing objective criteria of IP values;
- IP supermarkets aim at facilitating licensing by offering patents to a potential licensor in a standardized manner and allowing them an easy choice of what to licence;
- Open access clearing houses aim at facilitating collaboration on an open and royalty-free basis and target areas where the focus is on accessibility of the patents.

Some of these solutions seem suitable for a wide range of patent-based standards, while others require specific circumstances to succeed. The "clearing house concept" offers a conceptual framework for the move from a database to more advanced forms of collaboration in licensing.

# 1 Introduction

## 1.1 Context and objective of the Study

### Context

An efficient process of the licensing of intellectual property rights is crucial for achieving broad and rapid diffusion of innovation. Innovation is essential for general economic growth and the improvement of productivity in particular.

To assure that Europe is well positioned in today's world of global competition undue barriers in the market for IPR licensing need to be removed. This requires a successful balancing of, on the one hand, the protection of intellectual property rights to allow the owners of intellectual property rights to earn an appropriate return on investments and, on the other hand, providing a business environment in which a wide diffusion of knowledge is realized.

Of special interest in this context is the licensing of patents related to technologies that are included in standards. This applies in particular to standards that are related to infrastructure systems, such as telecommunications and energy, but it is also ever more important for standards in the field of (I)CTs, which have become essential in virtually all sectors of the economy. This importance has increased with the intense rivalry among (I)CT firms for market leadership in areas such as operating systems for smart phones and the related application stores.

As patents included in a standard become 'standard essential patents' (or SEPs) to which any adopter of the standard must obtain access, a successful standard can bestow on the SEP owners considerable market power. Moreover, the market for IPRs is prone to further market failures: externalities, information asymmetry and information shortage, non-rivalry and non-exclusivity. It follows that the market for IPRs (and notably SEPs) deserves special attention. Where necessary, rules and regulation may need to be introduced or updated in order to assist the (continued) proper functioning of the market for IPRs.

### Objective of the Study

The principle objective of this study is to collect quantitative and qualitative data on IPR-based standardization, with a focus on identifying barriers for efficient licensing of SEPs and on possible solutions to these barriers. Where barriers to IPR licensing exist, they typically slow down both the process of developing standards as well as the adoption of standards and, consequently, slow down the innovative process in an industry as well as the innovative process of the economy at large. The study analyses these barriers in the context of four standard-dependent industries: communication technology, consumer electronics, automotive and smart grids.

In a next step a range of policy options is identified to lower said barriers and assesses these in terms of costs, benefits and effectiveness. Ultimately, the outputs of this report should aid the Commission in its attempts to improve the European governance of licensing arrangements to the benefit of both the patent holders as well as the implementers of standards.

## 1.2 Theoretical frameworks applied in the Study

### Transaction costs theory and market failures

This Study focuses on SEP licensing and thus on a transaction between patent holders and patent users. Transaction cost theory provides thus the underlying theoretical framework for the study. Key analytical elements are the transactions, their participants and the written and unwritten rules of collaborative action, or in Commons' terminology: "...the alienation and acquisition, between individuals, of the rights of property and liberty created by society, which must therefore be negotiated between the parties concerned before labour can produce, or consumers can consume, or commodities be physically exchanged".<sup>3</sup>

Transaction costs can be divided into three broad categories: (1) search and information costs, such as incurred in determining whether a technology is encumbered by patents, the identity of patent owners, whether or not the licenses can be obtained through a patent pool, the royalty rates, etc.; (2) bargaining and contracting costs, such as the costs of preparing a licensing bid, assessing the willingness to pay, the actual negotiations, the drafting of a contract, etc.; and (3) policing and enforcement costs, for processes such as: ensuring that terms and conditions of the licensing contract are met and that payments are made on time, tracing patent infringement, bringing a dispute to the court for settlement, etc.<sup>4</sup>

Transaction cost theory relates to the market selecting the governance structure best suited to the characteristics of the assets that are being transacted.<sup>5</sup> The default is a bilateral market exchange, as the most efficient governance structure with the lowest costs. As stipulated in economic theory of transaction costs, the characteristics of the asset and the frequency of transaction, as well as the uncertainties involved may lead to the emergence of alternative governance structures, at lower costs. This may cause a shift from markets towards hierarchies (vertical integration within firms) and various hybrid modes of governance in between. In the context of this Study the emergence of a patent pool can be considered a hybrid in the terms of Williamson, or a micro-institution in the terms of Ménard.<sup>6</sup>

A second strand of economic theory providing a theoretical framework for this study concerns market failure theory. Market failures relevant for this study are information asymmetry impacts the ability of the market to provide for efficient market exchange. The acquisition of information to mitigate this asymmetry increases transactions costs.<sup>7</sup>

### Framework for socio-technical analysis

In line with the economic theories positioned above, the framework for the analysis of socio-technical systems, as developed by Koppenjan and Groenewegen<sup>8</sup>, is based on the work by

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<sup>3</sup> Commons, J.R. (1931). "Institutional economics." *American Economic Review*, **21**, p648-57.

<sup>4</sup> For an extensive overview of the 'transaction costs' literature see: Allen, Douglas W., 1999, "Transaction Costs", *Encyclopedia of Law and Economics*, <http://users.ugent.be/~gdegeest/0740book.pdf>.

<sup>5</sup> Williamson, O. E. (1998). "Transaction cost economics: How it works; where it is headed." *De Economist* **146**(1): 23-58.

Williamson, O.E. (1981) "The economics of organization: The transaction cost approach." *The American Journal of Sociology*, **87**(3), pp. 548-77. Williamson, O. E. (1985). *The economic institutions of capitalism, firms, markets and relational contracting*. London: Macmillan. Williamson, O. E. (1996). *The mechanisms of governance*. Oxford: Oxford University Press.

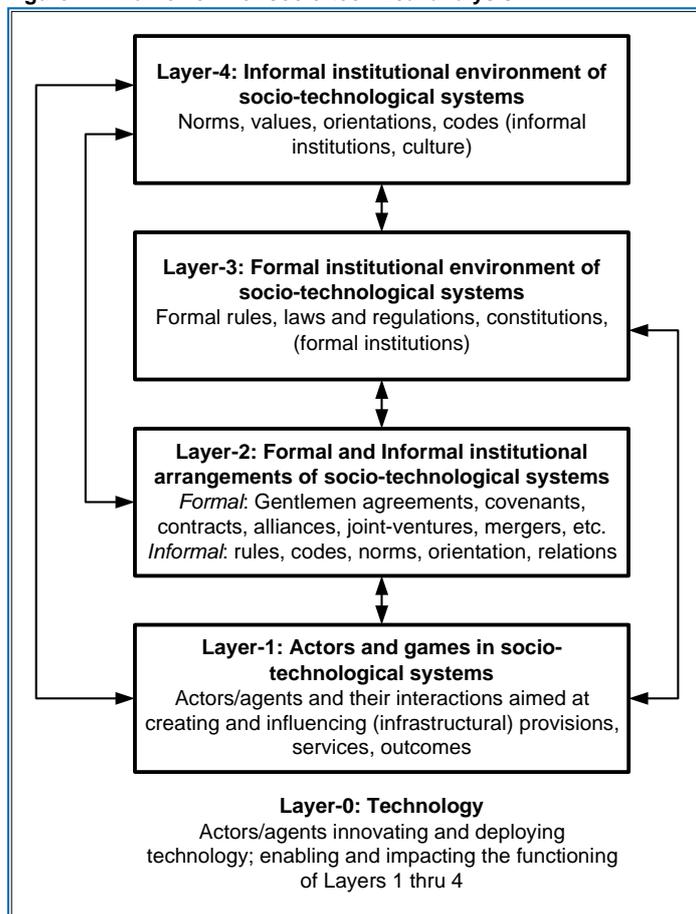
<sup>6</sup> Ménard C., (2009), "Water Regulation: the Key Role of Micro-Institutions.", 1st International Forum on Regulation of Water Services and Sustainability, Rome.

<sup>7</sup> See for information asymmetry the seminal article by Akerlof, G.A. (1970). "The market for 'lemons': Quality uncertainty and the market mechanism.: The quarterly Journal of Economics. **84**(3), pp 448-500.

<sup>8</sup> Koppenjan, J. F. M. and J. P. M. Groenewegen (2005). "Institutional design for complex technological systems." *Int. Journal Technology, Policy and Management* **5**(3): 240-257.

Williamson on transaction cost economics<sup>9</sup>; it facilitates the exploration and understanding of the industry dynamics, as well as the assessment of the proposed solutions. The framework distinguishes between those activities and solutions that belong to the private domain of the actors involved in standardization and licensing, and the role of the government in facilitating these activities through laws and regulations. See Figure 1.1.

**Figure 1.1 Framework for socio-technical analysis**



The exploration and analysis of standardization and licensing involves a variety of explanatory variables such as technology, laws and regulations, strategies of the firms, values and norms, etc. The behaviour of the actors is largely conditioned by the institutional structures in their environment, such as laws and regulations. On the other hand, these actors have a certain degree of autonomy in realizing their own objectives, to explore new ways and to change the institutional structures around them. Moreover, actors not only interact with the institutional structures in their environment, but they also interact with each other. In doing so they share ideas, they learn and they also compete and try to control the behaviour of others. To explore and analyse the dynamics of the licensing market we need to understand the behaviour of the different actors involved. Figure 1.1 represents the different layers that can be distinguished in the institutional environment of the actors, with the arrows indicating the interactions. In conceptualizing institutions we follow North in his definition of institutions as “humanly devised constraints that structure political, economic and social interactions” and “institutions consist of a set of moral, ethical, behavioural norms, which define the contours and that constrain the way in which the rules and regulations are specified and

<sup>9</sup> See note 13.

enforcement is carried out<sup>10</sup>. In our context institutions created and shaped by the actors involved include the standards setting organizations and patent pools.

At the top of Figure 1.1 in Layer-4 the so-called informal institutions are located, which influence – mostly implicitly – the behaviour of actors. This is the cultural embedding of the key actors involved in innovation, licensing and standardization, which has an impact on the motivation of these actors and on their expectations of how the other (private and public) actors will behave. Our ideas about human rights and equity belong at this level. While there are many similarities across Europe in norms and values, there are also cultural differences that will play-out at the lower levels.

At Layer-3 we show the so-called formal institutions that influence the behaviour of the actors more explicitly. Here are located the laws about, for instance, competition and corporate governance, but also the EU regulations on patenting and standardization, as well as the Patent Offices. These are examples of explicit institutions that have an impact on the behaviour of the industry actors. Layer-3 is typically the working domain of public actors, such as parliament, ministries and public agencies.

At Layer-2 the so-called institutional arrangements are located, being the institutions that private actors make to coordinate the transactions between them. A distinction is made between the institutions that private actors purposefully create, such as contracts and organizations and the ones that informally evolve, such as norms that are shared among the actors involved.

At Layer-1 the firm actors are located with their day-to-day routines, in our case operating in the competitive market for IPRs. These same actors, often in different roles and capacities, create and modify the institutional structures at the higher layers, while being at the same time constrained by them. As the higher layers condition the actions at the lower layers, the institutional formation represented by these interactive relationships is an important aspect in explaining the dynamics of the IPR market. At the lower layers these relationships may be more explicit and traceable, while at the higher layers they are more diffuse and difficult to capture.

Technology plays an important role in innovation. Hence, the model has been extended to reflect technology at Layer-0, as it forms the embedding of all other Layers thereby reflects that technology is all encompassing. Technology is considered to be developed by actors/agents in Layer-1 or, in other words, man-made. In its application it is impacting Layer-2 through Layer-4; in turn technology is being shaped through these interactions.

### 1.3 Benefits of smoother SEP licencing

The economic potential of smooth SEP licensing is complex to assess but potentially huge. This section briefly examines some of the benefits, drawing upon previous studies. In some cases the order of magnitude of specific benefits are given for illustrative purposes.

#### **Direct benefits for the businesses involved**

Licensing agreements are beneficial to both the patent holder as well as the patent user. They provide the patent holder with revenue and give the patent user the right to commercialize the patented technology. They allow both sides to perform and even focus on the respective side of the business, which is the R&D from which patented innovation follows on the side of the patent holder, and the manufacturing and sale of products on the side of the patent user.

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<sup>10</sup> North, D. C. (1990). Institutions, institutional change and economic performances. Cambridge, UK: Cambridge University Press.

As with any business transactions, some transaction costs are unavoidable to conclude such licensing agreements. This includes search costs, information acquisition costs, negotiation costs and dispute resolution costs. A modern and efficient framework for licensing can significantly reduce such costs.

This is particularly pertinent in the area of SEP licensing, where many aspects governing licensing are pre-determined by the standardization context and where many instruments can specifically reduce transaction costs.

### **Benefits of patent-based standardization depend on efficient SEP licensing**

Including patented technologies into a standard can be beneficial in some cases and even necessary in others, such as where interoperability between products can only be achieved by a technology-specific standard.

In such a case of a standard comprising patented technologies, the benefits of standardization depend on efficient SEP licensing. Innovators will contribute their best technologies to the standard only where they can be sure that to get a fair return on investment from licensing revenues. Implementers will use the standard only where they can be sure to get licenses at reasonable costs. Both sides are particularly vulnerable where licensing agreements are, as a matter of standing business practice, concluded only after the technology was contributed to the standard and after the industry has locked itself into the standard.

### **Efficient SEP licensing promotes innovation by removing uncertainty**

A particularly important way by which efficient SEP licensing promotes innovation is by reducing uncertainty. Clear rules and established practices, minimize uncertainty on specific elements which otherwise negatively impact innovation: Where a business faces uncertainty over the extent to which its innovation is protected, over the costs of enforcing this protection (such as by litigation), over the time required to can launch the product in the market and so forth, this will reduce its appetite to innovate in the first place. This type of uncertainty is driven by a lack of transparency of the patent situation (validity, essentiality, enforceability of patents) as well as by rules being unclear. Both aspects are thus a focus of the present study.

### **Efficient SEP licensing is crucial for undistorted competition**

Undistorted competition is a crucial driver of innovation. Efficient SEP licensing is crucial to maintain and allow undistorted competition both in market for technologies as well as in the market(s) where the standard is implemented. Where SEP licensing is unnecessarily difficult and/or costly, small innovators may not be able to get a sufficient licensing income, thereby hampering their ability to supply the market for technologies. Efficient SEP licensing also ensures that the market where the standard is implemented is not distorted by allowing some competitors to delay or avoid paying royalties and thus to gain an unmerited competitive advantage over those who take license.

### **SEP licensing and the rapid diffusion and adoption of innovations**

IPR licensing and standardization and thus also in particular SEP licensing are crucial for the rapid diffusion of innovative technologies. While it is complex to quantify the benefits of rapid diffusion of innovation in general terms, these benefits have been quantified for more specific settings such as the role of ICT spill-overs for total factor productivity growth. This seems instructive, given that patent-based standardization plays such an important role in ICT.

For the Netherlands (building on the seminal work of Griliches)<sup>11</sup> it has been assessed that ICT spill-overs can be an important source of TFP growth in ICT-using industries and that roughly one third of labour productivity growth in Dutch market services can be attributed to own ICT capital deepening, whilst even higher effects are accrued through indirect effects of spill-overs.<sup>12</sup> On a more general level the McKinsey Global Institute assesses that advanced robotics has the potential to affect \$6.3 trillion in labour costs globally, whilst cloud technology has the potential to improve productivity across \$3 trillion in global enterprise IT spending.<sup>13</sup> McKinsey also develops several other types of diffusion benefits in their report.

### **Efficient SEP-licensing brings international benefits**

By contributing to the success of IPR-based standardization, efficient SEP licensing enables significant benefits stemming from international trade and provide a significant first mover advantage for economic areas offering efficient standardization processes to industry.

Standardization is an instrument to remove non tariff measures (or NTMs) which are one of the most persistent and most costly barriers to trade. Ecorys has analysed NTM's at length, notably in the context of the trade and investment negotiations. It appeared that in R&D, production preparation and detailed technical specifications, agreements on standards makes the e.g. aerospace sector more competitive in both the EU and the US, since productivity gains will enhance investment and trade opportunities. The same applies to the automotive sector, where the main NTMs are differences in safety and environmental standards, as well as many other sectors. In a scenario where 25% of all NTM's between the US and the EU are removed the study concludes welfare gains of 19.4 billion euro in the short run for the EU and 53.6 billion euro in the long run. Of course not all these NTM's are related to standard setting, but in some sector standards are a big chunk of NTM's. These potential gains do tell that if Europe gets its act together, other types of gains (of big magnitude) can materialize.

The first-mover advantage of successful standardization was examined for the setting of the GSM standard. In Europe all providers adopted the GSM standard, whereas in the United States there were three competing standards in the market. Looking at mobile penetration rates it is clear that that US has been lagging behind the EU since 1995. We analysed how much the EU has gained over the US due to having a single standard instead of multiple standards. The benefits for Europe of being ahead were being estimated at 35 billion euro per year.<sup>14</sup>

## **1.4 Research methodology and value added of the study**

### **Background**

The study starts with a discussion at a high level on the economics of information and innovation. It discusses the presence of market failures, the need for assigning intellectual property rights and the incentives to collaborate in the process of innovation. The assignment of intellectual property rights (i.e. patenting technologies) and the complementarity between technologies are of particular relevance for standard setting. The background serves as a platform for subsequent analysis, hence we also add institutional arrangements governing the process of standardisation, including the relations between stakeholders and institutions (standard setting organisations (SSOs), patent holders, the European Commission and patent offices) and we add licensing motives and practices

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<sup>11</sup> See e.g. <http://www.siepr.stanford.edu/RePEc/sip/09-016.pdf>.

<sup>12</sup> <http://www.cpb.nl/publicatie/do-ict-spillovers-matter-evidence-dutch-firm-level-data>.

<sup>13</sup> [http://www.mckinsey.com/insights/high\\_tech\\_telecoms\\_internet/disruptive\\_technologies](http://www.mckinsey.com/insights/high_tech_telecoms_internet/disruptive_technologies).

<sup>14</sup> [https://ec.europa.eu/digital-agenda/sites/digital-agenda/files/final\\_report\\_internal\\_market\\_ecom.pdf](https://ec.europa.eu/digital-agenda/sites/digital-agenda/files/final_report_internal_market_ecom.pdf).

that characterise the relationship between patent holders and standard adopters (as well as the relationship among patent holders).

### **Standard-dependent industries**

The study provides an elaborate and unique description of existing frameworks governing the inclusion of patents in standards and the subsequent licensing of those patents in four standard-dependent industries: communications technology, consumer electronics, automotive and smart grids. Such a study has not yet been done. We explore the strategic role of standardization and IPR licensing (notably licensing of SEPs), which includes a discussion of the industry structure, a foundation for the practices that prevail in the industry and the recent changes in market dynamics. The descriptions of the industry structure and market dynamics are based on literature research complemented with interviews with industry experts. This allows us to draw a cross-industry summary of the trends that impact standardization and licensing.

### **Barriers to efficient SEP-licensing**

The study summarizes the literature, uses interviews with stakeholders and analyses quantitative analysis of SEP data to identify a number of barriers for licensors and licensee to efficiently close licensing agreements. Two types of barriers are identified: barriers stemming from a lack of transparency and barriers stemming from business behaviour towards SEPs.

The data analysis is new. We focus mainly on the Open Essential IPR Disclosure Database (OEIDD) that has been developed from 2011 to 2013 and aims to provide the most comprehensive collection of disclosures of standard essential patents available. While OEIDD is based on disclosure records made publicly available by SSOs, very considerable efforts went into processing this information harmoniously. More specifically, the data was cleaned, harmonized, matched and complemented with additional data.

### **Problems and solutions**

Over the last years, in response to the wide range of concerns, numerous desired solutions or measures have been put forward by stakeholders, either in SSO meetings, in the public domain or otherwise. The problems underlying a particular solution are not always clear. Some solutions seem to be related to multiple perceived problems, whereas some problems may be addressed by multiple solutions. The value added of our study is that we map problems and solutions in a structured way. We discuss practicalities of the process actually followed and structurally map the transaction costs involved in licensing of standard essential patents; including risks stemming from the inclusion of IP-protected material and technologies in standards and the degree to which these risks have materialised or may arise in the future.

### **Out of the Box**

In the search for policy options the study attempts to provide an 'out-of-the-box' approach by taking on board the experiences and lessons learned from other (non-standard dependent) industries struggling with similar risks related to both transparency problems and royalty stacking. These industries have developed interesting arrangements for efficient technology transfers and smooth licensing.

We examine these arrangements and analyse how these manage to minimise transaction costs stemming from transparency problems and how these address the problem of royalty stacking. Next we analyse the extent to which they can be transposed to the framework governing licensing of SEPs.

In order to analyse the above-mentioned issues, we analysed four non-standard dependent industries, namely: chemicals, diagnostics, mechanical engineering and nanotechnology. For each industry we took the following research steps:

- A screen of these industries on the basis of desk research for identifying interesting licensing arrangements;
- Semi-structured, in-depth interviews with industry-specific licensing experts to capture the licensing practice in general, to learn about success/fail cases in particular and to acquire more information on the interesting arrangements;
- Description of the industry structures and institutional arrangement that facilitated the success cases; and finally
- A transposition analysis, identifying critical success factors (and their presence in the standard-related industries), necessary adaptations to the identified arrangement to achieve transferability.

## 1.5 Outline of the research

A first step of the research consisted of defining the framework for analysis. This consists of a methodological framework for analysis and a description of the institutional framework in which technology/standards developers and adopters operate. The results have been documented in Chapter 2. Furthermore, this Chapter includes the summaries of desk research into two topical items: Patent Offices and Patent Pools.

Considering the objective of the study and using the guidance provided by Thietart, Miles and Huberman<sup>15</sup> on qualitative research, the research then proceeded with an in-depth literature study into the industry dynamics of the four selected standard-dependent industries, whereby two industries are highly dynamic ICT-based industries – telecommunications and consumer electronics – and two industries are in an early phase of ICT adoption – automotive, with emphasis on ‘smart mobility’ and the ‘connected car’, and the electricity industry, with emphasis on ‘smart grids’ and ‘smart homes’. The literature study has been complemented with a first round of semi-structured interviews with industry experts. These two activities combined have provided an understanding of the industry structure, the rules-of-the game in the industry, the role of standards, as well as an understanding of the trends in these industries. The results are documented in Chapter 3.

Adding to the in-depth understanding of the industry dynamics, a second round of structured interviews was held with licensing experts in these industries. The purpose of the second round of interviews was twofold:

- To explore in more depth the strategic role of standards and patents in the four industries and the consequences for licensing practices (adding to the analysis in Chapter 3); and
- To identify barriers facing the actors in concluding licensing agreements (presented in chapter 4).

Chapter 4 presents a non-prioritized, gross list of barriers for efficient licensing that is based on combining the insights from previous chapters with the experience and insights obtained from the industry actors, complemented with an extensive, quantitative analysis of SEP data.

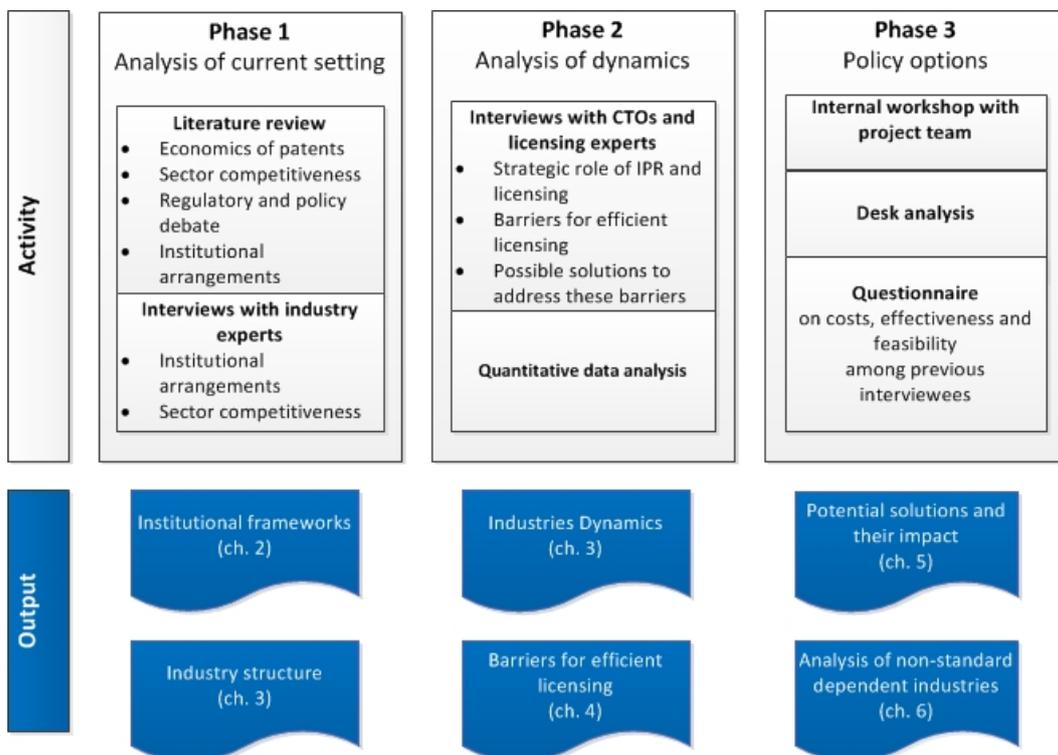
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<sup>15</sup> Thietart *et al.*, R.-A. (2001). Doing management research - a comprehensive guide. London: SAGE Publications Ltd.  
Miles, M. B. & A. M. Huberman (1994). Qualitative data analysis - An expanded sourcebook. Thousand Oaks, CA: Sage.

Chapter 5 subsequently identifies for each identified barrier possible solutions to lower or remove the barrier. Furthermore it analyses the impact of these solutions in terms of costs, benefits and requirements for implementation. The analysis is based on what we found in literature, on insights obtained during the second round of interviews with CTOs and licensing experts and on a survey conducted among these stakeholders.

Finally, Chapter 6 briefly describes four non-standard dependent industries in terms of industry structure and the strategic role of patents as well as the most common licensing arrangements. It follows with a brief discussion of the risks related to licensing of patents in these industries and closes with a discussion and transposition analysis of the mechanisms available to deal with these risks. The analysis is based on desk research and interviews with industry experts as well as ‘operators’ of these mechanisms.

The figure below presents an overview of the activities and outputs presented in these chapters.





## 2 Innovation, IPR and standardization

In this chapter the framework for the study is elaborated. The chapter starts (in section 2.1) with a high-level discussion on the economics of information and innovation. It discusses the presence of market failures that (in the absence of policy measures) hinder the realisation of an efficient allocation of information and technology. The section also discusses the need for assigning intellectual property rights to maintain incentives to innovate, as well as the incentives (and barriers) for collaboration in the process of innovation due to the complementary between technologies. The assignment of intellectual property rights (i.e. patenting technologies) and the complementary between technologies are of particular relevance for standard setting – for as long as standards are based on (patented) technologies. The latter is increasingly the case because, through time, standardization has evolved from the definition of interface specifications enabling interoperability to the joint development of large technological platforms including critical technologies.<sup>16</sup>

The analysis in the remainder of this study is to be placed within the proper context of the existing institutional arrangements governing the process of standardisation. This framework is partly presented in section 2.2 which describes the relations between stakeholders and institutions: standard setting organisations (SSOs), patent holders, the European Commission, and patent offices. Section 2.3 then completes the description of the institutional framework by describing licensing motives and practices that characterise the relationship between patent holders and standard adopters as well as the relationship among patent holders.

### 2.1 The economics of information and innovation

The principle elements of the study that will be introduced in this section are: what is an efficient market outcome (sub-section 2.1.1); what is the relation between (the incentives for) innovation and intellectual property rights (sub-section 2.1.2); and what are the motives for collaboration in innovation and in standardization (sub-section 2.1.3).

#### 2.1.1 *Efficient market outcomes and market failures*

The term welfare has different dimensions. First, it refers to production factors being used in the most efficient way (productive efficiency) such that alternative use of production factors yields lower value added. Second, welfare refers to goods, services and resources being allocated to those users that place the highest value to them (allocative efficiency). Alternative allocations then yield lower utility / value added. In the short-run a market will result in efficient allocation of resources, goods and services if the market is free from market failures: 1) no externalities, 2) no information problems, 3) goods or services are rival and exclusive, and 4) no significant market power. However, efficiency has to take the factor time into consideration as well. Efficiency in the short-run can be sacrificed (e.g. in the form of accepting market power and higher prices) for longer-term welfare (e.g. through innovation).

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<sup>16</sup> A typical example is the mobile cellular industry with the GSM and LTE standards.

## Market failures in the market for information and technology

Maximising the sum of short-term and long-term efficiency is a rather delicate balancing act, notably when talking about the market for information and technology, because these markets are often characterised by all four market failures mentioned above. First, information goods are often non-rival and non-exclusive and transactions (of information) are inherently characterised by an information asymmetry<sup>17</sup> as well as information shortage.<sup>18</sup> Non-rivalry and information asymmetry are factors that can seriously hinder the marketing of information and technology, reducing the incentives to innovate. Second, measures to correct these market failures and restoring the incentives to innovate<sup>19</sup> can create market power which can lead to higher prices and lower quantities. Finally, the diffusion of information and technology involves large (positive) externalities in the form of network effects and in the form of spill-over to the economy at large.

### *Information problems (in combination with non-rivalry)*

Information asymmetry means that one party is better informed than the other party. The better informed party is thus in a better position to negotiate. To put it in simple terms, the better informed party is able to draw more resources (i.e. money) to itself only because it is better informed, not because it can create more value with those resources.

Next is the problem of information asymmetry. There may be a problem of information shortage that hinders an efficient resource allocation. Information shortages increase with the amount of information or technology (i.e. number of patents) and the number of owners (i.e. licensors). Furthermore, it imposes search costs to both suppliers (licensors) and buyers (licensees). Besides that the resources used for searching could have been employed somewhere else (which is inefficient in itself), it also delays negotiations such that opportunities are missed. This affects both the licensors as well as the licensees. Furthermore, and this typically applies to IPR, if the technology owner is not fully informed about the identity of the technology adopter, the IP owner cannot be sure he receives the appropriate payments. Notably in the presence of non-rivalry the lack of such information is a serious issue because it leads to free riding, lowering rewards and thus lowering the incentives to innovate.

### *Market power (in combination with externalities)*

Market power (granted by the patent) leads to under-supply because the seller is able to ask for monopoly rents in the absence of competition. Externalities can lead to both under and over-supply, depending on who is experiencing the externality (the buyer or the seller) and on whether the externality is positive or negative. The combination of market power and positive externalities can be more serious than market power alone. This is typically the case for information and technology in general, but externalities are even more pertinent to standards (in the form of network effects).

Externalities can also exist when complementary products (e.g. SEPs) are sold by different parties. If supplier A charges a price for product A, then the end-user's ability to pay for other products reduces. Hence supplier B is forced to lower its price. In other words, the price regime of one party imposes a (negative) externality on the price regime of the other party.<sup>20</sup> If there are a number of complementary products, the end-user is faced with an accumulation of bills that might in the end

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<sup>17</sup> Experience goods: You don't know the quality of the information you buy until you have bought it, and once you have bought it you can't return it.

<sup>18</sup> When there are a large number of information and technology sources, it is difficult to identify all the relevant ones.

<sup>19</sup> Granting the patent owner the legal right to charge for the use of the technology by assigning intellectual property right and simultaneously demanding disclosure of the information.

<sup>20</sup> In case both products are substitutes, we also observe an interdependence of price regimes among suppliers but then this effect runs through competition and results in a lower price for end-users. When products are complements, suppliers are not competing with each other.

result in a total amount that would even exceeds the amount that an individual monopolist would have charged for a single package of all complementary products. Ironically, the price that each individual seller gets in the end might be rather low. In a hypothetical, extreme case the individual sellers cannot recoup their fixed costs and the end-user pays an extremely high price.

#### *Transaction costs*

All of the above market failures increase transaction costs:

- Information shortage result in increased search costs;
- Information asymmetry results in increased costs of negotiation;
- Non-rivalry in combination with information shortage results in increased enforcement costs;
- Market power (and the abuse thereof) may lead to dispute resolution costs;
- Etc.

Transaction costs (as the term indicates) make transactions more costly. They 'glue' the process, as opposed to lubricate it. As such, transaction costs have the effect of hindering the efficient allocation of resources in terms of productive and allocative efficiency, in both the static as well as the dynamic sense.

#### **Efficiency in licensing**

In the end, what an efficient allocation means in the context of standard dependent industries is that:

- the best technologies are adopted in the standard;
- that adoption of the standard (and thus the licensing of SEPs) involves low transaction costs;
- the cumulative amount of royalties paid is fair and reasonable; and that
- there is no risk of abuse of market power.

Broadly speaking, the problems to be solved are related to a lack of transparency in the market and/or to particular behaviour of the firm (involving e.g. strategic use of market power or deliberately ignoring the obligation to pay royalties). We discuss these two categories below.

#### *2.1.2 Innovation and intellectual property rights*

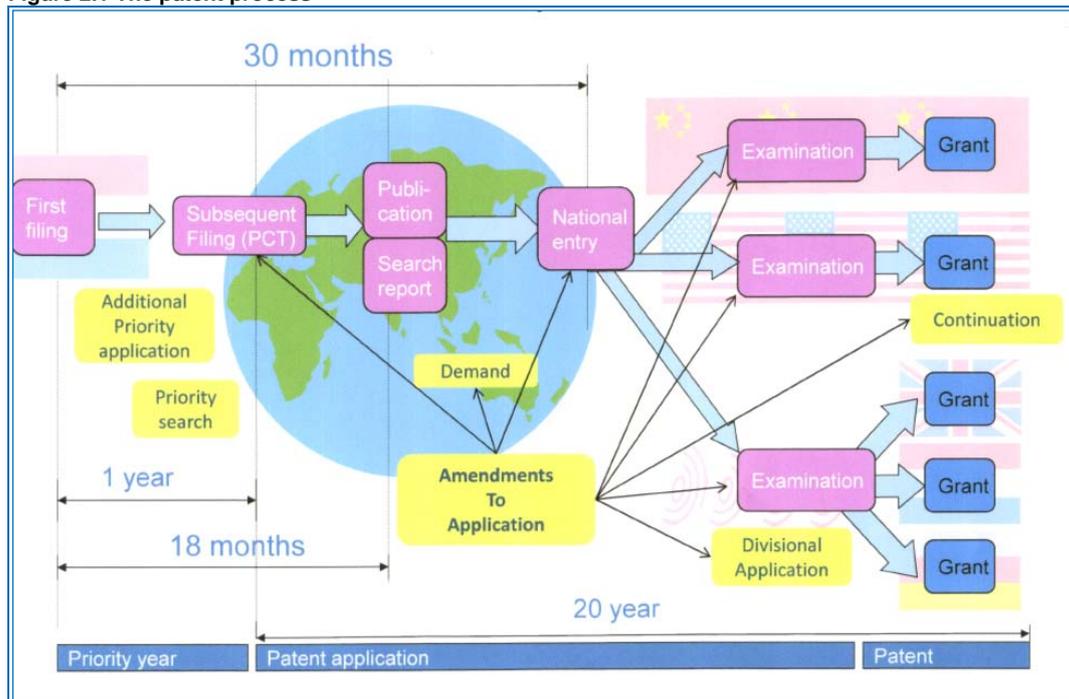
As mentioned above, the public goods character of information (non-rivalry and non-excludability) makes that (in the absence of any further institutional measures) there are no barriers to free riding, which reduces the incentives to invest / innovate. To assure firms have the opportunity to earn an appropriate return on investment, the law provides the possibility to protect the intellectual property that results from the research and development efforts. The types of protection available include: (utility) patent, design patent, copyright and mask work to which can be added trademarks and service marks and registered design.<sup>21</sup> The types of rights vary in the period of protection from 10-20 years, while trademarks/ service marks are protected as long as these are used. Based on the IPRs being granted the firm can chose to license these rights to other parties.

In the context of this study the focus is on the (utility) patent that is intended to protect products, devices, processes and depending on the jurisdiction also computer programs and business methods. Patent filings are made at a Patent Office which examines the application to establish its novelty and grants patents. The process is depicted in Figure 2.1 (courtesy Philips).

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<sup>21</sup> See e.g. Poltorak, A. I. & P. J. Lerner (2004). *Essentials of licensing intellectual property*. Hoboken, NJ: Wiley. and Palfrey, J. G. (2012). *Intellectual property strategy*. Cambridge, MA: The MIT Press.

**Figure 2.1 The patent process**



Patents may be obtained and used for a variety of reasons: (1) to obtain 'freedom to operate'; (2) to create a source of revenue (licensing); (3) as a currency in IP negotiations, e.g., in cross-licensing; and (4) as a means to enter new markets.

It should be noted that the processes of patenting and standardization are independent but closely linked. This causes uncertainty as a certain technology may be included in a standard and at the same time be subject of a patent filing being in progress, hence, in the end of the process the patent may fail to be awarded.

In Section 2.2.5 we expand on the role of the Patent Office in the registration, examination and award of patents.

### 2.1.3 Innovation and collaboration

The fact that information (or innovation) is an input for innovation (or for producing information) makes that information goods are each other's complements, giving rise to (positive) externalities or spillovers.<sup>22</sup> This characteristic of information is reflected in the way firms innovate. Firms typically innovate in-house (to contribute to their IPR asset base) but complement these activities with research and development that is executed in collaboration with others. This may be in collaboration with competitors, in pre-competitive research projects such as the EC FP6 and FP7 programs; with universities on the more fundamental R&D, and in consortia. Also the collaboration in standards making can be considered as 'collaborative innovation'.

Because of the many market failures that characterise the market for information, collaboration in the production of information has its negative sides as well. To provide a context for such collaboration the pro's and con's of such collaboration are summarized in Table 2.1.

<sup>22</sup> Incorporating spillovers into human economic behaviour can (amongst other things) be realised by assigning property rights (Coase, 1959). As such, this is another reason for introducing intellectual property rights.

**Table 2.1 Pros and Cons of collaboration**

	Pros	Cons
<b>For producers of technologies</b>	<ul style="list-style-type: none"> <li>• Benefits from scope economies and network effects (e.g. by coordinating the production of complementary products);</li> <li>• Risk sharing (e.g. by spreading costs and development risk);</li> <li>• Incorporate spillovers (e.g. from knowledge sharing);</li> <li>• Realize scale economies (e.g. by securing a large volume; or in enforcement and search costs);</li> <li>• Internalize double marginalisation problems.</li> </ul>	<ul style="list-style-type: none"> <li>• Coordination costs;</li> <li>• Opportunity costs: can the firm develop a <i>de facto</i> standard (or a technology that is dominant in the market) by itself?</li> <li>• Moral hazard;</li> <li>• Free riding;</li> <li>• Exposed to delaying strategies by partners (unilateral actions to delay the introduction of new technologies to sweat old ones);</li> <li>• Less flexibility for individual partners to use IPRs strategically.</li> </ul>
<b>For technology adopters and consumer</b>	<ul style="list-style-type: none"> <li>• Increased network values;</li> <li>• Lower search costs;</li> <li>• Cost / price reduction (more suppliers, more competition, less tying, no double margins, etc.);</li> <li>• Ensuring compatibility among products.</li> </ul>	<ul style="list-style-type: none"> <li>• Higher prices/less variety due to market power;</li> <li>• Possible collusion resulting in a multilateral delay of introducing new technologies.</li> </ul>

Source: adjusted from [http://www.wipo.int/wipo\\_magazine/en/2012/06/article\\_0008.html](http://www.wipo.int/wipo_magazine/en/2012/06/article_0008.html).

There is a direct relationship – a tension – between the various pros and cons: coordination leads to coordination costs, sharing of experiences leads to free riding, spreading costs and risks leads to moral hazard. Furthermore, we have to recognize that the size of the effects in each quadrant and the interaction between them depend on the industry structure and the technological features of the production function.

For example, network effects and interoperability are features of the production function amplifying the incentives for technological collaboration (top left quadrant) with the purpose of setting a standard. Consequently, it also amplifies the risks (cons) of collaboration (top right quadrant). Furthermore, in this case also the gains increase for technology adopters and consumers (bottom left quadrant) when technology producers successfully collaborate (resulting in a standard).

Another example is that asymmetry among collaborators (a structural feature of the industry) enforces the incentives to cheat (such as unilaterally delaying the introduction of new technologies – top right quadrant), whereas more homogeneity among collaborators may enforce the incentives to collude in the marketing of the technology (bottom right quadrant).

### Collaboration in standard setting

Complementary between different technologies is notably an issue in standard setting – for as long as standards are based on (patented) technologies. Through time, standardization has evolved from the definition of interface specifications enabling interoperability to the joint development of large technological platforms including critical technologies.<sup>23</sup> The development of formal standards can be considered a ‘loose form’ of collaborative innovation. Sometimes, standardisation is an ex-

<sup>23</sup> A typical example is the mobile cellular industry with the GSM and LTE standards.

ante process where technologies are developed while standardisation takes place. At other times, it is an ex-post process, where firms first develop rival technologies, some of which are eventually selected in the standard. Often, the standardisation process is a mix of both. Against the background of ex post standardisation, firms often use informal consortia to define a clearer and better manageable technology roadmap ahead of the formal standard setting process. Below we quote from a paper by Baron et al (2012) presenting a comprehensive description of how this process works.

#### Joint innovation in ICT standards<sup>24</sup>

Formal ICT standards are developed in standard setting organizations (SSOs) - such as ETSI (telecommunications) or IEEE (electronics) - that are open to a broad range of stakeholders. Besides the large number of participants, the originality of this process is that it does not involve any ex ante contracting between the firms preparing to develop a standard (Ganglmair & Tarentino, 2011). The choice of standard specifications rather takes place ex post in ad hoc working groups, based on the merit of rival technologies available to solve a given technical problem. **Firms thus compete in R&D ahead of the working group meetings**, thereby generating a large volume of patented innovations of which only a fraction will eventually become essential. [to the standard].

This formal process generates costly R&D cost duplications and delays due to vested interests (Farrell & Simcoe, 2012; Simcoe, 2012). **Firms therefore increasingly rely on informal consortia to take the lead in the standard setting process** (Cargill, 2001; Lerner & Tirole, 2006). Such consortia are fora wherein a group of firms seek to agree on a common design that they will **jointly push as a standard**. While some of them substitute for the lack of formal SDOs and issue their own standards (e.g., Blu-Ray alliance or W3C for web protocols), most consortia actually accompany formal standardization. They are then a means for members to better focus their R&D investments on a common roadmap (Delcamp & Leiponen, 2012); thereby saving useless development costs while enhancing their chances to obtain essential patents (Pohlmann and Blind, 2012). Leiponen (2008) furthermore shows that participation in a consortium improves the capacity of firms to influence the technological decisions taken at the formal SSO.

Typically, standards collaboration work takes place within formal standard setting organizations (e.g. ETSI, CEN/CENELEC) that are open to all interested parties, including users and governments. This is especially the case for telecom standards and all standards related to regulated industries (e.g. network industries such as energy). The formal work in these organizations is often complemented by informal work in consortia in order to settle issues and choices in advance of the formal SSO meetings. The important difference is that consortia may not be open to all participants. Other platforms for standards making have emerged and have reached a level of recognition equivalent to those of formal SSOs, such as the IEEE SD, the standards development branch as part of the Institute for Electrical and Electronic Engineers, and the Internet Engineering taskforce (IETF).

For other standardization setting work, for instance in consumer electronics, there are no specialized formal standard setting organizations and firms typically use consortia to develop the standard. In those cases there frequently develops a 'war between standards', developed and supported by different consortia, aimed at achieving market domination.

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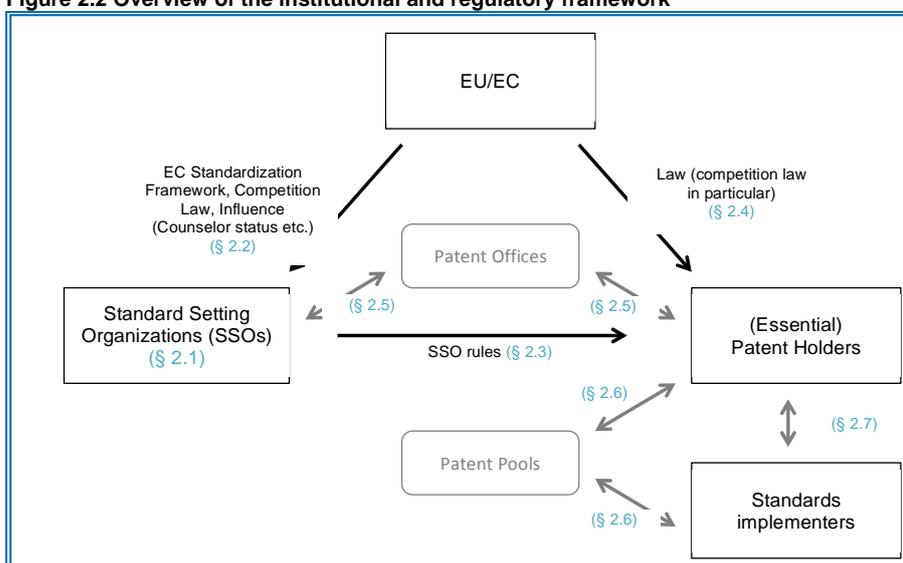
<sup>24</sup> Quoted literally from Baron, Meniere, and Pohlman (2012) "Joint innovation in ICT standards: how consortia drive the volume of patent filings", Working paper, June 11.

## 2.2 Standardisation: institutions and rules

This section provides an overview of the institutional context of standardisation (with an emphasis on patents related to standards) and the regulatory framework in which these standardisation processes and their patent-related issues take place (with an emphasis on Europe).

Figure 2.2 summarizes this institutional and regulatory framework, and also provides the structure of this and the following section. It starts by discussing the institutional setting of standard setting organisations (sub-section 2.2.1). It continues by examining the three most important relations between the actors, being the relation between the EU and SSOs (sub-section 2.2.2), the relation between SSOs and patent holders (sub-section 2.2.3), and between the EU and patent holders (sub-section 2.2.4). The direction of the arrows in the picture denotes the main direction of influence, although these are all obviously two-way relationships. The description continues by considering two additional institutions, being patent offices (sub-section 2.2.5) and patent pools (Section 2.3.4). In the final section we discuss licensing motives and practices.

**Figure 2.2 Overview of the institutional and regulatory framework**



### 2.2.1 Institutional context of standard setting organisations

Standardisation is an activity that dates back to ancient cultures like those in China and Mesopotamia, and were already quite visible in the Roman empire, where for instance the gauge of cart wheels was subject of a standard. It gained traction in the industrial revolution, where the standardisation of rifles was one of the first high-impact projects, and later catalysed by the Taylor system of production. Over the course of the years, a diverse system of institutions has developed for standardisation. Organizations that produce standards are typically known as Standard Setting Organisations (SSOs) or Standard Developing Organisations (SDOs).<sup>25</sup> While there are multiple ways to categorise these institutions, we will distinguish the following three categories: (1) Formal, recognized standards bodies; (2) Quasi-formal standards bodies and (3) Standardization consortia. Whatever the category, it is usually stakeholders that work together on a voluntary basis to produce standard. SSOs themselves do not create standards, their members or participants do.

<sup>25</sup> The academic discussion on whether there is a difference between these two terms goes beyond the focus of this report, in this report we will use SSOs from now on.

### Formal, recognized standards bodies

This first category refers to (often long established) organisations that are recognized as such by regulators as standard setting organisations (we will revisit this recognition in Section 2.2.2.)<sup>26</sup> This recognition can have different forms. Typically, a distinction is made between three geographic levels: global, regional and national. Table 2.2 provides examples. While the table focuses on the European regional context, the US, for instance, has a somewhat similar setting with ANSI as an umbrella organisation that accredits other organisations allowing them to produce American National Standards.

**Table 2.2 Examples of formal recognized standards bodies**

Scope	General	Electrical engineering	Telecommunications
Global	International Organisation for Standardisation (ISO)	International Electrotechnical Committee (IEC) <sup>27</sup>	International Telecommunication Union (ITU)
Europe	Comité Européen de Normalisation (CEN)	Comité Européen de Normalisation Electrotechnique (CENELEC)	European Telecommunications Standardisation Institute (ETSI)
National (examples)	DIN (Germany), AFNOR (France), NNI (Netherlands) <sup>28</sup>	Netherlands: NEC <sup>29</sup>	(none)

The formal, recognised bodies often focus on one of the following topical areas: general, electrical engineering (specifically), or telecommunications. To address situations of overlap, they often cooperate or coordinate their activities, for instance in the Global Standards Collaboration (GSC) or via bilateral agreements such as Memoranda of Understanding (MoUs). Sometimes, joint standardization activities are established, significant examples being the JTC 1 Joint Technical Committee between ISO and IEC, and the common development of the popular video compression standard known as H.264 between the ITU and ISO (this standard is used for Blu-Ray players, among many other applications). Nonetheless, there is also an increasing sense of competition between standards setting organisations (including quasi-formal standards bodies and consortia / fora) as all of them have a desire to serve new and promising application areas, such as machine-to-machine communications, next-generation networks (NGNs), smart grids, and more. In some cases, there is collaboration or a ‘division of labour’ between two or more standards setting organisations (often formalized in a Memorandum of Understanding), other times, they compete by developing their own standard, hoping it will become successful in the market (e.g. the various competing 3G standards, the various standards for home networks, or HIPERLAN vs. IEEE802.11).

### Quasi-formal standards bodies

The second category covers the quasi-formal standards bodies. These bodies have attained a status and position that is quite comparable to that of the formal recognised bodies, but do not have the formal recognition. In many other ways, such as being open to all stakeholders, producing

<sup>26</sup> While the term ‘de-jure’ standards and ‘de-jure SSOs’ has been widely used in the standards’ literature, we rather not use this confusing term, as very few legislators directly refer to standards in a sense that is binding to implementers (see also the discussion of the New Approach in this chapter).

<sup>27</sup> IEC is also known as the Commission Electrotechnique Internationale.

<sup>28</sup> DIN: Deutsches Institut für Normung. AFNOR: Association Française de Normalisation. NNI: Nederlands Normalisatie-Instituut.

<sup>29</sup> NEC: Nederlands Elektrotechnisch Comité.

publicly available standards, and having balanced IPR rules, these bodies are comparable to the formal recognised bodies.<sup>30</sup> Examples are the IEEE Standards Association (IEEE SA), the Internet Engineering TaskForce (IETF) and the World Wide Web Consortium (W3C). The standards of these organisations have a broad impact and are widely accepted within the industry.

### Standardisation consortia

The third category comprises the organisations known as standardisation consortia (sometimes called 'fora' or Special Interest Groups - SIGs). They may have been established for a single, very specific purpose or technical standard ('single topic'), but they often have a wider appeal. While firms or other parties can relatively easily start any new desired standardisation activity within both previous categories of SSOs, there are reasons why they might prefer to set up a new consortium instead. One reason is that a consortium may limit participation to invited parties (although it does not necessarily need to do so). Obviously, it is easier to reach consensus among a smaller group of like-minded partners than consensus in a setting where all stakeholders are present. Other reasons may be speed (some believe that consortia can act faster, although this is disputed by others), better possibility concerning confidentiality, and more freedom to set specific IPR rules.<sup>31</sup>

Worldwide, there are a large number of standardisation consortia, some national or regional in scope, some global. In fact, the well-known live inventory of SSOs by Andrew Updegrave<sup>32</sup> includes over 800 organizations, of which the lion's share is best characterized as consortium. Also CEN publishes such a list, although a shorter one.<sup>33</sup>

It is important to note that although the above categories are insightful in terms of understanding and analysing the field, the distinctions can also be somewhat blurred in reality. An activity might start up as a private consortium but at a later stage brought into a quasi formal or even a formal recognized standards body (example: Bluetooth, CD specifications, DVB).<sup>34</sup> Also, formal recognized standards bodies often collaborate with consortia, and sometimes provide the full set of necessary facilities to them to developed standards, as a commercial service (for instance, ETSI provides such facilities for the Open Mobile Alliance, OMA).

#### 2.2.2 The relation between the EU and SSOs

Standardisation has a substantial impact on society with both positive and negative effects, as summarized in Table 2.3. In addition, the standardisation *process* as such is a particular one, being a joint action of parties (i.e. SSO members) that are often in competition with each other outside the SSO, or otherwise often have a complex relationship within a particular value chain. Not surprisingly, many regulators have taken the view that they would like to promote standardisation, recognising the large benefits to society as a whole, while trying to provide safeguards when it comes to possible negative effects of such activities, including possible anti-competitive behaviour or other undesirable behaviour of those that are involved in such processes. This explains why the relationship between regulators and SSOs can be a complex one.

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<sup>30</sup> Several of the aspects mentioned relate to the concept of 'open standards'. This term, however, has different meaning to different persons. We will not go in detail here, but refer instead to Krechmer, K. (1998). *The Principles of Open Standards*. Standards Engineering, 50(6), 1-6, and Andersen, P. (2008). *Evaluation of Ten Standard Setting Organizations with Regard to Open Standards*. Copenhagen, Denmark: IDC.

<sup>31</sup> See Hesser, W. (Ed.). (2012). *Standardisation in Companies and Markets* (Vol. 3rd edition). Pro Norm, Page 18.

<sup>32</sup> <http://www.consortiuminfo.org/links/>.

<sup>33</sup> <http://www.cen.eu/cen/Sectors/Sectors/ISSS/Consortia/Pages/default.aspx>.

<sup>34</sup> DVB even had a predecessor that was formal through EC regulations regarding the development of HDTV. An attempt to replicate the success of GSM, see De Bruin, R and Smits, J.M. (1999) *Digital Video Broadcasting; Technology, Standards and Regulations*, Boston, MA, Artech House, pp. 93-111.

**Table 2.3 Some advantages and disadvantages of standards, from a users / public perspective<sup>35</sup>**

Advantages of standards <sup>36</sup>	Disadvantages of standards <sup>37</sup>
<ul style="list-style-type: none"> <li>• Increased network value for users;</li> <li>• Lower switching costs;</li> <li>• More suppliers;</li> <li>• More competition later in product life cycle;</li> <li>• Lower prices;</li> <li>• Greater offer and lower prices of complementary good;</li> <li>• Less risk of tying;</li> <li>• Easier evaluation of offerings;</li> <li>• Allows for certification;</li> <li>• Facilitates market liberalisation;</li> <li>• Easier interchangeability of products or services;</li> <li>• Easier communication between actors;</li> <li>• Less duplication;</li> <li>• Easier combination of products or services;</li> <li>• Reduces risk for choosing a future loser;</li> <li>• Lower risk for one-supplier dominated markets.</li> </ul>	<ul style="list-style-type: none"> <li>• Reluctance towards newer and better standards;</li> <li>• Loss of variety;</li> <li>• Less competition early in product life cycle;</li> <li>• Protection of markets; entry barrier;</li> <li>• Bias to large vendors;</li> <li>• Bias to large purchasers;</li> <li>• Costs to rival vendors;</li> <li>• Large power for standards sponsor;</li> <li>• Higher costs associated with over-standardisation;</li> <li>• Higher costs associated with gateways;</li> <li>• Costs of setting the standard;</li> <li>• Congestion costs;</li> <li>• Limiting performance or functionality.</li> </ul>

The European Union has a long history when it comes to its position on technical standards. Already since the establishment of the ECSC and the EEC in the 1950s, the importance of technical standards was appreciated. Initially, the EC included many specific, technical specifications in its legislation in an attempt to harmonise many of the European markets for products and services. Gradually, it was realised that such detailed rules were undesirable, as well as very resource-intensive. Increasingly, it was realized that different national standards and different member state laws and regulations on standards became more and more a barrier to the cross-border exchange of goods,<sup>38</sup> which is hindering the central goals of the EC, i.e., the creation of a common market. In the mid-1980s, the so-called New Approach to Standards was introduced to address these concerns.<sup>39</sup> This new approach was based on four fundamental principles. In short, these principles are as follows:<sup>40</sup>

1. Legislative harmonisation should be limited to the adoption of essential safety requirements (or other requirements in the general interest) with which products on the market must conform, and which therefore should enjoy free movement in the Community;
2. European standards organisations are entrusted with the task of drawing up harmonised standards for products that conform to these essential safety requirements;
3. These harmonised standards are not compulsory and maintain their status as voluntary standards;
4. National authorities are obliged to recognise that products manufactured in conformity to these harmonised standards are presumed to conform to essential requirements.

<sup>35</sup> Based on Bekkers, R. N. A. (2001). *Mobile Telecommunications Standards: GSM, UMTS, TETRA and ERMES*. Boston, MA: Artech House.

<sup>36</sup> For an elaboration of these items, please refer to the original source, page 214-217.

<sup>37</sup> Ibid.

<sup>38</sup> See Hesser, W. (Ed.). (2012). *Standardisation in Companies and Markets* (Vol. 3rd edition). Pro Norm, Page 813-870.

<sup>39</sup> For a detailed description of the New Approach, see Farr, S. (1996). *Harmonisation of technical standards in the EC* (Second edition). Chichester, UK etc.: John Wiley & Sons.

<sup>40</sup> Ibid, p. 24.

The European Commission took a rather pragmatic legal approach towards standardisation and its importance for the Common market. Although an approach through the use of competition law was possible, the European Commission argued that using the legal basis of harmonisation legislation from the Treaty would prevent a large amount of competition cases.<sup>41</sup>

To protect the consumer, the European Commission adopted a number of directives that contain essential safety requirements (often simply called essential requirements) for specific product families, ranging from general categories like toys and electrical apparatus, up to very specific categories such as pressure vessels, elevators and high-speed trains. In principle, any product brought onto the European market must comply with the relevant directives. Manufacturers are allowed to test the product against the relevant requirement (self-certification) and subsequently put the 'CE' mark on the product.

What does the New Approach mean for the role of standardisation bodies? Central to the idea of the New Approach is that the EC can ask ('mandate') recognised standards bodies to produce certain standards known as European Norms (ENs). Compliance with an EN automatically implies that all the relevant essential requirements are met, and standards implementers have no additional burden to prove so. Should a firm want to implement, for instance, another technology than the one covered by these standards, it is free to do so, but does have the additional burden of proving its products still do meet the essential requirements.

The first element of the EU's regulatory framework on standards, fully in line with the EC's general New Approach policy, is Directive 98/34EC, which elaborates on the role of standards in the EC and establishes that three European standardization organizations, CEN, Cenelec and ETSI are recognized standards bodies within the EU. These organizations also receive funds from the EU.<sup>42</sup> While other SSOs are extremely important for the European market and European companies as well (ISO, IEEE, IETF, OMA, and many more),<sup>43</sup> they are not in the category of 'recognized standards bodies' in this directive.

Fast changes in the field prompted the EC to order several studies, such as the one carried out by DLA Piper,<sup>44</sup> and in 2005 the Commission published 2010-2013 Action Plan for European Standardisation,<sup>45</sup> which is updated regularly, and in 2010, a broad public consultation was held on the review of the European Standardisation System.<sup>46</sup> Specifically for the field of ICT, a White Paper was released in 2009.<sup>47, 48</sup> In 2011, the EC took a number of important steps, by publishing a strategic vision<sup>49</sup> and a proposal<sup>50</sup> how to update its entire standardization framework (including

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<sup>41</sup> Guidelines on the application of EEC competition rules in the telecommunications sector (1991/C 233/02). OJ C 233, 6.9.1991, p. 2–26.

<sup>42</sup> This is established in Decision No 1673/2006/EC. There are both structural funds for the secretariats, as well as specific funds when the EC requests one of these bodies to develop a specific standard ('mandate').

<sup>43</sup> At <http://www.consortiuminfo.org/links/>, Andrew Updegrave maintains a list of over 800 SSOs and consortia that are important (or less important).

<sup>44</sup> DLA Piper, Delft, T. U., & Uninova. (2007). EU Study on the specific policy needs for ICT standardisation. European Commission.

<sup>45</sup> The most recent version is European Commission. (2011). 2010-2013 Action Plan for European Standardisation. Ref. Ares(2011)754197 - 11/07/2011. Brussels: European Commission.

<sup>46</sup> See [http://ec.europa.eu/enterprise/policies/european-standards/standardisation-policy/policy-review/public-consultation-2010/index\\_en.htm](http://ec.europa.eu/enterprise/policies/european-standards/standardisation-policy/policy-review/public-consultation-2010/index_en.htm).

<sup>47</sup> European Commission. (2009). WHITE PAPER Modernising ICT Standardisation in the EU - The Way Forward COM(2009) 324 final (European2 Commission2 ed.). Brussels: Author.

<sup>48</sup> One of the possible approaches that the white paper highlighted was the introduction of ex-ante declaration of most restrictive licensing fees, but that approach met resistance from a variety of actors and has not been embraced widely.

<sup>49</sup> European Commission. (2011). Communication COM(2011) 311/2 from the Commission to the European Parliament, the Council and the European Economic And Social Committee: strategic vision for European standards: Moving forward to enhance and accelerate the sustainable growth of the European economy by 2020. Brussels: European Commission.

Directive 98/34EC), accompanied by an impact assessment.<sup>51</sup> A significant change in the proposed framework is that, for instance, also standards from other SSOs than the recognized bodies may be considered for procurement. This includes organizations usually referred to as consortia and fora (but under the condition they meet certain criteria). This development is important for this study, because it is one more reason to look at patents and standards beyond the traditional or recognized SSOs.

The EC also has direct relationships with – at least – the three recognized European standards bodies by having a special membership status (like the Counsellor status in ETSI). This status, in combination with other direct or indirect influences the EC has on such organization, may be used to influence decisions (and has been used as such in the past).<sup>52</sup>

Concerning safeguards to avoid anti-competitive behaviour in the standard-setting context, the Commission has provided some basic principles in its Guidelines on Horizontal Co-operation Agreements.<sup>53</sup> As summarized recently by a commentator,<sup>54</sup> these guidelines consider:

1. If companies were to engage in anti-competitive discussions in the context of standard-setting, this could reduce or eliminate price competition in the markets concerned, thereby facilitating a collusive outcome on the market;
2. Standards that set detailed technical specifications for a product or service may limit technical development and innovation... Once a technology has been chosen and the standard has been set, competing technologies and companies may face a barrier to entry and may potentially be excluded from the market... In addition, standards requiring that a particular technology is used exclusively for a standard or preventing the development of other technologies by obliging the members of the standard-setting organisation to exclusively use a particular standard, may lead to the same effect;
3. Standardisation may lead to anti-competitive results by preventing certain companies from obtaining effective access to the results of the standard-setting process... If a company is either completely prevented from obtaining access to the result of the standard, or is only granted access on prohibitive or discriminatory terms, there is a risk of an anti-competitive effect.

### 2.2.3 The relation between SSOs and patent holders

Virtually all SSOs have a set of rules that members or participants need to follow. These sets of rules include also the way SSOs deal with patent holders. Although SSOs may also contact third party patent holders and request certain things, these third parties are not bound by any SSO rules.

The SSO rules and the way they are institutionalized can be very diverse.<sup>55</sup> Whatever the implementation, virtually all SSOs seek to find a way to have certain rules binding to members, and

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<sup>50</sup> European Commission. (2011). Proposal COM(2011) 315/2 for a Regulation of the European Parliament and of the Council on European Standardisation and amending Council Directives 89/686/EEC and 93/15/EEC and Directives 94/9/EC, 94/25/EC, 95/16/EC, 97/23/EC, 98/34/EC, 2004/22/EC, 2007/23/EC, 2009/105/EC and 2009/23/EC of the European Parliament and of the Council. Brussels: European Commission.

<sup>51</sup> European Commission. (2011). SEC(2011) 671: Impact Assessment: Accompanying document to the Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on European Standardisation and amending Council Directives 89/686/EEC and 93/15/EEC and Directives 94/9/EC, 94/25/EC, 95/16/EC, 97/23/EC, 98/34/EC, 2004/22/EC, 2007/23/EC, 2009/105/EC and 2009/23/EC.

<sup>52</sup> As a matter of illustration, we refer to Section 4.6 of the ETSI Guide on IPRs, which witnesses the way in which the EC intervened to include particular safeguards for public interests in the ETSI IPR policy.

<sup>53</sup> European Commission (2011). Communication from the Commission (2011/C 11/01) on Guidelines on the Applicability of Article 101 of the Treaty on the Functioning of the EU to Horizontal Co-operation Agreements.

<sup>54</sup> Barazza, S. (2013). Hold-up and standard essential patents: leading economists weigh in. *The IPKat weblog*, Monday, 11 March 2013. Retrieved from <http://ipkitten.blogspot.nl/2013/03/hold-up-and-standard-essential-patents.html>.

<sup>55</sup> This is entirely different in an international treaty organisations from a private organisation with members, for instance.

enforceable if necessary. In the context of this study, we are particularly interested in the SSO rules on intellectual property. The large majority of SSOs has such rules, and they usually come in two categories: (1) intellectual property rules concerning the actual, literal text of the produced standards and (2) intellectual property rules concerning protected technologies that might be necessary to implement the standard.

The first category is typically about copyrights, and these rules usually define that the SSO becomes the copyright owner of all the text of the standards it produces, regardless of who provided input. In this report, we will pay no further attention to these rules. The second category of IPR rules, however, is core to this study. They typically concern patents (some SSOs actually refer to a patent policy instead of an IPR policy), although it might also involve copyrights or other IPRs – as long as they are necessary to implement the standard in question, although, such other forms of essential IPR are very rare. Moreover, most policies that do cover non-patent essential IPR do not seem to be very effective in doing so since their language is often quite specifically geared to patents and not applicable for other IPRs. From now on, this report refers to this second category when it refers to SSO IPR rules and will simply refer to patents, even though we are aware that some policies include other forms of IPR as well.

The very idea that the implementation of standards could require the use of patented technology is hardly new. As early as 1932, ANSI's Committee on Procedure made the following recommendation: *"That as a general proposition patented design or methods not be incorporated in standards. However, each case should be considered on its own merits and if a patentee be willing to grant such rights as will avoid monopolistic tendencies, favourable consideration to the inclusion of such patented designs or methods in a standard might be given."*<sup>56</sup> The recommendation was adopted unanimously, and marked the creation of what may have been the first formal intellectual property rights (IPR) policy relating to standards. The recommendation addressed several topics that remain key elements in the current debate on IPR in standards.

We have come a long way since 1932. It was not until the late 1980s, however, that the incorporation of patented technology in standards began to attract wider attention. This broader scrutiny may have been in large part the result of the IPR issues that surfaced regarding GSM, a mobile technology that would eventually become extremely successful.<sup>57</sup> Unfortunately, the hosting organisations of the GSM standards development process had not yet adopted effective IPR policies.<sup>58</sup> This was not unusual, because in the 1980s, many standards setting organizations (SSOs) lacked established IPR policies. Among those that did have policies in place, most were summary in nature, and many have therefore been amended and updated in later years. Over the last three decades, the attention given to such policies increased and by now many SSOs, and virtually all of the large, established SSOs, have IPR policies with varying degrees of sophistication.

In the remaining part of this section, we will discuss some of the important elements of SSO IPR policies. We need to restrict ourselves to the basics, given the many different dimensions and provisions these policies cover. This section draws heavily on a recent study that extensively

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<sup>56</sup> ANSI Minutes of Meeting of Standards Council, November 30, 1932. Item 2564: Relation of Patented Designs or Methods to Standards.

<sup>57</sup> For early issues on IPR in standards including GSM, see Bekkers, R. N. A. (2001). *Mobile Telecommunications Standards: GSM, UMTS, TETRA and ERMES*. Boston, MA: Artech House.

<sup>58</sup> GSM standardization started in the European organization for PTTs called CEPT, and was moved to ETSI on the establishment of that organization in 1988.

examined a very wide range of relevant elements of these policies and that was commissioned by the US National Academies of Science.<sup>59</sup>

### Goals of SSO IPR policies

When examining any type of policy, the first question to be addressed is what the policy aims to achieve. Perhaps surprisingly, few SSO IPR policies have explicitly stated goals or objectives. At best, a few objectives are mentioned on web portals or in FAQs, but these are often broad, and the 'official' objective of the policy in relation to which it could be assessed, is not always clear.

Sometimes there are snippets of information – often buried somewhere in the policies – that provide hints about their objectives, or the SSO's attitude towards including patented technology.<sup>60</sup>

While somewhat simplified, the goals of IPR policies can be summarized as:

1. Allow informed decisions about technology inclusion, alternatives or design around at the stage of the standards development;
2. Ensure licenses for Standard Essential Patents (SEPs) are available;
3. Prevent patent holdup;
4. Prevent patent ambush or patent blocking;
5. Prevent too high cumulative licensing fees ("royalty stacking");
6. Prevent discrimination between implementers; and
7. Ensure transparency about essential patents.

We will now elaborate these seven possible goals.

*Ad 1. Allow informed decisions about technology inclusion, alternatives or design around at the stage of the standards development.* IPR policies have the goal to support such informed decisions. In fact, this is the supposed reason why many policies specify 'early' or 'timely' disclosures. If this information is only supplied after the standard is finished, the window of opportunity to make other choices about technology inclusion, alternatives or design around is closed. A good example here is the IETF, where working groups are known to have a preference for patented technologies that are available at a royalty free basis, or technologies that are not patented at all. The IETF IPR policy helps the participants in this respect by requiring early disclosure of patents as well as statements about the conditions under which access to the technology these patents cover is available.

*Ad 2. Ensure licenses for SEPs are available.* This goal tries to prevent that one of the technologies that is indispensable to implement the standard is protected by a patent and its owner is not willing to provide any license at all. Absent other obligations, patent owners are free to choose not to license their patents. It is possible that a firm is not willing to license what it considers its 'diamonds', through which it hopes to have a competitive edge over its competitors. SSOs might want to know this in advance so they know they should not incorporate such technologies.

*Ad 3. Prevent patent holdup.* This refers to the situation where, once the patent is covered by the standard, and implementers are locked in, the patent holder charges a higher licensing fee than it could have negotiated before the technology was made part of the standard (e.g. *ex ante*<sup>61</sup>). A down-to-earth definition was recently provided by three influential individuals working for or having worked for the European Commission, the US Department of Justice, and the US Federal Trade

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<sup>59</sup> Bekkers, R., & Updegrove, A. (2012). *A study of IPR policies and practices of a representative group of Standards Setting Organizations worldwide*. Washington, DC: National Academies of Science. Retrieved from [http://sites.nationalacademies.org/xpedito/groups/pgasite/documents/webpage/pga\\_072197.pdf](http://sites.nationalacademies.org/xpedito/groups/pgasite/documents/webpage/pga_072197.pdf).

<sup>60</sup> For instance, the OASIS policy includes text that explicitly encourages the submission of existing, patented technical work. In contrast, ANSI notes that inclusion of patented technology may be justified if 'technical reasons justify this approach'.

<sup>61</sup> A term not to be confused with 'ex ante licensing of most restrictive licensing terms'.

Commission respectively: ‘*Hold-up occurs when the SEP owner approaches firms practicing the standard—after those firms have invested in developing their products that depend on the standard—with an onerous licensing demand. Assuming the patent is indeed essential and valid, the firm’s product **must** practice the patent in order to be interoperable, placing the firm in a poor bargaining position.*<sup>62</sup> In such a situation, the patent holder not only charges rent for the technical merit of the patent, it also gains from the (high) switching costs of the implementers. Patent hold-up can overcompensate patentees, raise prices for consumers who lose the benefit of competition among technologies, and deter innovation by manufacturers facing the risk of hold-up. Good definitions of hold-up in the context of standards can be found in the 2007 DoJ/FTC report<sup>63</sup> as well as in an ABA handbook on the Antitrust Aspects of Standards Setting<sup>64</sup>.

*Ad 4. Prevent patent ambush or patent blocking.* Somewhat related to item (2), this is about a concern where parties intentionally keep it unknown to other parties that they own a certain patent. Once implemented at large volume in products, they litigate their patent, hoping to make huge benefits. This concern differs from (2) as the IPR owner has not tried to keep its patent secret. In case of a patent ambush, patent owners typically try to ensure they have no licensing obligations under the policy, whereas in (2) they typically do have such obligations and admit they do so.

*Ad 5. Prevent too high cumulative licensing fees (“royalty stacking”).* This relates to a concern that a standard that is covered by a (very) large number of essential patents might face a high cumulative licensing fee, even if each individual essential patent is available at a relatively low rate.<sup>65</sup> The cumulative fee might even reach a level that prohibits actual implementation (e.g. where the total of licensing fees exceeds the market value of the product). Only a few policies have been identified having this as an explicit goal or even have elements that seem to address cumulative licensing fees.

*Ad 6. Prevent discrimination between implementers.* The concern here is that, absent other obligations, patent owners are free to discriminate between licensees. In the context of standards, this could distort the market, especially if categorical discrimination would take place, for instance established manufacturers versus new entrants, or firms with vertical integrated business models versus firms that do not own essential patents.

*Ad 7. Ensure transparency about essential patents.* The SSO might seek to disseminate knowledge about who claims to own essential patents, thus trying to facilitate the market and transactions for SEP licenses. While (again) hardly ever mentioned as an explicit goal, the very fact that many SSOs make disclosure records publicly available on their website to any member of the public suggests that they do seek to offer transparency.

### Principle approaches

In practice, SSOs follow different approaches in order to reach their goals, regardless of whether these goals were made explicit or not. The chosen approach is often a result of consensus reached among their members, and may be impacted by culture, a specific technical context, the composition of members that can vote or otherwise influence the decision processes. In a very crude way, we can distinguish the following approaches:

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<sup>62</sup> Kühn, K.-U., Scott Morton, F., & Shelanski, H. (2013). Standard Setting Organizations Can Help Solve the Standard Essential Patents Licensing Problem. *CPI Antitrust Chronicle*, March 2013 (Special Issue).

<sup>63</sup> U.S. Department of Justice, Federal Trade Commission. (2007). *Antitrust Enforcement And Intellectual Property Rights: Promoting Innovation And Competition* 35. U.S. Department of Justice & Federal Trade Commission.

<sup>64</sup> ABA Section of Antitrust Law. (2011). *Handbook on the Antitrust Aspects of Standards Setting* (Second Edition). Chicago (IL): American Bar Association.

<sup>65</sup> See Lemley, M. A., & Shapiro, C. (2006). Patent holdup and royalty stacking. *Texas Law Review*, 85, 1991-2049.

1. **Participation-based IPR policies.** Members or participants commit themselves to a policy requiring to license any eventual essential IPR at specified conditions, often defined as Fair, Reasonable and Non-Discriminatory (FRAND)<sup>66</sup> terms, or at Royalty Free<sup>67</sup> conditions. Usually, such policies do have an opt-out option should firms realize the standard to be adopted requires one of their ‘diamonds’. In such cases, a policy may specify, for instance, that this patent owner may notify the SSO of non-availability of licenses within 30 days after the draft standard is published (and the policy may require that the firm steps back from the working group that develops the standard in question). Often, firms cannot opt out if the patent covers a technical contribution they submitted themselves to the SSO. Participation-based IPR policies may include disclosure rules;
2. **Commitment-based IPR policies.** These policies seek to identify which patents are essential to a (draft) standard. Most often this is implemented through a disclosure policy, which creates disclosure obligations for patents owned by members / participants. Sometimes, members or participants also have an obligation to disclose patents owned by third parties insofar they are aware of these. After an (potential) essential patent is identified – no matter whether it is owned by a member, a participant, or a third party – the patent owner is requested to submit a licensing commitment. Some SSOs are satisfied with a FRAND commitment, others seek to have a Royalty Free commitment. A party is free whether or not it is willing to submit the sought licensing commitment. Although refusals are rare, they are allowed. In such cases the SSO rules usually specify that it should look for alternative solutions (not using the patented technology), or withdraw (work on) the standard altogether if that is not feasible.

Participation-based IPR policies are more common in smaller SSOs (especially consortia and SIGs), focusing on relatively narrow technological areas, where participants can relatively easily track their essential IPR ownership, and have agreed in advance to have such licensing obligations for this (narrow) field. Commitment-based IPR policies are more common in large SSOs, with often hundreds of working groups, where members or participants have a much harder time following all the standards being created at any given time, and where they would not easily agree to be bound to a certain licensing obligation in a wide diversity of technology fields.

### Definition of essential patents

Whatever approach an SSO follows, a central question is what actually constitutes an essential patent. A simple, layman’s definition is that a patent is essential if it is indispensable to any company wishing to implement a technical standard. In other words: there is no way to implement the standard according the specification without using the technology that is protected by the patent, or: there are no technical alternatives available for implementation that do not infringe the patent in question.

Almost all IPR policies define what an essential patent is, and while all definitions are compatible with the notion above, there is a large degree of variety and diversity in the more detailed parts of the definition. To give an idea, the definition differs in the following aspects between policies:

- whether it includes copyrights essential to implementation;
- whether it includes other IPR than patents or copyrights;
- whether it includes commercial essentiality;<sup>68</sup>

<sup>66</sup> In the US context, the term RAND (without the ‘F’) is often used. This seems to be purely a matter of convention, and does not reflect any difference in meaning or intent.

<sup>67</sup> Some policies refer to FRAND-RF, emphasizing that even though royalty free there may not be any other licensing terms of conditions that would otherwise not be fair, reasonable or non-discriminatory.

<sup>68</sup> Of the 14 SSO IPR policies investigated in the earlier cited Bekkers/Updegrave report, the policies of two bodies (IEEE and VITA) include commercially essential patents. The others do not. For more details we refer to this report (for the reference see Footnote 69).

- whether it includes IPR on optional normative portions of the standard;
- whether it includes IPR on other, externally developed standards that are normatively referenced;
- whether it excludes enabling technologies;
- whether it excludes non-essential claims that are part of the same patent;
- whether it includes pending applications;
- whether it excludes expired patents, withdrawn applications, and patents held invalid by court;
- whether it includes patents for which technical alternatives exist, but each of these alternatives is also patented;
- whether essentiality is determined with reference to final standard; and
- what is the moment of timing of an essentiality test?

## Disclosure and licensing commitments

### Disclosure

For many IPR policies, disclosure is one of the two main elements (the other one is licensing commitments, which is the topic of the next paragraph). Disclosure rules basically specify under which conditions members or participants of the SSO are required to inform the organisation that it believes to own IPRs that are essential to the standard, or may become essential when the final standards text is adopted.

The prominent presence of disclosure rules in SSO IPR policies (often half the text of the overall policy) suggests that these policies serve an important function. It may be surprising then that few policies are very explicit about what these policies are aiming to achieve. Authors of IPR policies might believe certain goals are self-evident (e.g., ensuring that all essential IPR is available on FRAND terms) but this is not always clear from the actual detailed rules and implementation. While these detailed rules and implementation do, of course, provide hints of what the supposed function of these rules is, such an analysis will usually fail to resolve all ambiguity, which suggests that many disclosure policies may aim to serve multiple goals. The very fact that these different goals may require different – and sometimes conflicting policy elements (for instance regarding the timing of disclosures) - also contributes to the ambiguity of these rules.

The study of Bekkers and Updegrave (2012)<sup>69</sup> suggests that they can serve at least one or more of the following four distinct goals:

1. To allow Working Group members to make appropriate, informed choices concerning the inclusion of technologies (merit versus costs, availability of licenses, etc.). For instance, the ANSI Patent Policy states *“There is no objection in principle to drafting a proposed American National Standard in terms that include the use of a patented item, if it is considered that technical reasons justify this approach.”* (ANSI, 2008, emphasis added). This suggests that the inclusion of patented technologies is supposed to be an informed decision, requiring technical knowledge of a potentially essential patent. Working Groups may also decide to use disclosure information to make a choice about different technical alternatives (which may or may not all be covering patented technology), or to apply efforts to design around a certain patented technology (by putting efforts in finding new options). In the IETF, Working Group members are known to have frequently considered disclosure information in this respect;
2. To record which members and participants are subject to licensing obligations following directly from the policy (such as in participation-based models);

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<sup>69</sup> Bekkers, R., & Updegrave, A. (2012). A study of IPR policies and practices of a representative group of Standards Setting Organizations worldwide. Washington, DC: National Academies of Science. Available at [http://sites.nationalacademies.org/xpedito/groups/pgasite/documents/webpage/pqa\\_072197.pdf](http://sites.nationalacademies.org/xpedito/groups/pgasite/documents/webpage/pqa_072197.pdf).

3. To serve as a trigger such that patent holders can be requested or required to make a related licensing commitment;
4. To provide information to prospective implementers regarding which companies they may want to approach to seek licenses, or know by whom they might be approached who require licenses, and to allow such implementers to assess the extent and value of the claimed patents.

Between SSOs, the exact rules show a great degree of variety. Some important dimensions in this regard include:

- What triggers a disclosure obligation?
- Whose patents must be disclosed?
- What information exactly must be disclosed?
- How is essentiality defined? (See also above);
- When must disclosures be made?
- To whom is disclosed information made available (and which information)?

Below, we will come back to several of these items, when we will discuss the degree of transparency.

#### *Licensing commitments*

Many IPR policies aim to ensure that licenses for patents with essential claims are available to all implementers, or that these patents will not be asserted against implementers of a standards-compliant product.<sup>70</sup> Many terms have been used to indicate licensing commitments, including *Licensing Statement*, *Undertakings*, *Letter of Assurance*, and *Declaration of Licensing Position* (these are all examples of commitments arising under signed documents). As indicated above, there are also standards organizations where the licensing commitment arises from being a member or a participant, without signing any specific documents in connection with the adoption of a particular standard. These latter policies typically offer an opt-out provision (either from a specific working group or from the organization itself) for firms that do not wish to make a licensing commitment.

For virtually all SSO's, the minimum goal is to ensure that all known essential IPR is available under FRAND license terms. Some SSOs, or discrete working groups within a SSO, may set a stronger requirement, and seek to ensure that all patents with essential claims are available on a royalty-free basis.

Typically, most SSOs consider their role finished once FRAND commitments (or otherwise sought commitments) are given. It is then up to the parties involved – IPR owner and implementer – to negotiate a license agreement. Should they not manage to do so, and should the prospective licensee believe that the commitment is not respected, and then they may go to court.<sup>71</sup> Also competition authorities could address whether certain conduct is compatible with FRAND commitment, if a case of possible abuse is brought to their attention.

Importantly, few SSOs further define what FRAND exactly means. This is basically left to the parties in question, and to courts and competition authorities. Here, a definition does not only relate to the licensing fees, but also to several other dimensions, as listed in Table 2.4.

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<sup>70</sup> A statement that the owner of an essential claim will not sue an implementer of a compliant product is usually referred to as a 'covenant not to assert,' or a 'non-assertion covenant.' For the sake of simplicity, when we refer to 'licensing commitments', we also include covenants not to assert, while recognizing that such covenants, strictly speaking, are not licensing commitments as such.

<sup>71</sup> Although there is still some legal discussion on who exactly the beneficiary of a FRAND commitment is.

**Table 2.4 Various dimensions associated with FRAND**

Dimension	Issues being discussed
License fees	Are there any principles that define when a licensing fee is reasonable and/or fair? Several courts and competition authorities have now embraced the view that FRAND fees should bear a reasonable relationship to the economic value of the IPR prior to its inclusion in the standard. <sup>72</sup> Yet, competition authorities can only address cases that are within their authority (e.g. the need to establish an abuse of market power) and SSOs have not (yet) adopted such definitions.
License base	There exists a wide variety of practices between industry sectors (upfront payment, per-unit or percentage). There are also different implications when markets change over time. While percentage-based fees usually do not impede a development towards lowering prices of end products, they may be an obstruction towards more integrated devices, such as laptops with a build-in 3G or 4G communications unit. Per-unit fees may have the opposite effect. In practice, some licensors facilitate changes with royalty caps or discounts. There have been suggestions to link the licensing base to the smallest identifiable unit (e.g. the communications unit in the above example).
Licensing conditions allowed or mandated	There is a diverse range of licensing conditions (other than the royalty fee) that may or may not be considered as not compatible with FRAND, such as reciprocity, defensive suspension, geographical restrictions, subject to standard compliance, etc.
(Preliminary) injunctive relief / exclusion orders	While some argue that these are the cornerstone of patent rights and litigation, others suggest these are inappropriate remedies in context of FRAND because an IPR owner by definition is already willing to license for money. Some advocate conditional access to injunctions.
Process	Does FRAND need to be respected for an initial offer of a licensor, or only to the outcome of the negotiation process? Is there a good faith obligation?

#### *Summary of disclosure and commitment rules at twelve selected SSOs*

In order to illustrate the diversity of SSO policies, we now summarize the disclosure and licensing commitment rules at 12 SSOs that were studied in-depth by Bekkers and Updegrove (2012).<sup>73</sup> We focus on those rules that have a specific link to this study – particularly to the section on transparency, below. Please note that this section presents only a very high-level overview; for details we refer to the original report.

Table 2.5 presents a general overview of the twelve selected SSO's. The selection was based on several factors, including the desire to cover some of the most significant SSOs worldwide, as well as taking some 'typical' examples of medium-sized and smaller SSOs or consortia. Because ISO, IEC and ITU share a common IPR policy, they are taken as one category (there are some exceptions, though, between the rules of these organisations).

<sup>72</sup> See European Commission (2011). Communication from the Commission (2011/C 11/01) on Guidelines on the Applicability of Article 101 of the Treaty on the Functioning of the EU to Horizontal Co-operation Agreements (see paragraph 289 in specific) and FTC (2011). The Evolving IP Marketplace: Aligning Patent Notice And Remedies With Competition. Federal Trade Commission (see pages 191-194 and 234-245).

<sup>73</sup> Bekkers, R., & Updegrove, A. (2012). A study of IPR policies and practices of a representative group of Standards Setting Organizations worldwide. Washington, DC: National Academies of Science. Available at [http://sites.nationalacademies.org/xpedito/groups/pgasite/documents/webpage/pqa\\_072197.pdf](http://sites.nationalacademies.org/xpedito/groups/pgasite/documents/webpage/pqa_072197.pdf).

**Table 2.5 General overview for 12 selected SSO's**

Organisation	Characterization	Size	Scope	Geographical focus and membership	Technical area (roughly)
ITU/ISO/IEC	Formal SSO	Large	Broad	World-wide	ITU: Telecommunications; IEC: electro technology ISO: all except the above (1)
IEEE	Consortium	Large	Broad	World-wide	ICT, power, energy, nanotechnology (more)
ETSI	Formal SSO	Large	Medium	European/Worldwide	Telecommunications
ANSI	Accreditation organization; does not develop standards	Large	Broad	United States	Any technology or service
IETF	Consortium	Large	Narrow	World-wide	Internet standards
OASIS	Consortium	Medium	Medium	World-wide	e-Business and web service standards
VITA	Consortium	Medium	Narrow	World-wide	High-demand electronics and connectors
W3C	Consortium	Large	Narrow	World-wide	World Wide Web
HDMI Forum	Consortium	Small	Narrow	World-wide	A specific video standard
NFC Forum	Consortium	Medium	Narrow	World-wide	Standards for near field (wireless) communications

Notes: (1) ISO and IEC share JTC-1 with its focus on IT standardization.

Table 2.6 summarizes some of the most relevant aspects related to the disclosure rules in these organisations. As can be seen from the table, there is a considerable degree of diversity between these organisations. Some of this diversity is the result of contextual settings (membership rules in a private body will be different from those in an international treaty organisation). Also small versus large, or technologically narrow versus broad, will impact choices. In most SSO's, however, policies are adopted by voting of members, and thus the diversity is also a result of the consensus that such members (or the most powerful members) could reach.

Finally, Table 2.7 summarizes some of the most relevant aspects related to the licensing commitment rules in these organisations. Note again the diversity. In six of the bodies, members or participants are obliged to submit a licensing declaration if they believe to own essential patents (though they are allowed to refuse licenses in that declaration, although this does not happen often). In two more bodies, parties (member or not) that are believed to own essential IPR are requested to submit a licensing obligation. In three other bodies, licensing obligations arise from participation and/or contribution (although there are usually opt-out options). Table 2.7 continues with some other aspects, with a special focus on dimensions of FRAND as listed above.

**Table 2.6 Disclosure rules for 12 selected SSO's**

	ITU/ISO/IEC	IEEE	ETSI	ANSI	IETF	OASIS	VITA	W3C	HDMI Forum	NFC Forum
Disclosure by Submitter/ WP participant / any member / recipient of draft standard (1)	O/O/V/O (2)	-/O/V/-	O/O/O/-	Left to the accredited SSO	O/O/O/O	O/O/V/R	O/O/-/-	-/-/-/O	No disclosure policy	No disclosure policy
Nature of disclosure rules for patents held by third parties	Obligatory for WG participant	Voluntary (encouraged)	Obligation	Left to the accredited SSO	Voluntary (encouraged)	Obligatory for WG participant	Depends (3)	Limited obligation (4)	No disclosure policy	No disclosure policy
Patent searches	Not required	Not required	Not required	Not required	Not required	Not required	Not required	Not required	No disclosure policy	No disclosure policy
Blanket disclosures allowed	Yes (ITU: unless unwilling to license)	Yes	No (5)	n/a (6)	Only for RF	No	No	(7)	No disclosure policy	No disclosure policy
Provisions concerning updating of disclosures	Not specified	Not specified	Updating is encouraged	Not specified	Update requests may be sent by IETF (or volunteered)	Not specified	Not specified	Not specified	No disclosure policy	No disclosure policy
Are patent disclosures being made public?	Yes	Yes	Yes (upgraded)	Not specified (may vary per SSO)	Yes	Yes	No (yes for ANS) (8)	Yes	No disclosure policy	No disclosure policy

Notes: (1) O = Obligation, V = Voluntary, R = Requested; (2) Obligation for ISO/IEC only; (3) There is a disclosure obligation for those third-party patents that are licensed. For all other third-party patents, the VITA policy has a weaker wording than the regular obligation ('must' instead of 'shall') and should probably be interpreted as 'encouraged'; (4) Disclosure of third party is only required when 'the Advisory Committee Representative or Working Group participant has been made aware that the third party patent holder or applicant has asserted that its patent contains Essential Claims'; (5) ETSI has a new, early declaration form (GL) but this is not a disclosure form (does not imply the submitter believes to own SEPs); (6) In the ANSI baseline policies, disclosures are not obligatory, but ANSI-accredited SSOs may include them in their procedures; (7) At W3C, a participant either goes with the 'default' – which is to grant licenses on RF terms – and then it does not need to disclose. Or it decides to exclude its patents from RF terms (following appropriate procedures) and then it needs to make specific disclosures; (8) Disclosures are made public by ANSI with respect to VITA standards that have been submitted to ANSI for adoption as American National Standards.

**Table 2.7 Commitment rules for 12 selected SSO's**

	ITU/ISO/IEC	IEEE	ETSI	ANSI	IETF	OASIS	VITA	W3C	HDMI Forum	NFC Forum
General obligation to submit licensing declaration	Yes		Yes	-			Yes			Yes
Presumed IPR holders receive specific request to submit licensing declaration		Yes		-	Yes					
Licensing obligations arise from participation and/or contribution				-		Yes		Yes	Yes	
Geographic scope of commitment)	World wide	World wide	[World wide] (1)	Not specified	Not specified	World wide	World wide	World wide	World wide	World wide
Defensive suspension condition)	Not specified	Not specified	Not specified	Not specified	Not specified	Allowed	Allowed	Allowed	Not specified	Not specified
Reciprocity condition	Bilateral FRAND reciprocity allowed  Bilateral FRAND-RF reciprocity allowed (2)	Not specified	[Bilateral] FRAND reciprocity allowed	Not specified	[Allowed]	Universal reciprocity allowed	Bilateral FRAND reciprocity allowed	Universal reciprocity allowed	Automatic bilateral reciprocity	Reciprocity is permitted  Bilateral FRAND-RF reciprocity allowed (2)
Are all commitments made public?	Yes	Yes	Yes (upgraded)	Yes (at ANSI and possibly also at the SSO)	Yes	n/a	No (yes for ANS) (3)	n/a (4)	n/a	No

Notes: (1) Unless a patent family member is explicitly excluded by the submitter; (2) Those that choose to commit to FRAND, can require bilateral reciprocity. Those who commit to FRAND-RF, can opt to have the freedom to nevertheless charge FRAND royalties to those licensees that did commit themselves to royalty bearing FRAND 'only'; (3) Commitments are made public by ANSI with respect to VITA standards that have been submitted to ANSI for adoption as American National Standards; (4) Public information is made available on which parties of a WG carry a licensing obligation because of participation. Public information is also made available on the licensing commitments made by other members (not participating nor submitting), and invited experts. Licensing commitments made by non-members are not yet available.

## Transparency into SEPs

As noted above, one of the possible roles of IPR policies is to provide transparency into SEP ownership. Even while such a role is not explicitly stated, it is often obvious from the conduct of SSOs (available disclosure information publicly available) that this is an objective. In our analysis we start with the question what constitutes the relevant public. Which different stakeholders may have a legitimate interest in disclosure information? We believe this array of stakeholders to be quite wide:

- **Working Groups and participants in these groups.** It is these groups and individuals that may have the greatest need for disclosed information in order to perform their work and pursue their collective and individual goals. As argued above, these groups attempt to make informed decisions about technology and about the inclusion of patented technology in particular (especially if these technologies are part of a substantial, written technical contribution by the owner of the patents). In other cases, though, participants may seek to avoid reviewing other companies' patented information and any proposed licensing arrangements for both practical and legal reasons. It also may depend on the sheer number of potentially essential patents;
- **Actual and prospective implementers.** Vendors or other implementers of the standard have a need to know which parties claim to own essential IPR, which specific patents they believe may contain essential claims, whether the IPR holder will require implementers to obtain a license, and if so, whether payment of a royalty or other fee will be required. This allows such implementers to take related decisions, including whether to contact the IPR holder (note, however, that many do not proactively contact disclosing patent holders for a diversity of reasons), or assess which companies might later come to them and require them to take licenses (with associated costs). Sufficiently specific disclosure information also allows implementers to review how many possibly essential patents are disclosed, their nature and 'value', and whether they agree that the patents in question are indeed valid, essential and/or infringed by their specific products. Finally, disclosure information can generate an understanding of the overall IPR coverage of a given standard and the relative position of the various IPR owners;
- **IPR owners.** Owners of essential claims may wish to assess their essential claims in the context of the claims owned by others, and develop a general idea of what fee levels might be appropriate and within the boundaries of their FRAND commitment, based on their overall knowledge relating to industry norms, the number of owners of essential claims under the standard, and the past practices of other companies with which they may be familiar;
- **Policy makers and public authorities.** The first group of users in this category is perhaps the competition/antitrust authorities, who may wish to monitor standardization processes to ensure that no harm is done to competition. When a case of possible anticompetitive behaviour is brought to their attention – either informally or as a formal complaint – they may wish to consult relevant patent disclosure databases. Such databases may show whether certain parties respected their obligations and commitments (such as disclosure obligations), and can help competition authorities to assess a case of possible abuse in its actual context, for instance by considering all other disclosed patents (for example, to compare a SEP portfolio of a given firm with that of all other firms that disclosed SEPs). More generally, policy makers may have interest in SEP disclosure databases to understand how dependent industries are on SEPs, among other things;
- **Judges and Juries.** Disclosures, once made (and even more significantly, not made), become matter of record that cannot later be retroactively modified or supplemented vis-à-vis establishing compliance with the rules of an IPR policy. Accordingly, they may provide key benchmarks of behaviour during the standards development process. As a result, they are crucial to determining which parties are bound to specific commitments regarding essential patents. Moreover, because several courts and competition authorities have embraced the view that FRAND fees should bear a reasonable relationship to the economic value of the IPR prior

to its inclusion in the standard, disclosure information has become important input to develop appropriate benchmarks for either of the parties, an independent expert retained by the parties or the court, or other stakeholders;

- **Academics.** Disclosure databases provide a crucial, empirical, tool for gaining a better understanding of the standardization processes and its results. Insights gained and shared by academics can in turn better inform and support policy makers, antitrust/competition authorities, and judges in their tasks.

#### 2.2.4 *The relation between the EU and patent holders*

Any company operating in Europe must comply with European legislation. In this context, the European competition rules (current Art 101 and 102 of the TFEU Treaty) are particularly important.<sup>74</sup> Among other things, these competition rules forbid the abuse of firms' dominant market positions. The degree to which these rules are applicable to intellectual property rights as well has created an interesting debate, including the *Magill* case<sup>75</sup> (on copyrights), and the Essential Facilities doctrine (once advocated by a former Director in the Competition Directorate General of the Commission of the EC, Temple Lang).<sup>76</sup> In more recent years, clearer guidance on this has been created by the issuance of the Technology Transfer Block Exemption Regulations<sup>77</sup>, where technology transfer agreements include patent licensing agreements, and a further communication from the Commission concerning horizontal co-operation agreements from 2011.<sup>78</sup> (In this Communication, Chapter 7 is entirely dedicated to standard setting environments. Concerning FRAND fees, paragraph 289 is particularly relevant).

In recent years, competition authorities started to be more vocal about IPR abuse in standards. In his speech on 10 February 2012, Joaquín Almunia, Vice President of the European Commission responsible for Competition Policy, stated that the EC is determined to use antitrust enforcement to prevent the misuse of standard essential patents (SEPs).<sup>79</sup> Since then, DG Competition has formally opened investigations against parties that are suspected of making such abuse. Taking this one step further, Joseph F. Wayland, the Acting Assistant Attorney General Antitrust Division U.S. Department of Justice, delivered a speech on September 21<sup>st</sup> 2012 where he not only expressed similar concerns, but also made a number of specific recommendations to standard setting organizations.<sup>80</sup> The FTC showed its muscles in late 2012 with a Consent Order in the

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<sup>74</sup> Furthermore, in the text below we will also consider the US antitrust law; for reasons that will become clear below.

<sup>75</sup> Radio Telefís Éireann (RTE) and Independent Television Publications Ltd (ITP) v Commission of the European Communities. - Competition - Abuse of a dominant position - Copyright. - Joined cases C-241/91 P and C-242/91 P. European Court reports 1995 Page I-00743.

<sup>76</sup> See Temple Lang, J. (1995). Defining legitimate competition: Companies' duties to supply competitors, and access to essential facilities. In B. Hawk (Ed.), Annual proceedings of the Fordham corporate law institute: International antitrust law & policy (pp. 245-313). New York: Juris Publishing and Temple Lang, J. (1996). European community antitrust law-innovation markets and high technology industries. New York: Fordham Corporate Law Institute.

<sup>77</sup> European Commission. (2004). Commission Regulation (EC) No 772/2004 of 7 April 2004 on the application of Article 81(3) of the Treaty to categories of technology transfer agreements. OJ L 123 of 27.4.2004. Brussels: European Commission.

<sup>78</sup> European Commission. (2011). Communications from the Commission (2011/C 11/01): Guidelines on the applicability of Article 101 of the Treaty on the Functioning of the European Union to horizontal co-operation agreements. European Commission.

<sup>79</sup> Joaquín Almunia Vice President of the European Commission responsible for Competition Policy Industrial policy and Competition policy: Quo vadis Europa? New Frontiers of Antitrust 2012 – Revue Concurrences Paris, 10 February 2012. Reference: SPEECH/12/83 Available at [http://europa.eu/rapid/press-release\\_SPEECH-12-83\\_en.htm](http://europa.eu/rapid/press-release_SPEECH-12-83_en.htm).

<sup>80</sup> US Department of Justice (DOJ). (2012). Antitrust Policy in the Information Age: Protecting Innovation and Competition. Antitrust Policy in the Information Age: Protecting Innovation and Competition. Talk delivered by Joseph F. Wayland, Acting Assistant Attorney General Antitrust Division, at the Fordham Competition Law Institute, September 21, 2012. Available at <http://www.justice.gov/atr/public/speeches/287215.pdf>.

matter of Google<sup>81</sup> and with a Complaint and Order against the German Robert Bosch company<sup>82</sup>, two cases involving standard-essential patents.

At several recent occasions, DG Competition, FTC and DoJ have indicated that they are working closely together on this matter and adopt a similar, harmonized and strict approach towards abuse of SEPs.<sup>83</sup> As stated earlier, in March 2013, three influential individuals working for or having worked for the European Commission, the US Department of Justice, and the US Federal Trade Commission respectively, reiterated their views and argued that SSO's should take more steps in order to reduce problems associated to hold-up behaviour.<sup>84</sup>

### 2.2.5 Patent offices

For a long time, patents were seen as the sole authority of nation states, in Europe as well as elsewhere in the world. Over the course of several hundreds of years, various national patent systems with a fascinating and divergent history,<sup>85</sup> slowly converged into more similar, but not identical systems. A key ingredient in this convergence was a set of international agreements, such as the Paris Convention for the Protection of Industrial Property (1883, later updated), the Patent Cooperation Treaty (PCT), 1970, single filing of an international application, and the GATT and WTO's Trade-Related Aspects of Intellectual Property Rights (TRIPS), which defined certain minimum standards to which each national patent law has to comply.

While patent systems have basically remained national systems up to today, an important development was the European Patent Convention (EPC) from 1973, signed by all EC member states (and also other countries). As a result of this convention, the European Patent Office (EPO) was established and given the authority to receive and examine patent applications. If EPO decides favourably that an application meets the necessary criteria of novelty, non-obviousness and industrial application, then a patent will be granted in all the participating EPO countries for which the applicant has sought protection. It is important, however, that a European patent is not a unitary right, but a group of essentially independent nationally-enforceable, nationally-revocable patents. While the EPC and EPO have certainly achieved a lot, one of the current challenges is still that of 'forum shopping', where parties strategically choose national courts for their litigation, knowing that some choices will give them particular advantages over their competitors. This is also relevant in the context of standards and patents, where the German system with its bifurcation<sup>86</sup> (a rule that the validity of patents can be challenged only in separate actions from an infringement lawsuit) strongly attracts holders of standard-essential patents.<sup>87</sup> It must be stressed, though, that forum shopping is not a unique European phenomenon: also in the US, patent holders seem to make strategic choices to litigate for district courts or to file a case at the ITC, hoping for an 'cease and desist' order.

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<sup>81</sup> FTC. (2013). Agreement containing Consent Order in the matter of Google Inc., File no. 102 3136. Retrieved from <http://www.ftc.gov/os/caselist/1023136/110330googlebuzzagreeorder.pdf>.

<sup>82</sup> FTC. (2012). Decision and Order in the matter of Robert Bosch GmbH, a corporation. [Public Record Version]. Retrieved from <http://www.ftc.gov/os/caselist/1210081/121126boschdo.pdf>. See also FTC. (2012). FTC Order Restores Competition in U.S. Market for Equipment Used to Recharge Vehicle Air Conditioning Systems (press release, 26-11-2012). Retrieved from <http://www.ftc.gov/opa/2012/11/bosch.shtm>.

<sup>83</sup> For instance, at the meeting of the National Academies of Science, October 2-3 2012, Washington DC, and the ITU Patent Roundtable, 10 October 2012, Geneva.

<sup>84</sup> Kühn, K.-U., Scott Morton, F., & Shelanski, H. (2013). Standard Setting Organizations Can Help Solve the Standard Essential Patents Licensing Problem. CPI Antitrust Chronicle, March 2013 (Special Issue).

<sup>85</sup> See Machlup, F., & Penrose, E. (1950). The patent controversy in the nineteenth century. The Journal of Economic History, 10(1), 1-29.

<sup>86</sup> See Katrin Cremers, Dietmar Harhoff (2012). Invalid but Infringed?! The Impact of the German Patent Enforcement System on Innovation. 7th Annual Conference of the EPIP Association, Leuven, Belgium, September 27-28, 2012.

<sup>87</sup> See the public blog of Florian Müller ([fosspatents.com](http://fosspatents.com)) for an extensive account of SEP cases in German court.

An important European development is that of the unitary patent (a.k.a. Community patent, European Community Patent, EU patent, EC patent<sup>88</sup>). While the idea of having a 'true' European patent, with direct validity in all participating countries, judicial procedures for a court with effect in all countries, and lower translation and maintenance fee requirements, has been discussed for well over a decade, the materialisation of the unitary patent gained momentum when 25 of the 27 EU member states of the European Union reached an agreement during the European Council of 28–29 June 2012. On 11 December 2012 the European Parliament voted on the EU Council's compromise proposals for two draft EU regulations: 1) The first draft regulation concerns unitary patent protection, and 2) sets out the translation arrangements. The regulations entered into force on 20 January 2013.<sup>89</sup> However, they will only apply from 1 January 2014 or the date of entry into force of the Agreement on a Unified Patent Court, whichever is later.<sup>90</sup>

### Patent offices and standardization

Patent offices have an obvious relation to patent holders, being the organisations that are authorized to grant patents on behalf of their governments. But, for a long time, technical standardisation was not really an item on the agenda of patent offices. This changed in recent years, when not only the economic relevancy of standards has become increasingly recognized, but also particular concerns were identified. One was that companies discuss many technologies in the context of standard setting (for instance in technical committees), but this information was hidden from the view of patent examiners that need to assess novelty of patent applications. They did not have access to that documentation, and in addition, it was not clear whether this information would fall under the definition of 'prior art'. Within EPO, the latter was well clarified with appeals Case T 202/97, which provided a clear precedent that this is indeed prior art.<sup>91</sup> As this was resolved, EPO signed agreements with ETSI, IEEE and ITU providing it with timely access to all such documentation. In addition, EPO and ETSI started to cooperate extensively to improve the quality of the ETSI patent disclosure database.

## 2.3 Licensing: motives and practices

The relation between essential patent owners and standards implementers is essentially a licensing relation. This section discusses the licensing regime in general, and closes with a discussion on the licensing regime specifically for standard essential patents.

In contrast to standards or patents, there is not an extensive institutional framework on licensing. Patents, once granted, provide a relatively strong property right that allows their owners a large degree of freedom on how they want to use this right. In principle, a patent owner is not obliged to license out its patents at all (subject to some exceptions<sup>92</sup>). In fact, much of the original arguments

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<sup>88</sup> All in contrast to the 'European Patent', the common name used for patents granted by the EPO since the 1978.

<sup>89</sup> Regulation (EC) 1215/2012 (*Regulation (EU) No 1215/2012 of the European Parliament and of the Council of 20.12.2012 on jurisdiction and the recognition and enforcement of judgments in civil and commercial matters (OJEU L351/1 of 20.12.2012)*, including any subsequent amendments).

<sup>90</sup> See the EPO website for regular updates: <http://www.epo.org/law-practice/unitary/unitary-patent.html>, consulted march 13, 2013. The draft regulations were accepted under the EU's legislative procedure of "enhanced co-operation": With the exception of Italy and Spain, 25 EU member states have embarked on enhanced co-operation with a view to creating unitary patent protection for their territories.

<sup>91</sup> George T. Willingmyre (2012) Corporation between patent offices and standard developing organisations.

[http://sites.nationalacademies.org/xpeditio/groups/pgasite/documents/webpage/pga\\_072715.pdf](http://sites.nationalacademies.org/xpeditio/groups/pgasite/documents/webpage/pga_072715.pdf).

<sup>92</sup> These exceptions include the following: (1) a judge has issued a compulsory license, (2) the patent owner has chose the 'license of rights' option, which is available in some patent legislations and (3) a competition authority has forced a patent owner to license as a remedy to determined abuse of dominant position. All these exceptions are quite exceptional in occurrence; only a minor fraction of patents is subject to such obligations. A patent owner may, of course, voluntarily decide to commit itself to licensing (such as a FRAND commitment), but this remains a free choice.

to introduce a patent system in the first place is to offer the patent owner exclusivity on producing and selling its invention.

Over time, licensing out the invention became an increasingly interesting option for many patents – but certainly not all. Among other things, licensing is interesting if other parties are expected to be more successful in implementing the innovation than the patent owner itself. It is also interesting if there are strong network effects and success of an invention requires broad adoption by multiple players. But even when licensing out, a patent holder has a great degree of freedom. In principle, the patent owner can freely decide who to license to, and under what conditions. The owner may issue just one (exclusive) license, or may license multiple licensees. In the latter case, it is not obliged to set similar terms and conditions to different licensees; it is allowed to discriminate between licensees (again subject to exceptions<sup>93</sup>).

### 2.3.1 Licensing in the perspective of patenting motives and strategies

In order to understand the role of licensing, it is good to take a step back and consider why companies apply for patents in the first place. What are the goals that companies pursue? These goals can be quite diverse, and many firms have sophisticated patent strategies. In a more stylized way, this section summarizes patenting motives.

**1. Prevent copying, preserve exclusivity.** This is the original *raison d'être* of the patent system, allowing an inventor to be the sole implementer of the invention in question. An example is the rotary shaver technology that was developed by the Dutch Philips company, which decided that this technology could differentiate its products from those of competitors, and decided not to license the technology out. In the pharmaceutical industry, exclusivity is the main driver of patenting.

**2. Licensing revenue.** This motive relates to applying for a patent with the intention to offer licenses to third parties to allow implementation of the invention. Licensing is not only interesting when others are likely to be more capable to implement the invention in a successful way, it is also important when the nature of the technology requires broad implementation by many stakeholders to be a success. For instance, to make the Compact Disc (CD) a success, it was realized that content owners (record companies, the sellers of the discs) as well as a range of potential CD player manufacturers also needed to be licensed to establish the format. In the next section we will go into more detail of various licensing practices. In the Carnegie Mellon Survey,<sup>94</sup> only 28% of the companies indicated they had a licensing revenue motive.

**3. Prevent suits.** Owning a patent portfolio may deter others from starting an infringement case against that company, realizing that they might trigger a counter-attack (as far as the company that starts litigation is not a non-practising entity (NPE)). In this way, this is a defensive motive. Patented technologies neither need to be implemented ('worked') by the owner itself, nor have to be licensed out, to serve this defensive role.

**4. Bargaining chips for cross-licensing.** In fields that are characterized by patent thickets (large numbers of overlapping patent rights), companies typically own patents themselves but also need access to patents of many other patent holders. In such scenarios, patents serve as bargaining chips in securing access to these patents owned by others, often on the basis of cross-licensing

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<sup>93</sup> Also here, a (voluntary) FRAND commitment creates an exception, after which a patent owner can no longer discriminate.

<sup>94</sup> Cohen, W. M., Nelson, R. R., & Walsh, J. P. (2000). Protecting their intellectual assets: Appropriability conditions and why US manufacturing firms patent (or not). NBER working paper 7552.

agreements. While cross licenses may be conducted with ‘closed wallets’, they may also specify a license fee to be paid to one of the two companies, in case the value of the portfolio’s and/or the volume of implementation differs.

**5. Enhancing reputation, create intangible assets and acquire financing and alliance partners.** In many ways, patents work as a signalling device. They are recognized by other shareholders and the outside world as valuable assets, signalling that an innovative firm is in a better position than a similar firm without patents. Among other things, start-up firms find it easier to attract venture capital when they established a patent portfolio. Likewise, firms with patents are rated higher on the stock market than otherwise comparable firms.

**6. Blocking other technological routes, discourage entry into field.** Patents may also be applied for as a means to impact actual or prospective competitors. Well-chosen patents may block a competitor in further improving its products along its own technological route.<sup>95</sup> Firms may apply for such a patent even when they have no intention of using the patented invention themselves, or licensing it to others. Large or strong patent portfolios may also discourage new entrants to become active in a given technology field.

The 1994 Carnegie Mellon Survey on Industrial R&D in the U.S. Manufacturing Sector<sup>96</sup> is, despite of its age, still seen as the major survey into the motives for firms to patent. The outcomes are shown in Table 2.8, which includes several of the categories discussed above.

**Table 2.8. Share of US manufacturing firms that indicates that a certain motive was important for the decision to patent a technology**

Motive	Share
Prevent copying	95.7 %
Blocking	81.8 %
Prevent suits	58.7 %
Enhance reputation	47.9 %
For use in negotiations	47.3 %
Licensing revenue	28.2 %
Measure performance	5.7 %

### 2.3.2 Licensing practices

Patent licensing is a widespread yet complex activity, being so close to firms’ most important asset: knowledge. The heterogeneity in licensing terms and conditions also reflects the heterogeneity of the organizations that enter into such an agreement. Companies can have different motives and strategies for leveraging their patents. Other types of patent owners, such as universities, research organizations, or individuals, may differ even more.

In principle, licensing terms and conditions are to be agreed between licensor and licensee, where the licensor is having the best bargaining position (unless it is bound to certain obligations, such as a FRAND commitment in the context of technical standards). Below we provide a summary of important terms and conditions in licensing contracts.

<sup>95</sup> See, for instance, Granstrand, O. (1999). *The Economics and Management of Intellectual Property: Towards Intellectual Capitalism*. Edward Elgar.

<sup>96</sup> Cohen, W. M., R. R. Nelson, and J. Walsh. (2000). “Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (or Not),” NBER Working Paper 7552.

**Table 2.9 Summary of important terms and conditions in licensing contracts**

Licensing period	The period for which the license is valid. After expiration of this term, the licensee will need to re-negotiate a new licensing agreement (or may not be offered a new agreement at all).
Exclusivity	A licensor may commit itself that it will not license other parties for the invention, which raises the value of the license in the perspective of the licensee. The licensor may also commit itself to actively tracing and litigating infringers. In an exclusive license, a licensor may or may not have secured the right to implement the invention itself.
Geographical scope	The geographical scope specifies in which patent jurisdictions the licensee may implement the invention (in so far the patent owner does own a patent right in the jurisdiction in question).
Technical scope	Often, a licensing agreement covers multiple patents. The technical scope determines to which patents the licensee is licensed, for instance by listing all patents in questions, or by defining a technological area.
Remuneration, royalty determination	The licensor will typically require a compensation, which may be of monetary nature, or otherwise (e.g. a cross license). There is a wide variety of ways to specify the licensing fee ('royalty') in case of monetary compensation. Parties may agree on, among other things, a fixed, one-time fee, an annual fixed fee, a fee per implementation, or a fee based on a percentage of the value of the products incorporating the invention.
Other terms and conditions (selection)	<ul style="list-style-type: none"> <li>• Capture period, which determines that new patents that are granted in a certain period after the agreement is reached are also covered by the agreement;</li> <li>• Reciprocity, which determines that the licensee is obliged to license back existing or new patents in a defined technological area, if it has such patents;</li> <li>• Grant back: the licensee agrees to grant the licensor a license with respect to any improvements to that patent made by the licensee;</li> <li>• Reach through: allow companies that license patented research tools, for instance, to profit from inventions created by others using these tools;</li> <li>• Defensive suspension: determines the license terminates if the licensee commences litigation against the licensor on any grounds whatsoever.</li> </ul>

### 2.3.3 Licensing in the case of Standard Essential Patents

When a patent owner commits itself to FRAND, by issuing a licensing commitment (also known as Licensing Statement, Undertakings, Letter of Assurance, and Declaration of Licensing Position), or by participating in an SSO that stipulates FRAND conditions as a consequence of participation<sup>97</sup> then its licensing choices are much more limited than those described in the previous sections.

Most importantly, the owner waives the right not to license the patent at all, or license it only exclusively. Secondly, it commits itself to license at certain terms and conditions, for instance as meant by the terms of FRAND.

As already discussed in Section 2.2.3, few if any SSO provide a detailed definition of what FRAND precisely means. Most often, this is left to the interpretation of the parties involved when they are negotiating a license for essential patents, or if they fail to do so, to the courts.

<sup>97</sup> See Section 2.2.3.

### 2.3.4 Patent pools

A (modern<sup>98</sup>) patent pool is an organizational 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. Most contemporary pools are based around technical standards. While such a pool can benefit society and consumers by introducing many pro-competitive effects, they may also carry anti-competitive effects, depending on the actual pool rules and the behaviour of the pool members. Some of these *potential* effects are summarized in Table 2.10.

**Table 2.10 An overview of potential pro- and anticompetitive effects of patent pools<sup>99</sup>**

Potential pro-competitive effects <sup>100</sup>	Potential anti-competitive effects <sup>101</sup>
<ul style="list-style-type: none"> <li>• Facilitating equal access to licenses for all potential licensees;</li> <li>• Speeding up access to technology;</li> <li>• Integration of complementary technologies;</li> <li>• Reduction of transaction costs for both licensees and licensors;</li> <li>• Possible clearing of blocking positions;</li> <li>• Avoidance of costly infringement litigation;</li> <li>• A potential reduction of the cumulative license fee<sup>102</sup>;</li> <li>• Protection against certain strategies of patent holders (such as bundling essential IPRs with nonessential ones);</li> <li>• Guaranteed non-discriminatory and equal access to all potential licensees;</li> <li>• A valuable source of information to would-be licensees (e.g. on essentiality of patents for a standard).</li> </ul>	<ul style="list-style-type: none"> <li>• Restrict competition between the licensors that participate in the pool and serve as a price-fixing mechanism;</li> <li>• Force licensees to purchase patents that they normally would not have licensed (if the pool is exclusive);</li> <li>• Affect non-participating firms that hold patents that are (superior) substitutes to patents;</li> <li>• Limit competition in downstream products incorporating the pooled patents;</li> <li>• Affect the development of other standards or technologies;</li> <li>• Remove incentives for further innovative behaviour.</li> </ul>

Competition authorities have reviewed the expected effects of some actual proposals of patent pools (see below) and came to the conclusion that, as long as certain safeguards and design rules were respected, the pro-competitive effects could outweigh the anti-competitive effects. Some of these safeguards/design rules are: (1) include only complementary patents in a pool (in the context of standards, this can be achieved by having only essential patents in the pool, and have a proper, preferably independent mechanism to determine this, (2) assure pool members keep the possibility to license their SEPs independently from the pool.<sup>103</sup>

<sup>98</sup> This to differentiate from the 'old' pools, mostly before the second World War, that did not license to third parties and that were often seen as anti-competitive vehicles for their initiators. Merges, R. P. (1999). Institutions for intellectual property transactions: the case of patent pools. University of California at Berkeley Working Paper.

<sup>99</sup> Based on Bekkers, R. N. A. (2001). Mobile Telecommunications Standards: GSM, UMTS, TETRA and ERMES. Boston, MA: Artech House.

<sup>100</sup> For an elaboration of these items, please refer to the original source, page 250-255.

<sup>101</sup> Ibid.

<sup>102</sup> This has been the goal of comparable efforts with mobile telecommunications standards. In fact, the UMTS IPR working group has described a patent pool as "... a one-stop clearing house with a cap on the maximum royalties". The background of this is that the cumulative fee for all needed IPRs for a standard was considered to be potentially prohibitive, and a patent pool could serve as a coordination mechanism that brings the total fee down to a level that is acceptable to would-be producers. (Source: UMTS IPR Working Group, Third Generation Mobile Communications: The Way Forward for IPR, [s.l.]: Author, 1998.

<sup>103</sup> This list is non-exhaustive.

Arguably, the first modern patent pools were those for the MPEG video coding technology, and two pools for patents for the DVD standard – all three proposed in the 1997-1999 time frame. While up to that point in time competition authorities had a negative attitude towards patent pools, these three pools requested a Business Review Letter from the US Department of Justice, and for all three, the authorities concluded that the pro-competitive aspects outweigh the anti-competitive aspects and that they did not have the intention to prohibit such pools as long as a number of safeguards were met.<sup>104</sup> At the same time, the European competition authorities seem to have embraced similar views, although their procedure in reviewing proposed pool initiatives at that time did not result in as extensive and public review as that of the US authorities.

From that moment on, several dozen of standards-based pools have been established, often – but not always - with success. Specialized pool administrators including MPEG LA, Vialicensing, and Sisvel have attempted to set up pools for a wide range of standards, especially in the consumer electronics space.<sup>105</sup> These pools were very similar in set-up from the pools that received a green light from the competition authorities. They have proven to be a successful mechanism to facilitate licensing in the context of standards, provided they manage to enrol enough holders of essential patents.

These patent pools have also proven to be a successful mechanism to facilitate licensing in the context of standards. In the mid-1990s, approval was sought for a new type of patent pool for 3G technology. The idea was that this pool could cover multiple standards that would compete on the market. The review of this proposal by competition authorities met a lot of delay, but was eventually given the green light after some proposed adaptations.<sup>106</sup> The latest development in pools is the 'pool of pools' that covers several technology generations, as illustrated by the One-blue pool created by Philips, Sony and other SEPs owners for the Blu-Ray and DVD standards.<sup>107</sup>

While pool activities have traditionally been completely separated from standard setting efforts, the DVD project was one of the first where pool creation became an integral part of the standardisation effort.<sup>108</sup> In the summer of 2012, IEEE engaged the person that managed the DVB process (Carter Eltzroth) in order to speed up pool activities for IEEE standards, an initiative that could have significant impact on the market.

Furthermore, there is a significant regulatory relation between competition authorities and patent pools, which changed significantly over time. Focusing specifically on the EC legislative framework for patent pools: until the mid-1990s, the EC had a similar mechanism to that of the US in that parties could ask the competition authorities to review whether a particular proposal would be compatible with EC competition law. In more recent years, guidance on what is allowed and not

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<sup>104</sup> See Department of Justice (DoJ), Antitrust Division. (1997). [Business Review Letter of proposed arrangements concerning the MPEG 2 compression technology", dated June 26, 1997; Department of Justice (DoJ), Antitrust Division. (1998). [Business Review Letter of proposed arrangements between Philips, Sony and Pioneer concerning DVD-ROM and DVD-Video], dated December 16, 1998; and Department of Justice (DoJ), Antitrust Division. (1999). [Business Review Letter of proposed arrangements between Hitachi, Matsushita, Mitsubishi and others concerning DVD-ROM and DVD-Video]", dated June 10, 1999.

<sup>105</sup> See Bekkers, R., Iversen, E., & Blind, K. (2012). Emerging ways to address the reemerging conflict between patenting and technological standardization. *Industrial and Corporate Change*, 21(4), 901-931.

<sup>106</sup> See Choumelova, D. (2003). Competition law analysis of patent licensing arrangements — the particular case of 3G3P. *Competition Policy Newsletter*, 1, 41-43, as well as the extensive book on this pool by Goldstein, L. M., & Kearsley, B. N. (2004). *Technology Patent Licensing: An International Reference on 21st Century Patent Licensing, Patent Pools and Patent Platforms*. Aspatore.

<sup>107</sup> See Peters, R. (2011). One-Blue: a blueprint for patent pools in high-tech. *Intellectual Asset Management*, September/October 2011, 38-41.

<sup>108</sup> Eltzroth, C. (2008). IPR Policy of the DVB Project: Negative Disclosure, FR&ND arbitration Unless Pool rules OK Part 1. *J. of IT Standards & Standardization Research*, 6(2), 18-39.

allowed for activities such as pooling is provided by the guidelines<sup>109</sup> accompanying the Technology Transfer Block Exemption Regulations (TTBER), of which the current version is from 2004. While the TTBER as such does not cover pools, the guidelines do provide a comprehensive view on how the European competition authorities will judge pools in the light of competition rules. On 20 February 2013, the EC opened a public consultation on a proposal for a revised block exemption for technology transfer agreements and for revised guidelines. This consultation has been closed on 17 May 2013. In the draft regulation,<sup>110</sup> again, it is specified that pools fall outside its application area, yet, the associated draft guidelines<sup>111</sup> do again provide a comprehensive view on how the European competition authorities will judge pools in the light of competition rules.

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<sup>109</sup> European Commission. (2004). Commission Regulation (EC) No 772/2004 of 7 April 2004 on the application of Article 81(3) of the Treaty to categories of technology transfer agreements. OJ L 123 of 27.4.2004. Brussels: European Commission.

<sup>110</sup> Commission, E. (2013). Draft Commission Regulation (EU) on the application of Article 101(3) of the Treaty on the Functioning of the European Union to categories of technology transfer agreements C(2013) 921 draft. European Commission.

<sup>111</sup> Commission, E. (2013). Draft Guidelines on the application of Article 101 of the Treaty on the Functioning of the European Union to technology transfer agreements C(2013) 924 draft. European Commission.

### 3 Standardization and licensing in standard dependent industries

In this chapter we explore the strategic role of standardization and licensing IPR (notably SEPs) in four standards-based industries: the communications industry – with emphasis on mobile, the consumer electronics industry – with emphasis on smart devices, the automotive industry – with emphasis on the ‘connected car’ and ‘smart mobility’; and the electricity grid industry – with an emphasis on the ‘smart grid’ and the ‘smart home’.

The communications industry and the consumer electronics industry are chosen as subjects of research for this study based on the critical importance of patents in standards in these industries. While the use of patents in standards is well-established in these industries, the treatment of patents is different. This choice is re-enforced by the high profile issues that have emerged around SEPs in these industries and by the high degree of ICT technology-based convergence that is occurring between these two industries. The automotive industry and the electricity grid industry have been chosen as subjects of research on a forward looking basis, recognizing that in these industries the role of ICTs is increasing and hence the issues now experienced with patents in standards in the ICT industry will most likely be encountered in these standards-based industries in the near future. Hence, potential improvements towards achieving a smooth licensing process in the first two industries may be applied pro-actively in the other two industries.

The analysis of the four industries follows the same sequence of analytical steps. The exploration starts with a discussion of the industry structure and a grounding for the prevailing practices in the industry (following the dimensions of the Five Forces model by Porter<sup>112</sup>). Subsequently we discuss the more recent changes in market dynamics (notably resulting from ICT-induced changes in the industry), including the convergence between industries. The descriptions of the industry structure and market dynamics are based on literature research complemented with interviews with industry experts. Against this backdrop, a number of observations can be made regarding the role of knowledge creation and flows next to the issue of patents and licensing, and their relationship to standards. Subsequently, we put this in perspective vis-à-vis the strategies and actions of firms. These observations are presented as a position or as a hypothesis, with supporting evidence from the desk research and/or the interviews with industry experts, which were cross-checked where necessary.

The chapter concludes with a cross industry summary of the trends that impact standardization and licensing.

#### 3.1 (Mobile) telecommunications

In telecommunications patents have played an important role in the development of the industry. In the early days the patent granted to Alexander Graham Bell allowed the creation of an exclusive position for the Bell System, later AT&T in the USA. Expiry of the patent resulted in a flurry of competitive activity and government intervention was required to assure the interconnection between rivaling networks. Subsequently interconnection and interoperability became the norm

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<sup>112</sup> Porter, M. E. (1980). *Competitive strategy - Techniques for Analysing Industries and Competitors*. New York: The Free Press.

and standardization of interfaces a collaborative effort among operators and network equipment vendors. Cross-licensing became the prevailing practice to resolve interdependency among the relatively small number of firms involved.

With the development of smart phones for use with mobile networks during the past two decades, communications technology (CT) and consumer electronics (CE) are two industries that have converged strongly. At this point in time it is very difficult to discuss these two industries separately, notably in relation to standard setting and licensing. Illustrative for this development is the gradual replacement of the feature phone by the smart phone which has transformed traditional telephony into an integrated system of communication and entertainment. A similar example is the smart TV. In this section the focus is on mobile telecommunications, where the standards development and the use of patents is most prominent and where we can best observe the convergence between the communications industry and the consumer electronics industry. Not surprisingly that many of the findings and conclusions in this section are applicable to both the communications industry (CT) and the consumer electronics industry (CE).

We first present an industry definition and the rationale for our focus on the mobile segment of the industry followed by a brief historic overview of the industry developments by describing in broad terms the industry dynamics and the role of standards and patents, being concluded with an overview of the industry value chain (in Section 3.1.1 respectively 3.1.2). The subsequent section (3.1.3) elaborates the topic with a focus on firm entry and exit. In Section 3.1.4 the strategic role of standards, patents and licensing is addressed, including a discussion of the barriers for licensing in / out standard essential patents (and thus for the adoption of standards). Section 3.1.5 concludes with a summary of the industry characteristics, as a result of the desk research and the industry interviews.

### *3.1.1 Industry definition and focus*

For the purpose of this study the telecommunications industry is defined as comprising the network equipment, terminal devices and the communication services provided on the basis thereof to end-users, both residential and business. The equipment includes the hardware, the software and the associated support services. The infrastructure includes the switching and transmission equipment as well as associated planning, operations, maintenance and management systems. Switching includes circuit switching and packet switching, as well as routing. Transmission includes all types of media: twisted pair copper, coax, optical fibre and radio waves. The service provisioning includes the customer care and billing systems. Terminal devices include the fixed and mobile attachments to the network.

The industry focus for this study is mobile (cellular) communications. This industry segment is chosen as it represents the area where the issues around patents in standards has become most controversial. Moreover, it exemplifies the convergence of the communications and consumer electronics industries in the development of devices (handsets), having evolved from voice-only devices to smart computing platforms supporting voice, data and image communication, as well as a range of other functions. This is where the role of mobile operating systems providers has become of critical importance.

For specifics of the standards setting organizations mentioned in this section we refer to Chapter 2 covering the institutional and regulatory framework of standardization.

### 3.1.2 Industry structure and developments

#### Industry developments over time: an overview

The mobile communications industry is characterized by successions of next generations of technologies, providing increasing capabilities to the end users.

##### 1G - domestic markets

Historically, the telecommunications industry has had a national orientation and was subject of national industrial policies. In many countries in Europe a stylized model of one country / one operator / one vendor could be observed. The operator was a governmental entity and contracting could be characterized as political, very long term (sometimes decades), and stable.<sup>113</sup> Standards were set nationally and resulted from close collaboration between the vendor and the operator. Typically, both the telecom operators and the vendors were engaged in large R&D activities.

Consequently, the first (analogue) mobile technologies were developed with a strong national focus: operators served domestic markets only, operators and vendors were collaborating at a national level while setting technological specifications for the network and the hand sets. It led to different standards being used in the different European countries, which did not provide for interoperability.<sup>114</sup> The use of all these different technologies prevented vendors from enjoying scale economies which kept prices for mobile communication in Europe high and the technology was only available to a happy few.

##### 2G - prioritisation of efficiency

The liberalization process initiated in the mid-1980s led to privatization of the incumbent operators and the entry of competing operators from other Member States. Operators gradually reduced their R&D activities and vendors were increasingly operating at a European and even global level. While standardisation activities were initially driven by the operators, the emphasis had now shifted to the vendors striving for scale economies.

Consequently, the second generation of mobile technology was developed with an awareness that a mass market take-up of mobile telephony would benefit operators, vendors as well as society at large. With that in mind, and endorsed by the European Commission, the GSM working party was installed under the hierarchy of the Coordination Committee for Harmonisation of CEPT. In this working party a group of European operators closely collaborated with vendors in setting the GSM standard. For the purpose of marketing the technology (i.e. licensing out the standard essential patents), a number of parties favoured the idea of setting up a pool. This would lower the (transaction) costs for adopters and thereby contribute to the objective of a quick mass market (potentially global) take-up of the technology. However, not all IP holders had similar objectives. Notably Motorola, as the only important non-European party in the development of the GSM standard, insisted on negotiating on a bilateral basis. During interviews with stakeholders, some argued that Motorola's motives were to prevent the GSM-standard from entering the US-market, in which Motorola was competing for the market on the basis of a different standard. The failure of setting up a pool, however, did not prevent the GSM technology being adopted as the new standard

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<sup>113</sup> This model applies in particular to the supply of switching equipment and to a lesser degree to transmission equipment, which requires lower levels of R&D.

<sup>114</sup> The introduction of mobile communications in Europe dates back to the 1950s. The first mobile generation of equipment based on an open standard developed by the Nordic telecommunications administrations NMT-450 was introduced in 1981. The specification was made available – free of charge – to the equipment vendors. The stage was set for the broad deployment of first generation –1G– mobile telephone systems. In the Netherlands the incumbent operator adopted the Nordic NMT 450 standard, as did the operators in Belgium and Luxembourg. However, national cellular standards were applied in Germany: Netz-C (in service in 1986), in France: Radiocomm 2000 (1986), in the UK and Ireland: TACS (1983), and in Italy: RTMI/RTMS (1985), which later introduced TACS. See ([Meurling and Jeans, 1994](#); [Botto, 2002](#); [Manninen, 2002](#); [GSM Association, 2004](#)).

for mobile telephony in Europe, and later in large parts of the world. In the US, however, operators were employing three different standards that were to compete for the market.

### *3G – recognising globalisation*

The development of the third generation of mobile technologies was driven by the need for mobile data communication. Initially, the standards for data communication (GPRS and EDGE) were developed on the basis of the installed base (GSM), but it turned out that its potential for delivering ‘true’ broadband communication with data rates in the range of multi Mbit/s was limited. In 1997 Lucent Technologies, Motorola, Nortel and Qualcomm set out to develop the next generation standard for the USA – CDMA2000. To reach a global deployment the new 3G equipment would have to interface with the existing 2G equipment, primarily GSM, D-AMPS and CDMA. In 1999 the dispute over intellectual property rights that had emerged in 1995 between Ericsson and Qualcomm was settled and a –3G– standard that had three modes of operation, one for each major 2G-variant, could be supported.<sup>115</sup>

It is important to note that network operators played no longer the leading role while setting the 3G standard. It had become largely a collaborative process among equipment vendors.

### *4G – competition for the market*

With the unabated growth of the Internet the need for mobile data communications at higher data rates continued and spurred the developments towards the fourth generation of mobile technologies, also known under the misnomer Long Term Evolution (LTE). The need for handsets to support the older standards as well remains. Furthermore, to manage congestion of the mobile networks, the data requests of end-users need to be off-loaded to fixed networks as soon as possible. This can be done by reducing the cell size of the mobile networks and/or by channelling the data requests via fixed modems at consumer premises using short range mobile connectivity standards such as Wi-Fi.

Smartphones can best be characterised as mini-computers that integrate the traditional voice telephony function with a broader set of communication and entertainment functionalities. Several operating systems for these mini-computers have been developed competing among each other for the market. An important driver determining the market share of each operating system has been the availability of applications giving concrete shape to the new functionalities.

Where network operators used to be the natural entry point for delivering a service to the end-users, the operating systems have taken over that role. It has led to a growth of so-called over-the-top (OTT) communication services that are detached from the network technology and typology (such as Skype, What’s App, Twitter, Facebook, etc.). These OTT services are, however, far from detached from the operating systems that are currently competing for the market.

### **The value chain**

The major steps in value adding activities within the mobile communications industry are depicted in Figure 3.1. The value chain representation depicts the major value-adding steps within an industry. Here we provide an overlay indicating where in the value chain the various standards are impacting the value-adding activities, what the type of standard is and to which industry the standard being applied belongs. This overlay is necessarily simplified, showing the main categories of standards, rather than specific standards.

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<sup>115</sup> Mock, D. (2005). The Qualcomm equation. New York: AMACOM.



### 3.1.3 Market dynamics: firm entry and exit

In the following paragraphs we provide a more detailed description of the current force field in terms of the changing role of the traditional suppliers and emerging new players resulting in new 'rules of the game'. As part of the description the main actors at the main nodes in the value chain are discussed.

#### Network equipment providers

The development and production of network infrastructure equipment was dominated by large, mostly European companies (Ericsson, Nokia, Siemens and Alcatel), able to generate large economies of scale and engaging in very high levels of R&D investment to attain (and maintain) technological leadership. Consequently, entry barriers were high.

The relative maturity of the network infrastructure industry and the high degree of open standardization of the industry has allowed Chinese manufacturers, such as Huawei and ZTE to gain access to IP, to enter the market, and to assume an increasing share of infrastructure supplies. A main driver behind the growth of these companies is the scale economies they realise in their home market and the consequent room for R&D they enjoy.

The collapse of the equipment market following the collapse of the Internet/telecom bubble in 2000, combined with the transition to All-IP networks, has resulted in high-profile mergers of Alcatel-Lucent and Nokia Siemens Networks, and the demise of Nortel.

#### Devices

##### *Feature phone era*

Traditionally there used to be a link between developing and producing network equipment and communication devices. This link was almost natural since both had to be based on the same technological standard for reasons of interoperability. Consequently, one observed the same players Ericsson, Nokia, Siemens and Alcatel as suppliers of handsets. But also a company like US-based Motorola was well positioned as a supplier of GSM feature phones because, as an owner of patents essential for the GSM standard, it had (via cross licensing agreements) relatively easy access to all other SEPs as well. The ownership of SEPs was a prerequisite for keeping the costs of production low. After all, such a portfolio of SEPs can be used as currency in bilateral cross licensing negotiations and thus avoid having to pay cash based royalties.

As different network technologies (2G and 3G) were being employed side-by-side, devices had to support multiple standards. At the same time telephones became subject of design and even became fashion accessories. This opened up a number of opportunities for differentiation and consequently the number of suppliers expanded (while the traditional suppliers retained a significant market position). Typically the new entrants at this stage were the (former) OEM producers such as LG, HTC and Samsung. The latter was greatly facilitated by an active Korean industrial policy enabling Samsung to catch up and assume a position as technological leader.

Mobile devices require a few key components for which there are only very few providers (the so-called baseband chip sets, and to a lesser degree also the application processors, the large high resolution displays, and the high capacity memory chips). This creates a considerable supplier power for these suppliers. Qualcomm, for instance, reportedly had over 50% revenue share of the

base band chip set market,<sup>118</sup> a market worth over US\$8 billion per year. Another significant key supplier is Samsung (application processors, displays, memory).

### *Smartphone era*

With the introduction of the Internet and the increasing use of data, devices transformed from single feature phones into multifunctional mini-computers. Initially the functionality was constrained by the size of the display and the size of keys or keyboard, but with progress in technology and in design these constraints were soon lifted. It became apparent that design features and applications that were embedded in the operating systems were the new market drivers for selling a device.

New players arrived on the basis of different strategies. RIM (Blackberry™), Apple and Google entered the market on the basis of mobile operating systems and a wide range of applications specifically developed for smartphones. RIM and Apple placed high value on controlling the quality of hardware in order to guarantee the quality of the entire system. The companies therefore needed access to SEPs in order to keep costs low.<sup>119</sup> Google initially seemed to stay away from the SEP discussion and leave it to the vendors to which it licensed out its OS (such as Samsung, HTC, LG, ZTE, and Huawei). Eventually, however, Google bought Motorola (including its considerable portfolio of 17,000 SEPs) inter alia to support its vendors during the bargaining game or even to defend themselves in Court. The ability to do so was limited by the US Federal Trade Commission's antitrust case against Google that resulted in Google conceding to apply the FRAND terms as Motorola had pledged to apply in the licensing of its patents.<sup>120</sup>

Despite owning a large portfolio of SEPs, many of the traditional vendors were confident that they could not win the battle on the basis of their own mobile OS. Hence some of them (e.g. Ericsson and above all Nokia) placed their bets on the joint development of the Symbian operating systems. Its market share has been substantial at the time when the market was still rather small. As the market grew, Symbian's market share declined and so did the market shares of the vendors that had adopted this standard.

While the mobile standards facilitated competition among a multitude of vendors, the shift towards smart phone platforms adds to the rivalry the element of 'network effects' and thus creates a 'winner takes all market'. This is reflected in the intense rivalry between Apple and Google and Apple and Samsung for leadership in the OS platforms that are applied in the smart phones and that enable the applications on these phones to be accessed through on-line stores. This war is fought at all fronts, including that of patents. Portfolios are strengthened through acquisitions (Google to buy Motorola patents; Apple to buy Nortel patents; Microsoft buying Nokia's device business and access to patents<sup>121</sup>). Some strengthen their portfolio's with design patents that competitors claim to be so-called market essential patents<sup>122</sup> (e.g. the screen swipe of Apple). They are claimed to be market essential because consumers highly value these designs and competitors feel they need to provide these as well, either by taking a license or developing a work-around.

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<sup>118</sup> <http://blogs.strategyanalytics.com/HCT/post/2012/11/16/Cellular-Baseband-Market-3G-Smartphones-Boost-MediaTek-to-Number-Two-Spot-in-1H-2012.aspx>.

<sup>119</sup> RIM bought a portfolio of SEPs from Ericsson in 2001 and a number of NORTEL SEPs in 2011. Similarly Apple bought a considerable amount of SEPs from the NORTEL bankruptcy in 2011.

<sup>120</sup> Source: [www.nytimes.com/2013/01/05/technology/in-google-patent-case-ftc-set-rules-of-war-over-patents](http://www.nytimes.com/2013/01/05/technology/in-google-patent-case-ftc-set-rules-of-war-over-patents).

<sup>121</sup> September 2013, Nokia sold its devices and services business to Microsoft and granted licenses on its patents against a fee of €1.65 billion. <http://www.microsoft.com/en-us/news/press/2013/sep13/09-02announcementpr.aspx>.

<sup>122</sup> This refers to patents that are not SEPs (as they are not required to implement the standard), but cover a functionality that the majority of end users does expect on any phone in a given market segment.

### Convergence with consumer electronics

While OTT service provision is a substitute for traditional marketing channels for the music and video/film industry (CDs, DVDs, cinema, broadcasting), the technology convergence suggest that content has become 'just another data file, with encoding and formatting suitable to the content'. It is also just another data application handling on a general purpose (handheld) computer. Being a multifunctional device able to store and display all this content, the smartphone is required to communicate not only with the web, but also with other consumer electronics equipment in and around the house; notably those that are designed to display content: the PC and laptop, the audio system, and the TV screen.

To facilitate connectivity, the smart device incorporates multiple wireless and wired short range connectivity standards such as Wi-Fi, Bluetooth, and (mini)USB. The smartphone also supports audio standards (MP3, ACC, GSM voice codecs), picture standards (JPEG, PNG, TIFF), video standards (MPEG) and hardware standard (SDcard, Smartcard, NFC). Typically these standards are licensed out via patent pools.

As the incorporation of these consumer electronics standards evolved from voice and text messaging towards OS platforms for providing a wide range of ICT applications, the natural lead in the device sector shifted from the telecommunications equipment suppliers to the OS platform suppliers and the companies that incorporate the leading OS platforms in their smart devices.

It is rather difficult to identify all the main IP owners and licensees, but when zooming in on the 3G and LTE standards one can identify the main (net) licensors and (net) licensees as reflected in Table 3.1.

**Table 3.1 Main (net) licensors and (net) licensees in 3G and LTE**

main (net) IP owners	Main (net) IP licensees
Ericsson	Apple
Inter Digital	LG
LG (only LTE)	Nokia
Motorola (Google)	Samsung
Nokia	ZTE
Philips (only 3G)	HTC
Qualcomm	RIM
Samsung (only LTE)	Huawei
Siemens (only 3G)	+
Panasonic	+

Source: interviews.

#### 3.1.4 The strategic role of standards and patents

In this section the role of standards, patents, and licensing is discussed based on the literature study and the complementary interviews with the industry and licensing experts.

##### Standardisation arrangements

When considering mobile communication, standards are largely set within the context of formal standard setting organisation and a few recognized SSOs. The individual standards combine to system-level standards, such as 2G-GSM and 3G-UMTS. The standards cover the radio interface and the interworking with terrestrial networks (PSTN/ISDN/Internet). The radio technologies covered include: CDMA/FDD, MIMO, OFDMA, SC-FDMA, SOFDMA.

The most important SSOs for mobile communications industry<sup>123</sup> are (with their respective focus areas): ETSI (infrastructure 2G-GSM, 3G-UMTS, HSPA, 4G), 3GPP (infrastructure 3G), IEEE (short range devices Wi-Fi, WiMAX), and the IETF (Internet protocols IPv4, IPv6; security). On occasion parties form a consortium in support of the standard setting process of the SSOs, such as 3GPP and WiMAX Forum. The modern multifunctional devices, however, embed much more standards that may be set via other arrangements (see the section 3.2 on the consumer electronics industry).

Motives for participating in standardisation processes vary from:

- developing technology in dialogue with users (operators);
- ensuring interoperability of a firm's technology IP with the technology IP of others;
- promote the adoption of own IP;
- steering technological developments in a way that is complementary to the own installed IP base; and
- keeping up-to-date about technological developments (knowledge management).

### The role of IP

For most mobile communications industry firms, the strategic purpose of IP is to ensure a freedom to operate. It is an essential asset for operating in the industry, as the acquisition of IP portfolios by 'new' entrants in the mobile communications industry, notably Apple, Google and Microsoft, illustrate. It allows the firm to use IP as a currency in accessing the IP of others. Without it, the costs of accessing IP will significantly erode margins. For the communications industry firms, i.e. as producing entities (PEs), IP is generally not considered as a primary source of revenue. But this applies only as long as the firm is successful in the business. If market shares and cash flows come under pressure the strategic focus will change and IP becomes a more direct source of revenue (see e.g. the Nokia case). In general, a SEP does not lend itself for differentiation of end products this is typically accomplished on the basis of non-SEPs. Nonetheless, patents are being used to protect the operation of a particular business model.

Small (start-up) communication firms entering the market tend to stay below the IP-radar and refrain from licensing in IP. By the time success can be demonstrated and/or products are sold either a license can be taken or the start-up may be acquired by another larger firm and the acquiring firm will then have to decide on the licensing strategy. Innovation by start-ups is not necessarily hindered by (neighbouring or standards related) patents. This is essentially a result of the high costs involved in bringing infringement cases to court.

Start-ups and small firms do apply for patents for various reasons. For start-ups IP plays a crucial role to ensure access to venture capital and in the case of an IPO to access to the stock market. Patents represent tangible value of the (start-up) firm, which is important for the exit strategy of the venture capital providers. Larger entrants cannot stay below the IP-radar, but they tend to play a hard bargain, gambling on the willingness of the IP owner to reduce the price to avoid costly litigations. For these firms their IP position plays an important role in the case of mergers and/or acquisitions.

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<sup>123</sup> This listing is based on those standards that are important for deployment in Europe.

### The creation/acquisition of IP

The major mobile communications equipment providers produce IP mainly in-house. Most (mobile) operators have divested their R&D activities and tend to insource (and license-in) whatever they need. Reasons to buy IP are often related to market entry and/or in response to a changing IP landscape. The latter means that the portfolios of competitors has changed vis-à-vis the own portfolio such that the bargaining position has become weaker and triggers the buying process. The acquisition of IP through collaboration is of a lesser importance, as collaboration is often complicated by IP ownership issues. If collaboration occurs, IP is typically jointly produced and owned. Collaboration typically occurs with (semi) public institutes, when there is a public funding programme involved such as EU FP6 or FP7.

### Filing for IP

The PCT (Patent Cooperation Treaty) filing, at costs of €10.000-40.000 (typically €15.000), provides an evaluation report that is highly valuable as the basis for the decision to improve the formulation of the filing, pursue a patent, or to withdraw the application if found too weak. The small firm needs to strategize with respect to the patenting process to minimize the (up front) capital requirements while protecting the IP, as the whole exercise of obtaining a patent will typically cost €100.000. The need to use the full length of the PCT process (30 month), and it will need to push patent maintenance fees out into the future. Engaging in a PCT filing provides better protection and freedom to interact in the market than non-disclosure agreements (NDAs).

### Licensing-out and sale of IP

As interoperability is key in the communications industry and as standards are created as a joint effort (mobile) communications firms are used to license-out IP. Reasons for an outright sale of IP is that (parts of the portfolio of) IP has become of less strategic importance (market exit) or subject of a changing IP landscape. The latter refers to the need to strengthen the own bargaining position or that of allies (e.g. Google giving patents to HTC). But it may also mean that the portfolio is very strong and that cashing in on a part of the portfolio (non-strategic IP) does not really affect the overall bargaining position in the market. If for reasons mentioned above the strategic purpose of IP is to generate revenues, selling IP is an alternative to licensing out. Often this may involve selling IP to an NPE, which is specialised in monetising the value of the IP.

Typically, licensing agreements between firms cover multiple standards, typically covering SEPs and non-SEPs. These agreements tend to result in (partial) cross-licensing arrangements with royalties paid in the balance. The scope of the arrangements are largely determined by the 'boundaries of the adopting firm' rather than the boundaries of a 'standard'. The number of SEP disclosures for the telecommunications industry at large has been 965.<sup>124</sup>

The use of mobile communications technologies in M2M (machine to machine communications) and in many 'smart' technologies (smart grids, smart transportation) may lead to many more implementers of communication standards, and hence may make the use of patent pools more attractive (since pools reduce transaction costs and transaction time).

### Enforcement of IP

To bring an IP infringement case to court and pursue it to the end will require licensing benefits of at least US\$0.5-1 mln. Moreover, infringement cases will be pursued top-down, meaning that those firms will be pursued first that have a large sales volume or are strategically important. Many start-ups fail in the early years, hence, only when they become successful and/or become a potential

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<sup>124</sup> Data derived from the quantitative analysis as part of this Study.

threat action against infringement will become meaningful. As small firms lack the financial power to enforce their patent position against infringements – litigation costs are simply too high – in reality the patent regime only protects the more wealthy firms. However, in the USA small firms can avail the support of law firms applying a ‘no cure, no pay’ regime. Such type of law support is not available in (parts of) Europe (it is against the rules of the law profession).

### Licensing strategies

Where the development and exploitation of telecommunications technologies used to be a bargaining game among vendors and between vendors and operators, it has now become a game between vendors and the developers of operating systems. It has led to a separation in the supply of infrastructure and the supply of devices and to considerable shifts in terms of market shares.

Traditionally, the standard essential technologies were developed by vendors (and sometimes network operators) that eventually embedded these technologies in the handsets and network equipment they sold. In other words, the developers of standard essential patents (SEPs) were at the same time the adopters of SEPs. As such, standard essential patents gave vendors a freedom to operate. They were both a ticket to sit at the table during standardisation processes as well as a currency for obtaining access to the standard essential patents of other vendors (through cross licensing).

Entry in the market was rather difficult without owning any SEPs because it required to take a license on all SEPs on a cash basis. Even though the FRAND commitment more or less constrained the prices of individual SEPs, the production costs would become very high because of the large number of SEPs involved (royalty stacking). For that reason, early smartphone producers have soon acquired a package of SEP-rights providing them the freedom to operate (e.g. RIM bought a package of SEPs from Ericsson, Google acquired Motorola, Apple bought NORTEL patents and Microsoft obtains access to Nokia patents).

As operating systems became the new natural entry point to reach end-users, the phenomenon of so-called market essential patents became increasingly important. These are technologies that are not necessary for adopting a standard, but they are *de facto* necessary for selling products. Not being subject to any FRAND condition, market essential patents give considerable bargaining (or competitive) power.

The rise of the smartphones and the increasing role of operating systems resulted in plunging market shares of traditional leading developers of feature phones (such as Nokia, Siemens, Sony/Ericson, and Motorola) and rising market shares of new champions (such as Apple and the Android phone producers Samsung, HTC, Huawei, etc.). The shifts in market shares have put pressure on the cash positions of some of the traditional vendors. It forces them to review their licensing strategy. Some try to gain back market share by demanding access to non-SEPs (or market essential patents) in return for licensing out SEPs. Others seek to develop entirely new income streams by cashing in on SEPs. It often translates in licensing out SEPs on a cash basis or in selling off SEPs, in most cases to so-called non-producing entities (NPEs) which subsequently license it out on a cash-only basis. Some of these NPEs pursue a rather aggressive strategy: you pay immediately or we go to court.

Interestingly, our data analysis (see Annex) shows that SEP transfers were almost non-existent before 2005 and thereafter increased rapidly.<sup>125</sup> This coincides more or less with the rise of the multifunctional devices and the entry of new players such as RIM, Microsoft, Apple and Android. The increased ownership of IP by NPEs as a result of changing market positions is illustrated by the overview of the main SEP transfers over the past years that is given below, along with the prime reason for the transfer:

- Auction of Nortel patent portfolio (Nortel going bankrupt);
- Motorola sold to Google (market share and cash flow problem: shareholders wanting to cash in on IP; Google searching to strengthen its bargaining position);
- Eastman Kodak is seeking parties interested in acquiring its patents (market share and cash flow problem: shareholders wanting to cash in on IP);
- Ericsson sold SEPs to Research in Motion;
- Nokia sold SEPs to MOSAID, Sisvel and Vringo (cashing in on IP by selling to NPEs);
- IPcom acquired Robert Bosch SEPs (cashing in on IP by selling to NPE);
- Highpoint acquired SEPs originating from AT&T (cashing in on not-(anymore)-strategic IP by selling to NPE);
- HTC acquired SEPs from both Google and Hewlett Packard (HTC buying in bargaining power);
- Acacia acquired SEPs from Adaptix (Adaptix cashing in on IP by selling to NPE);
- Intel acquired SEPs from InterDigital (cashing in on IP by selling to an entrant);
- Apple acquired SEPs from Novell;
- Ericsson sells 2,185 SEPs to Unwired Planet (cashing in on IP by selling to NPE).

### 3.1.5 Stylized industry characteristics

In this section a summary is provided of the stylized characteristics describing the developments in the industry, using three categories: value chain developments, patenting /licensing, and standardization.

#### Value chain developments:

- The historical situation whereby R&D was executed by both operators and equipment vendors has been replaced by R&D being largely executed by network equipment vendors, with the related shift in IP ownership;
- As an infrastructure industry, requiring interoperability between network components, mobile network equipment vendors are interdependent in the creation of standards and thereby the implementation of products. This applies also for devices that connect to the network;
- The number of firms involved in the development of network standards is relatively small, they are both licensors and licensees, often through cross-licensing;
- As a result there is a succession of next generation network standards and the cases of competition between network standards within one generation is the exception rather than the rule;
- The transition from circuit switching to packet switching and the introduction of the IP protocol suite has decoupled the network layers from the services and application layers, allowing innovation in the services and application layers to be decoupled from innovation in the network layers;
- While the succession in generations of mobile networking technology continues (now from 3G to 4G), innovation in (smart) devices and application has become a new battle ground, enabled by the underlying network but otherwise decoupled;

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<sup>125</sup> A large majority of the transferred SEPs has been declared at ETSI for Telecommunications standards, JTC1 coming next. Yet, in both cases this represents less than 10% of all SEPs declared to the SSO. ETSI has also by far the largest number of standards that are subject to SEP transfers.

- Hence, the control of the value chain has become subject to splitting and shifting. Splitting into a network layer and a services/application layer. And a shifting of power at the network layers from the (mobile) telecom service providers to the providers of network equipment and from the network cum device manufacturers to the providers of mobile device operating systems enabling smart devices and applications;
- The traditional leadership of mobile network equipment cum device vendors is being replaced by a leadership of mobile device operating systems providers and their network of device manufacturers, which implies a shift from European-based leadership to USA-based leadership;
- It reflects the high profile market entry by firms with their roots in the information technology industry.

#### Patenting/licensing:

- In the mobile network equipment industry cross-licensing is prevailing practice;
- In the mobile services/application industry the importance of patents in the competition for the market has intensified;
- Portfolios of patents are transferred from 'old' industry leaders to the 'new' industry leaders;
- The interdependency between equipment vendors at the infrastructure level is complemented with intense rivalry among independent platform vendors at the services/application level.

#### Standardization:

- The number of SSOs most important to the mobile communications industry has increased from one to three. From ETSI, as driving force of 2G-GSM, to include IETF providing for the IP protocols and IEEE providing a standardization platform for short range devices and WiMAX as a 4G technology. To this we should add the SSOs that are involved in the development of consumer electronics standards applied into mobile devices (See section 3.2 on the consumer electronics industry);
- In support of the standardization activities consortia have been formed, such as 3GPP and WiMAX Forum.

## 3.2 Consumer Electronics

While we can recognize a succession of technology standards in both the mobile telecommunications industry and in the consumer electronics industry, the practices around standard setting and licensing are very different. In the telecom industry standardization work is largely performed in formal SSOs, while in the consumer electronics industry consortia play an important role. The consumer electronics industry is characterized by 'standard wars', while in the telecommunications industry the focus is on collaboration to create a (regional) standard. In the consumer electronics industry we find a large number of licensors and even larger number of licensees. In the communications industry cross-licensing is the prevailing licensing method, while in the consumer electronics industry the forming of patent pools has become the preferred means to realize a smooth and fast licensing process.

We first present an industry definition and the rationale for our focus on the audio/video and multifunctional products segment of the industry followed by a brief historic overview of the industry developments by describing in broad terms the industry dynamics and the role of standards and patents, being concluded with an overview of the industry value chain (in Section 3.2.1 respectively 3.2.2). The subsequent section (3.2.3) elaborates the topic with a focus on the large number of licenses and licensors that characterizes the consumer electronics industry. In Section 3.2.4 the strategic role of standards, patents and licensing is addressed, including a discussion of patent pools as an important institutional arrangement being used in the industry. The analytical narrative

covers the main players and their roles. Section 3.2.5 concludes with a summary of the industry characteristics, as a result of the desk research and the industry interviews.

### 3.2.1 *Industry definition and focus*

For the purpose of this study the consumer electronics industry is defined as comprising the audio electronics equipment, the video electronics equipment and the multifunctional devices. The equipment includes the hardware, the software and the associated support and repair services.

The audio electronics includes the recording/reproduction and duplicating systems, CD/MP3 players, radio receivers, speaker systems, jukeboxes, amplifiers for musical instruments, microphones, headphones and karaoke machines. The video equipment includes video cassette recorders/players and duplicating equipment, DVD/Blu-ray recorders/players and duplication equipment, television receivers, monitors and displays, household type video cameras. The multifunctional devices include video game consoles, tablets, e-readers, personal video recorders, set-top boxes.

The industry focus for this study is multifunctional devices for recording and reproduction of audio and video. This industry segment is chosen as it represents the area where the issues around patents in standards has become most intense as it reflects the convergence with the ICT industries.

For specifics of the standards setting organizations mentioned in this section we refer to Chapter 2 covering the institutional and regulatory framework of standardization.

### 3.2.2 *Industry structure and development*

#### **Industry developments over time: an overview**

Broadly speaking one can differentiate consumer electronics in two strands of technologies: related to “broadcasting” (e.g. radio and television signal modulation technologies and formats, coders/decoders) and related to “recording and reproduction” (e.g. media, signal encoding/reproduction). In line with the focus chosen for this industry the following description focuses on the latter.

#### *Content is king: vinyl*

Unlike in standards making for radio and television broadcasting, the consumer electronics firms had full freedom in setting the standards related to audio and video recording and reproduction apparatus as well as the medium carrying the information. As such the early developments were similar to the later stage of communications technology developments as the industry was competing for eardrums and later also for eyeballs. Competing standards were developed in vinyl recording differentiating in speeds (78, 33 1/3, 45 rpm), playing time, and in encoding and recording technologies (mono, stereo, and various sound quality enhancements).

Similar to what we see today in the competition among mobile Operating Systems, the competition for the market among CE devices was based on (access to) content. This role has remained to be important until today and is expected to remain so in the foreseeable future. The timely availability of sufficient content – music and films – in a format compatible with the reproduction equipment was typically secured through vertical integration with entertainment studio's. Philips owned the record company Polygram and more recently Sony assumed a major position by acquiring CBS

Records in 1987 and the Bertelsmann Music Group in 2004.<sup>126</sup> In 1987 Sony also acquired Columbia Pictures which was owned by the Coca-Cola Company since 1982. In 2005 Sony acquired Hollywood studio Metro-Goldwyn-Mayer in a leveraged buy-out.<sup>127</sup> Note that in the USA the big three TV networks had co-owned record companies (ABC owned MCA Records until 1979; RCA owned NBC, the parent was sold to General Electric in 1986; and CBS sold its Record division in 1987 to Sony).

#### *Active licensing programme: VCR*

History repeated itself during the 1980's as multiple standards for video cassette recording competed for the market (JVC's VHS, Sony's Betamax, and Philips' V2000). JVC's VHS prevailed in the end. Some argued this was again due to the wider choice in content, but in part it was also through a push for early licensing of VHS to RCA, Magnavox, Zenith, Quasar, Mitsubishi and Panasonic.<sup>128</sup> This is one of the first examples that made clear that an active licensing programme benefits the adoption of technology.

#### *Collaboration in standard setting: CD*

Having learned their lesson from the costly battle over VCR standards, Philips and Sony joined forces in developing the audio CD format and the subsequent CD data storage formats. Both companies had pioneered laser disk technology from the mid-1970s onward. In 1979 the companies set up a joint taskforce of engineers to design a new digital audio disc resulting in the Red Book CD-DA standard published in 1980. The standard was adopted by IEC in 1987. The collaboration between Philips and Sony continued with the introduction of the CD-ROM in 1985 (Yellow Book) and CD-R in 1990 (Orange Book). In 1993 the video C was specified, a result of a wider collaboration including also Matsushita and JVC (White Book). Kodak introduced a proprietary format, the Photo CD.<sup>129</sup>

#### *Everything at once: Blu-Ray*

Sony, Philips and Pioneer (together with seven other companies) collaborated in the development of the Blue-ray technology. Early 2002 the specification for the Blu-ray disk were launched. Five month later Toshiba and NEC proposed an alternative the HD DVD format to the DVD Forum. Within an interval of one year the first players were introduced. Sony also integrated the Blu-ray player with the PlayStation 3 game console, thereby extending the market. Interactions between Sony and Toshiba failed and another battle for a standard was at hand.

To facilitate a fast take-up of the technology the Blu-ray licenses are marketed via two patent pools (One-Blue – covering 15 licensors – and BD Premiere – covering 6 licensors). A fast take-up was necessary to gain a competitive edge vis-à-vis HD DVD in the 'race' for the market. A failure to form a pool would result in high transaction costs frustrating the development of the market and lead to royalty stacking because the 50 or so licensees would all have to engage in bilateral agreements with the 21 licensors. With the purpose of fostering take-up, a pool also includes the licenses to complementary IP that is needed to market an end-product (such as IP related to CD and DVD technologies). To facilitate the licensing process further, the pool has several licensing programmes covering the IP that is needed for several types of products that adopt the Blu-ray technology.<sup>130</sup>

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<sup>126</sup> Source: <http://en.wikipedia.org/w/index.php?oldid=549224527>.

<sup>127</sup> Source: <http://en.wikipedia.org/w/index.php?oldid=548889888>.

<sup>128</sup> It has been claimed that over the thirty years of market dominance JVC collected billions in royalty payments – see: [http://en.wikipedia.org/w/index.php?title=Videotape\\_format\\_war](http://en.wikipedia.org/w/index.php?title=Videotape_format_war).

<sup>129</sup> Source: <http://en.wikipedia.org/w/index.php?oldid=549858005>.

<sup>130</sup> BD Drive, BD-PC, BD Software, BD Player/Recorder, BD-R/RE, BD-ROM, and BD Aftermarket Drive.

It was understood that in order to 'win the market', it was essential to get content providers on board. Turning the battle in favour of Blu-ray was forced by the Blu-ray association paying Warner US\$500 mln to switch to the Blu-ray format. Early 2008, Toshiba ended the support for the HD DVD format. The role of the providers of complementary goods (film/movie content) is said to have been decisive for the outcome of this battle.

*Convergence of consumer electronics and information technology industries*

Digitalisation of encoding techniques (starting with the development of the CD) drove the integration between consumer electronics, information and communication technologies. It has resulted in today's multifunctional devices being able to handle multiple encoding standards for audio and video. As such the content is detached from the device, in other words, there is less need for a specific content carrier (e.g. Blu-ray disc) with a specific player (i.e. Blu-ray). Today the access to content appears to be more and more attached to the Operating System that host the applications delivering the content (music/video stores).

The number of multifunctional recording and reproduction devices is very large (smartphones, smart TVs, tablets, laptops, PCs, cameras) and growing (built-in to spectacles and watches, display windows, in-car entertainment, and so on) and end-users want them all to be interoperable. It follows that all multifunctional devices need to adopt a wide range of standards including various encoding standards, multiple standards for short range connectivity (USB, HDMI, Wi-Fi, and Bluetooth) as well as long range wireless connectivity (2G / 3G / 4G).

Many of these standards are not always essential for a multifunctional device to operate. For example the number of video formats alone is tremendous (see Table 3.2 below), and from a functional perspective, a smartphone will still be a smartphone even it does not support one or more of these formats. However, supporting yet another format increases the interoperability of the device and adds to the value for the end-users.

**Table 3.2 A selection of video file formats**

▪ 3g2 (Mobile Video)	▪ f4v (Flash Video)	▪ mpeg (MPEG Video)	▪ tod (TOD Video)
▪ 3gp (Mobile Video)	▪ flv (Flash Video)	▪ mpeg4 (MPEG-4 Video)	▪ ts (MPEG Transport Stream)
▪ 3gpp (Mobile Video)	▪ m2ts (M2TS Video)	▪ mpg (MPEG Video)	▪ vob (DVD Video)
▪ asf (Windows Media Video)	▪ m4v (MPEG-4 Video)	▪ mts (AVCHD Video)	▪ wmv (Windows Media Video)
▪ avi (AVI Video)	▪ mkv (Matroska Format)	▪ nsv (Nullsoft Video)	
▪ dat (MPEG Video)	▪ mod (MOD Video)	▪ ogm (Ogg Media Format)	
▪ divx (DIVX Video)	▪ mov (QuickTime Movie)	▪ ogv (Ogg Video Format)	
▪ dv (DV Video)	▪ mp4 (MPEG-4 Video)	▪ qt (QuickTime Movie)	
	▪ mpe (MPEG Video)		

Source: <https://www.facebook.com/help/videos/uploading>.

It follows that producers of devices make a trade-off between the costs of incorporating yet another standard against the value added for end-users in terms of interoperability and connectivity. Transaction costs are part of this decision. Because there are so many standards (covering many SEPs and many SEP owners) and also many adopters, licensors have much to gain from preventing royalty stacking and facilitating a smooth licensing process; hence the conditions for forming a patent pool are optimal. Even when a certain standard is fully owned by a single company (e.g. AC3 from Dolby) the large number of adopters remains a good reason for the IP owner to minimise transaction costs by making the licensing procedure highly standardised.<sup>131</sup>

<sup>131</sup> See for example, <http://www.dolby.com/us/en/professional/technology/licensing/get-licensed.html>.

Besides the strong linkage between consumer electronics, information technology and communications technology products, there is also a link between consumer electronics and home automation, as well as with the 'smart electricity grid' and the 'smart home'. See also the section on smart grids. The convergence between industries leads to a growing number of adopters and therefore growing incentives for the pooling of SEPs.

### The value chain

In the NACE Rev.2 classification the manufacture of Consumer Electronics with the code 26.4 is part of the division 26 "Manufacture of computer, electronic and optical products".<sup>132</sup> It focuses on audio and video electronic equipment for home entertainment. This report follows the NACE definition, but widens it in the sense that tablets, e-readers and smartphones are also considered as consumer electronics products. The following table provides an overview on consumer electronics products and our categorisation.

**Table 3.3 Categorisation of Consumer Electronics**

Category	Description	Product examples
Video electronics	Entertainment products for home visualisation of reality or plays.	<ul style="list-style-type: none"> <li>• Video cassette recorders and duplicating equipment;</li> <li>• Television monitors and displays;</li> <li>• Household-type video cameras;</li> <li>• DVD players.</li> </ul>
Audio electronics	Entertainment products and accessories for audio production or re-production	<ul style="list-style-type: none"> <li>• Audio recording and duplicating systems;</li> <li>• Stereo equipment;</li> <li>• Radio receivers;</li> <li>• Speaker systems;</li> <li>• Jukeboxes;</li> <li>• Amplifiers for musical instruments and public address systems;</li> <li>• CD players;</li> <li>• Microphones;</li> <li>• Headphones;</li> <li>• Karaoke machines.</li> </ul>
Multifunction devices	Entertainment products which are based on the combination of video and audio electronics to provide a integrated entertainment experience	<ul style="list-style-type: none"> <li>• Video game consoles;</li> <li>• Tablets;</li> <li>• Smartphones;<sup>133</sup></li> <li>• E-readers;</li> <li>• Television sets;</li> <li>• Personal Video recorders (PVR).</li> </ul>

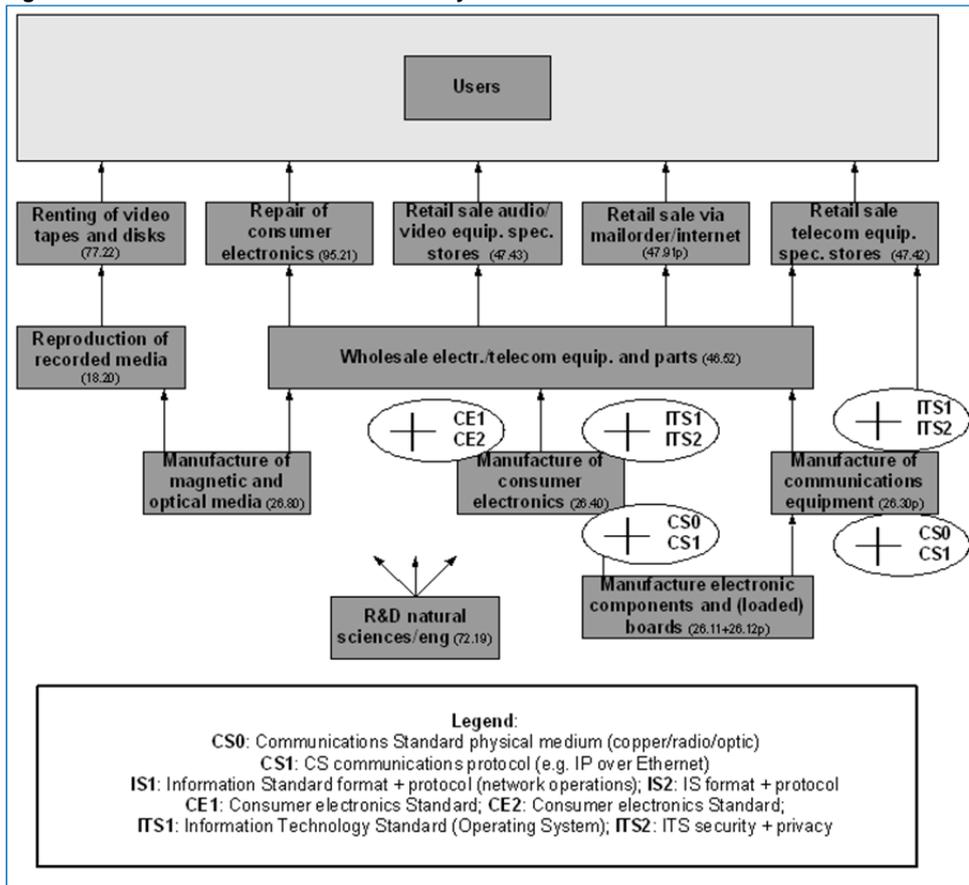
Source: Eurostat NACE 2 Rev. and Ecorys.

<sup>132</sup> EUROSTAT (2008): NACE Rev. 2 Statistical classification of economic activities in the European Community.

<sup>133</sup> Smartphones are also covered in the industry report on communication technology. We will therefore focus on other products when describing CE examples.

The major steps in value adding activities within the consumer electronics industry are depicted in Figure 3.2. The components constituting the value chain have been based on those value adding activities that are distinguished in the NACE system Revision 2 underlying the Eurostat data collection. The figure also displays the categories of interoperability standards applicable to the consumer electronics industry (CS – communications industry standard; CE – consumer electronics industry standard; ITS – information technology industry standard). It reflects – at high level – the convergence of the consumer electronics, the information technology and the communications technologies world in the integration of functionality of these industries in smart devices, using CE and ICT information formats.

**Figure 3.2 Value chain with standards overlay for consumer electronics**



### Market size

In 2010, the consumer electronics revenues in the EU27 amounted to €30 bln in manufacturing; with the retail sales of audio and video equipment in specialized stores amounting to €31.6 bln. The consumer electronics exports for the same year were €6.3 bln and the imports €18.1 bln. (source: Eurostat).

#### 3.2.3 Market dynamics: large number of licensees and licensors

The consumer electronics industry was dominated by large, globally competing companies which were able to generate large economies of scale and scope to afford high levels of R&D investment necessary to attain technological / product leadership. Today, the rivalry is intense, with the Asian suppliers having the benefit of a lower cost supply base, catch-up economies and the largest possible domestic market volume.

As the account of the various standards battles have shown, the power of the suppliers of complementary goods, in particular music and film, has been large. The power of the new ICT-enabled market place has shown that new players such as Apple can change the business model of the content providers (music store, pay-per-track). Moreover, more and more content is provided through the Internet without the intervention of the traditional content management companies.

### **Main producers of CE equipment**

In the consumer electronics industry some very large companies and major brands have historically determined the face of the industry, providing a broad portfolio of products. Notable examples are General Electric, Philips, Siemens, and Thomson. After the Second World War and the reconstruction effort, major competitors emerged from Japan, such as Yamaha, JVC, Panasonic and Sony. After the end of the Korean War the industrial catch up by South Korea resulted in new formidable global competitors, such as Samsung and LG. A well-known recent entrant originating in the IT industry is Apple.

Next to the main players a group of mid-sized and smaller companies exists that are highly specialised. In the audio segment examples of specialized firms are: Harman Kardon / Harman Grado, Sennheiser, Shure, Audio Technica, AKG, Denon, Bowers & Wilkins, etc. In fact, there are many smaller niche players: the Audiogon directory lists several thousands of such companies.<sup>134</sup>

### *Buyer power*

Buyer power is in part concentrated through the internationally operating Main Street shopping chains such as Media Market and Saturn. In their own market segments, these companies face increasing competition from on-line retail channels. Some of these are very large global outlets such as Amazon.

### *Supplier power*

Supplier power has increased with the major brands outsourcing supply and this supply becoming more unified and in the hands of a few specialised suppliers, such as Foxconn. Some large consumer electronics vendors are at the same time major suppliers to their competitors, Samsung is a typical case. This leads to conflicts of interest and high profile court cases, such as Apple vs Samsung.

If we consider technology as an input, the number of suppliers increased considerably. For example in audio and video encoding we recognize ATSC, Dolby, Ericsson, France Telecom, LG, Microsoft, NEC, NTT DoCoMo, Panasonic, Philips and Sony (to name a few). Also providers of chipsets (Qualcomm and Intel) should be regarded as suppliers to the main CE producers and they have considerable supplier power.

### **Exits and new entrants**

In recent years the market position of the large providers in Europe has become challenged by on the one hand cost pressures and on the other the technological convergence of information and communications technologies with the consumer electronics industry. For instance televisions tubes have been replaced by panel displays (based on LCD, Plasma, or LED technologies), similar to those used in computer screens. Cost pressures have resulted in a few global specialized suppliers based in Asia being used by the major consumer manufactures.

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<sup>134</sup> the <http://cgim.audiogon.com>.

As has been argued (also in the Communications Technology Industry section) audio and video have become mere data files in a specialized format. Computers, provided with a screen and speakers, can provide the audio and video functions once requiring specialized apparatus and specialized media.

The combined effect has led to a high profile exit: Philips exiting consumer electronics, selling its once-core business to Funai Electric Co. (Japan) for the token amount of €150 mln in January 2013.<sup>135</sup>

The introduction of MP3 as audio encoding format was followed by a wave of MP3-based products. Virtually all major brands were involved as well as many niche players. Apple can be considered the high-profile new entrant in consumer electronics, with iPods, Apple TV and the iTunes music and video store, closely tied to the iPhone and iPad as examples of converged consumer devices.

### 3.2.4 *The strategic role of standards and patents*

Traditionally, the competition for the market that characterised the CE industry has driven developers to collaborate in standard setting as well as in licensing out. This competition for the market requires a fast development of standards; hence consortia consisting of small groups of likeminded firms were often preferred over working through SSOs. Similarly, the need for a fast adoption of a standard led to the formation of a patent pool in an attempt to prevent royalty stacking and to minimize transaction costs and transaction time.

Digitisation and a growing complexity of the technology as well as the need for interoperability have led to a growing importance of SSOs. This is notably the case for digital media standards. At the same time the number of media standards is very high and the end-users wishes for interoperability require a device producer to adopt multiple standards – but not against all costs. The large number of adopters and the fact that being recognised as a standard does not guarantee acceptance by the market as such stimulates the use of patent pools when licensing out.

#### **Standardisation arrangements**

When considering consumer electronics, standards are largely set in consortia, some standards are de-facto firm standards. Media standards are often recognized through formal SSOs. For communications networking standards the formal SSOs play a leading role (see also section 3.1.4). With reference to the technologies that are standardized the following applies:

- hardware related standards, such as involving optical devices, SD card and USB) are typically developed in consortia; as well as through so-called middleware standardization platforms (W3C, UPNP);
- ETSI, 3GPP, IEEE, are commonly used for setting cellular radio standards (2G, 3G, HSDPA, 4G, WiMAX);
- IEEE plays an important role in the standardization of technology for short range devices (Wi-Fi);
- Internet related security standards (are addressed by the IETF);
- Media standards are typically developed through or recognized through an application at ISO or IEC;
- Some media technology standards are de facto standards (e.g. Dolby's AC3) but they often are registered with a SSOs and are subject to FRAND.

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<sup>135</sup> Source: <http://blogs.wsj.com/source/2013/01/29/philips-exits-consumer-electronics>.

Similarly to the telecom industry, the motives for participating in standardisation processes vary based of firm position and IP strategy:

- ensuring interoperability of a firm's technology IP with the technology IP of others;
- promote the adoption of own IP;
- steering technological developments in a way that is complementary to the own installed IP base; and
- keeping up-to-date about technological developments (knowledge management).

### **The role of IP**

In the consumer industry product differentiation is very important. At an early stage different standards compete for the market, which is a form of differentiation. Once a standard has 'won' the market and the SEPs are licensed out, they cease to lend themselves for differentiation. From then on differentiation is typically based on non-SEPs. Following a strategy to create standard-based market leadership, the use of IP in own products is the primary objective and the use of IP as a direct source of revenues becomes a secondary objective. The use of a patent pool facilitates the realization of these objectives. As such, the use of IP as a freedom to operate becomes a complementary strategy. The build-up of an IP portfolio for the purpose of cross licensing is considered of lesser importance. Nonetheless, the ownership of IP is essential in standard setting and winning a battle on standards and thus determines future developments.

The ownership of non-SEPs can become as important as ownership of SEPs, as the case of Apple appears to suggest. Market success and market dominance are enforced through Market Essential Patents (non-SEPs) rather than Standards Essential Patents, whereby SEPs relate to technologies that are accessible on FRAND terms and access to MEPs is at the discretion of its owner.

Patents represent tangible value of the (start-up) firm, which is important for the exit strategy of the venture capital providers. Having a strong IP portfolio facilitates access to capital (as it drives up the stock value) and it plays an important role in merger and acquisition processes.

### *IP landscaping*

IP landscaping is part of the routine activities of the IP departments, aimed at:

- identifying opportunities to innovate (including finding so-called blind spots);
- identifying the relevant IP partners;
- assessing own strategic IP position (valuation and risk assessment).

### **The creation/acquisition of IP**

Whether IP is developed in-house or is acquired depends on the position and strategy of the particular company. The large conglomerates are typically involved in all kinds of R&D trajectories: in-house, outsourcing, collaborations with universities, joint efforts with colleagues/competitors. Non-integrated niche players that focus on a particular technology mainly develop IP in house.

Again there is a difference between the conglomerates and niche players. Conglomerates move in and out of markets and (depending on the circumstances) they buy / sell / license in / license out IP depending on what is strategically deemed the best option. The non-integrated niche players typically license out IP.

### **Licensing-out/Patent pools**

Patent pools are a particular feature of the consumer electronics industry.

As both the number of licensors and licensees for a particular standard is large, the value added of patent pools is high. Patent pools usually only cover a single standard or a family of standards (for

instance the OneBlue pool) and they can only cover SEPs. Patent pools tend to favour a "one size fits all" approach, which is very useful in case there are a large number of adopters.

As by law bilateral negotiations need to be provided, licensing-out via patent pools is not exclusive.

As in the CE industry standards making is typically being followed by the formation of a patent pool, pure adopters of CE standards-based technologies have the 'option to wait' until a patent pool is formed.

### Licensing strategies

From the industry developments described above it becomes apparent that having established a standard does not automatically imply that the standard will also be adopted by the market. This is a crucial difference compared to the standardisation process in telecom and it affects licensing strategies. A multitude of factors play a role for the adoption of a standard by the market. Van de Kaa (2009) finds for instance that the characteristics of the standard supporter (financial strength, brand reputation and credibility, learning orientation) and of the technology (superiority, compatibility, flexibility) are crucial. It is also important to what degree the standard is compatible with the installed base (both at the adopter's as well at the end-user's premises). Last but not least, strategies towards complementary goods (i.e. content) as well as licensing strategies are crucial for getting a standard accepted by the market.

Concerning licensing strategies, we note that the marketing of a standard on the basis of bilateral negotiations becomes complicated if there is a high number of SEP owners ( $n$ ) and a high number of adopters ( $m$ ). As a result  $n \times m$  negotiations would have to take place if all potential contracts are to be concluded. This represents high transaction costs including delays which can in fast innovating markets be detrimental. Patent pools can mitigate the transaction costs, by reducing the search efforts, the contracting efforts and the enforcement efforts. Moreover, they reduce the time required to conclude a transaction. Patent pools also have some drawbacks, such as no cross-licensing possibility and no defensive strategies possible, but in the consumer electronics industry (in contrast to the communications technology industry) the balance is more often in favour of patent pools. Data on the use of patent pools shows that they are more frequently found in coding and compression, broadcasting and audio/video home systems – all of which are related to consumer electronics (see Figure 3.3). The other pools are associated with short-range communication standards and some in the telecommunication sector (about half of these are related speech compression technologies and codecs).<sup>136</sup>

But as the interests of patent owners are diverse, these pools are not easy to set up and may be a costly exercise.<sup>137</sup> The more recent pools are therefore usually administered by independent third parties that are specializing in the administration of patent pools, such as MPEGLA, ViaLicensing,

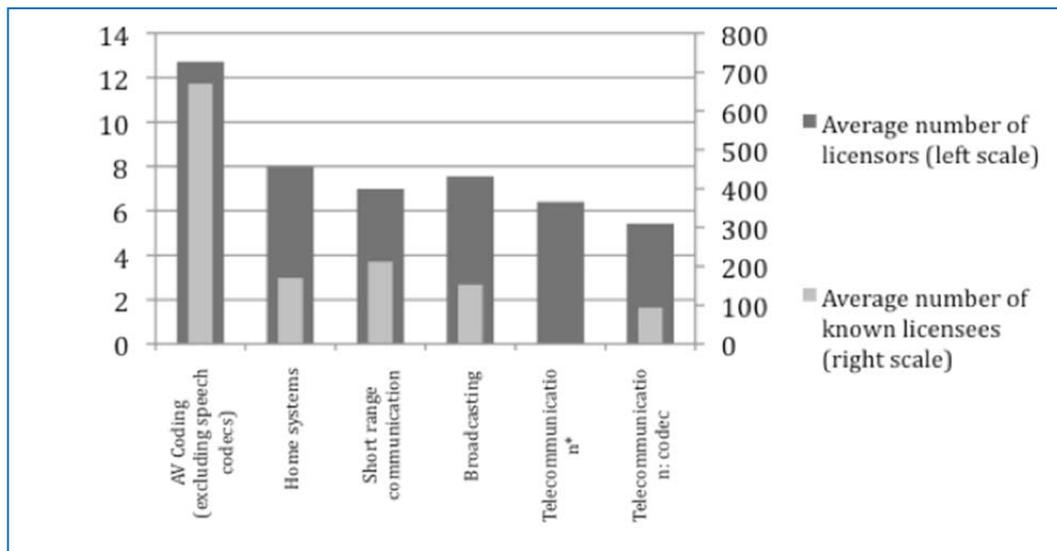
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<sup>136</sup> It is useful to differentiate between standards according to their level of aggregation as shown in Figure 3.3. Disaggregated standards such as codecs or compression technologies are typically used in many different applications. Patent pools on such standards often achieve high coverage and a very large number of licensees, especially in consumer electronics. In contrast, highly aggregated standards such as telecommunication standards (e.g. LTE), broadcasting technologies (DVB-T, ATSC) or home systems (Blu-Ray), incorporate and combine a large number of disaggregated technology standards for a particular technological purpose. Pools of these standards often achieve lower coverage of essential patent owners and have a limited number of licensees. We wish to note, though, that these are dynamic markets. A standard that results in a stand-alone product at one point in time (e.g. 802.11, for which initially specific products were made) may thus be combined with other standards later in its life cycle.

<sup>137</sup> Experience with setting-up the OneBlue pool showed that negotiations took considerable time and effort. In terms of monetary expenses (not including the man hours involved) the set-up costs were around 5 million euros. Additional expenses were required for being compliant with anti-trust rules by subjecting all patents to external essentiality assessments (costs: 5K to 10K euros, per patent, per major jurisdiction).

Sisvel, SiproLab, and VoiceAge. In other cases (e.g. One-Blue, One-Red), the pool members have created an ad hoc entity to administer a particular pool.

**Figure 3.3 Average number of (known) licensees and licensors**



### 3.2.5 Stylized industry characteristics

In this section a summary is provided of the stylized characteristics describing the developments in the industry, using three categories: value chain developments, patenting /licensing, and standardization.

#### Value chain developments:

- The historical succession of new media technologies and the associated battle for the related standard to be applied in recording/reproduction apparatus has come to an end;
- Digitalisation of audio and video has led to convergence, whereby audio and video have become 'just another encoding scheme and digital file format';
- Computers, provided with a screen and speakers, and the handheld equivalents thereof can provide the audio and video functions once requiring specialized apparatus and specialized media;
- The role of the recording medium is being replaced by an operating system platform, the access to content on the medium and now platform remains key in the competition for the market;
- Specialized technology suppliers have gained in market power.

#### Patenting/licensing:

- With many licensors and many licenses in an environment where standards battles are fought to obtain market leadership the use of patent pools enables fast adoption;
- Next to its importance in product differentiation, IP is also used for the creation of a separate revenue stream.

#### Standardization:

- For the consumer electronics industry the standardization in the information technology industry and the communications technology industry have become important, either as pure adopter or as influencer of their outcome;
- Hence, to the list of SSOs that were already important to the industry, such as ISO and IEC and the various consortia (CD/Blu-ray), are now added the SSOs and consortia important in the

Information Technology industry, such as IETF (IP and security), W3C (web protocols) and the UPnP Forum (plug and play), as well as the SSOs and consortia important to the communications technology industry, such as ETSI (infrastructure 2G-GSM, 3G-UMTS, HSPA), 3GPP (infrastructure 3G), IEEE (short range devices Wi-Fi, WiMAX), and the consortia support of the standard setting process, such as 3GPP and WiMAX Forum.

### 3.3 Automotive

This section takes a closer look at standardisation and licensing in the automotive industry. Specifically, the focus is on the 'smart' dimension of the industry value chain, the growing role of ICT therein, and the effects of new (ICT-based) standards on automotive industry dynamics. While the main geographical focus is on trends and developments in Europe, relevant international developments are included, given the global nature of the industry.

The section is structured as follows. First, we will present an industry definition and the rationale for our focus on the 'smart mobility' segment of the automotive industry (section 3.3.1). Second, a brief historic overview of the industry developments will be developed, including a description of industry dynamics and the role of standards and patents therein, concluding with an overview of the industry value chain (section 3.3.2). Third the market dynamics and business environment of the smart automotive industry will be tackled (section 3.3.3). Fourth the strategic role of standards, patents and licensing will be addressed, including a discussion of the most important Standard Setting Organisations (SSOs) and the relevant interoperability areas and platforms used in this industry (section 3.3.4). The final section (3.3.5) concludes with a summary of the industry characteristics.

#### 3.3.1 Industry definition and focus

For the purpose of this study the automotive industry is defined as comprising the design, manufacturing and retailing of cars for personal use. Main players in manufacturing include the tier - 1 through tier-3 suppliers. Car manufacturing components include: the body works, drive train, engine electronics and diagnostics, in-car entertainment systems, navigation and driver support systems. The industry focus for this study is the ICT-enabled 'smart' car. This industry segment is chosen as it represents the area where the issues around patents in standards have become the most intense reflecting the continued trend of convergence of the automotive industry with ICT industries.

For specifics regarding the SSOs mentioned in this section we also refer to Chapter 2 covering the institutional and regulatory framework of standardisation.

#### 3.3.2 Industry structure and developments

##### Industry developments

The term *automotive* was created from Greek *autos* (self), and Latin *motivus* (of motion) to represent any form of a self-powered vehicle. The automotive industry covers a wide range of companies and organisations involved in the design, development, manufacturing, marketing, and selling of motor vehicles, including towed vehicles, motorcycles, and mopeds. The term *automotive industry* usually does not include firms dedicated to the operation and maintenance of cars, such as repair shops and fuelling stations. The term typically *does* include a category of new players, namely the e-technology suppliers that are rapidly changing the capabilities of the modern car.

### *Standardisation in manufacturing*

The automotive industry is one of the first to apply extensive standardisation in its manufacturing process, required for the assembly line production, introduced by Ford in the beginning of the twentieth century. Early standardisation efforts concerned largely the nuts, screws, washers and bolts used in cars. Over time car manufacturers have standardised entire production platforms, which allow common parts, such as the chassis and the engine, to be used across multiple brands. Moreover, it enabled the development of a network of (sub-)suppliers to develop.

### *Process innovation*

Following the standardisation in manufacturing the focus shifted to innovations in process management. A well-known example is the adaption of the Just-In-Time (JIT) principle introduced by Toyota in Japan. JIT has a simple philosophy: increase return on investment by exposing the hidden cost of unused inventory. It has proven central to the smooth running of the car industry's supply chain and has led to substantial cost reductions in the manufacturing process. Another example of process innovation is the e-exchange of business documentation between car makers and their supply chain, so that suppliers can be incorporated into production lines with very little delay, irrespective of their location. This process is known as the electronic data interchange (EDI), this now 40-year old e-exchange system was a first step in incorporating ICTs into the automotive supply chain.

### *Alternative power*

Most cars are propelled by an internal combustion engine fuelled by gasoline or diesel. Increasing environmental concerns have led to the development of alternative sources for power such as: hybrid vehicles, plug-in electric vehicles, and hydrogen-based vehicles.

### *Smart cars*

Recent innovative developments in the automotive industry are mostly related to the incorporation of ICTs in cars. Examples include engine control and diagnostics. Concerns regarding car safety are leading to the increased use of ICTs to support the car driver, including radar-based distance control, car-to-roadside communication, and car-to-car communications. Car navigation and real-time traffic information systems are aimed at improving traffic flow, reducing delays and thereby improving transport economics. Finally, in-car infotainment is becoming increasingly important in providing added value for consumers.

The above trends show that e-mobility technologies supporting the connected car are changing the innovation landscape in the automotive industry, enforcing the position of existing ICT related suppliers and opening-up opportunities for new players. In particular, it is expected that the smart mobility dimension in automotive will lead to the development of new set of automotive standards, that one the one hand build upon existing ICT standards (e.g. mobile connectivity, audio & video, GPS-based navigation and location) and on the other develop industry specific ICT-based solutions and related standards. (E.g. related to safety, ICT-supported driving, use of radar technology).

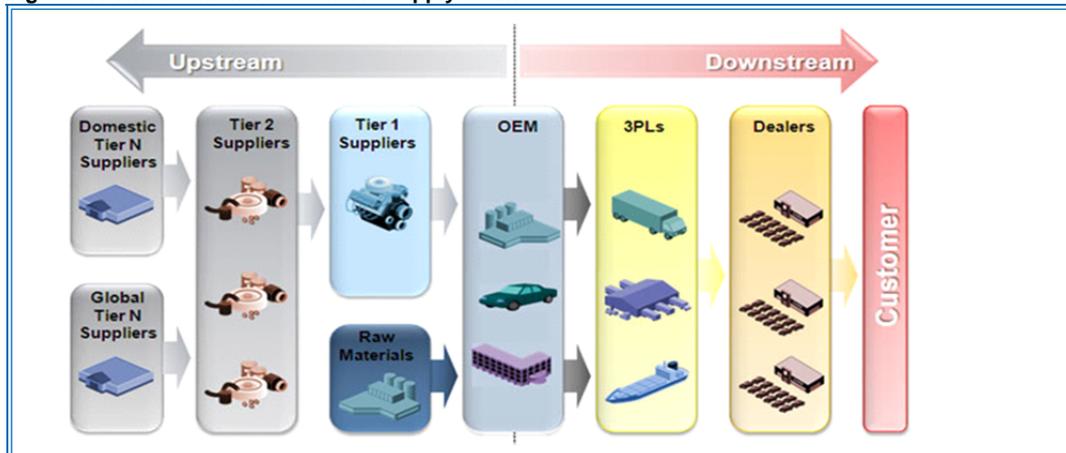
### **The automotive supply chain**

The automotive supply chain is complex. There are approximately 20,000 parts in a car and if only one of those parts is unavailable, the finished product (i.e. the car) cannot be shipped. The industry is highly globalized, meaning that many vehicle components are used from different (sometimes distant) locations. A key trend is the increasing role of e-technologies in the car manufacturing process. To this end, it is useful to make a distinction between two types of automotive supply chains: (1) the traditional value chain; and (2) the smart automotive value chain.

### Traditional automotive supply chain

The traditional automotive supply chain is composed of a linear, tiered structure (see Figure 3.4). The most important players in the traditional supply chain are the car makers, or Original Equipment Manufacturers (OEMs). Tier 1 and tier 2 suppliers will typically have a plant close to the car makers to ensure Just-In-Time (JIT) and lean manufacturing production processes. Examples of OEM companies include: Ford, Toyota, Nissan, Renault, General Motors, BMW, Hyundai-Kia, Integrated Automotive Group (Porsche, Volkswagen).

Figure 3.4 The traditional automotive supply chain



Source: EDI Basics<sup>138</sup>.

Upstream from the car makers are the tier 1 suppliers. These companies provide the major vehicle components or sub-systems for cars, such as the engine, suspension assembly or gearbox. They take care of car and engine design and put sub-component pieces together to create (semi-) final products. Further upstream, we find the tier 2 suppliers, who typically provide the sub-components to tier 1 suppliers, such as pump units, electric motors, or bearing assemblies. At the next level upstream are the tier three suppliers who supply basic equipment, such as brackets and seals. These suppliers can be sub-divided into global and domestic suppliers. Downstream from the car makers we find the so-called third party logistics (3PLs) or distributors, who will distribute finished vehicles to storage facilities and distribution centres around the world. The cars will then be shipped further downstream to car dealerships and car rental & fleet providers.

### Smart automotive supply chain

The smart automotive supply chain illustrates how cross-industry technological convergence is progressing between the Communications Technology (CT), Information Technology (IT) and automotive industries, see Figure 3.5. (CS – communications industry standard; IS – information standard; ITS – information technology industry standard). They include one crucial group of new players: the e-technology suppliers. Among other things, they design and manufacture electronic components and boards, computers and software, and communications equipment. Examples of European e-technology suppliers are NXP Semiconductors and Bosch Automotive Technology.

<sup>138</sup> EDI Basics: The Automotive Industry. Link: <http://www.edibasics.co.uk/edi-by-industry/the-automotive-industry/>.

Figure 3.5 Value chain smart automotive industry

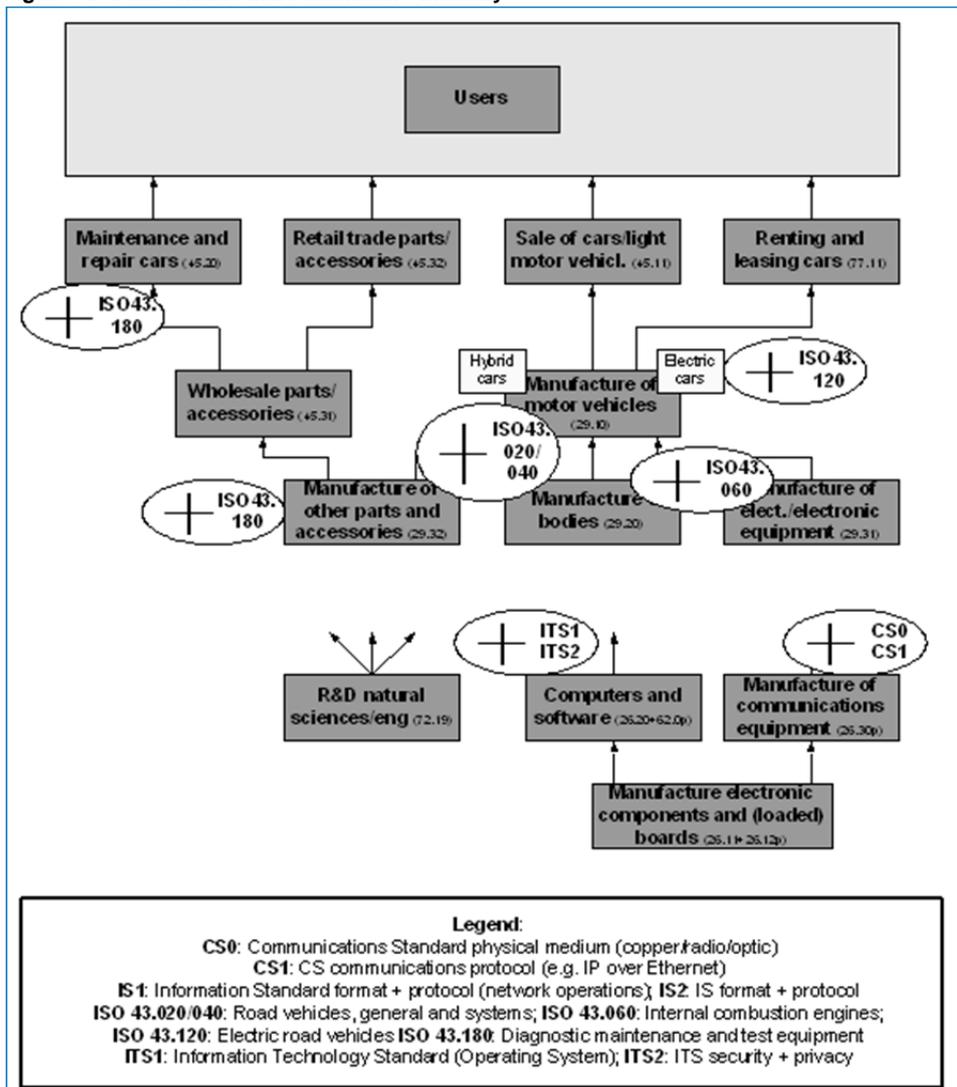


Figure 3.5 presents the categories of interoperability standards applicable to the automotive industry as an overlay on the value chain. (Source: author.) The figure reflects the convergence of the automotive and the communications technologies world. The components constituting the value chain have been based on those value adding activities that are distinguished in the NACE system Revision 2 underlying the Eurostat data collection.

### 3.3.3 Market dynamics: entry and exit

#### New technology developments facilitate entry

In the traditional automotive industry, the threat of market entry is low because of high barriers to entry as a result of economies of scale and scope. The developments with respect to all-electric cars and smart cars open up new possibilities for entrants.

Firms that are specialised in the electrical field rather than in the field of internal combustion engines are relatively less susceptible to the traditional barriers when entering the market for electric cars. For example, China – the biggest and fastest growing auto market in the world – is currently investing billions in massive electric vehicle (EV) infrastructure projects. This has led many European (especially German) automakers to seek out local Chinese state-owned companies to secure a long term presence in the development and deployment of electric cars in China.

Examples of joint ventures which have been formed by European car makers in this regard include: BMW and Brilliance Automotive, Daimler AG and BYD, and Renault and Dongfeng.

E-mobility and the establishment of a new network of players involved with creating a 'connected car' are set to drive the industry in a radical new direction. Enhanced connectivity within and between cars and road infrastructure through new IT and CT technologies will be a key driver for future R&D in the industry. Fields such as materials technology, recycling, energy and fuels, drive-train development, aerodynamics and ergonomics are all included in car makers' diverse R&D portfolio. Telematics in the automobile industry started with the focus on developing emergency warning system for vehicles. But the telematics segment is continuously expanding with technologies such as GPS navigation, integrated hands-free cell phones, wireless safety communications and automatic driving assistance systems now being covered under the telematics umbrella.

### **Business environment**

Substitutes in the form of alternatively powered cars and the increasing role of ICT-based firms have a strong effect on the already intense rivalry in the automotive industry. According to the KPMG Automotive Survey 2013, the automotive value chain is undergoing changes and the battle between firms for control is heating up. Tit-for-tat price slashes, advertisement campaigns, and product developments keep them on the edge of innovation and profitability. Margins are low and all major car-producing nations experience the intensified rivalry. This includes the EU (Germany, France, Italy, UK), US, Japan, EU, China, India, and Korea.

Most players realise that the only way to benefit from this rapidly changing and more complex business environment is through voluntary collaborations. Therefore, the favoured business strategy is to collaborate in the pre-market phase, as the smart automotive market, while rapidly developing, is still in its infancy and it is unclear which technologies and standards will dominate in the future. As a result, car makers (OEMs) are including smaller, more specialised players in their value chains to ensure the latest knowledge and specialisations are incorporated in their business models.

### **R&D and the role of ICT**

The ICT-based integration along the smart automotive supply chain is increasing the supplier power of ICT-based firms. Furthermore, as a result of a higher priority in regulations on efficiency and safety, the suppliers of related components are gaining power as well. Especially since car makers are finding it increasingly difficult to produce specialisations in-house, such as electric components, IT/connectivity, and strong lightweight materials such as carbon fibre.

The above mentioned developments are enhanced by the increasing role of R&D related to e-technologies relative to the more traditional R&D related to manufacturing car parts. According to Cap Gemini, 80% of industry executives agreed that the future of their industry lies in e-mobility and expect this change to occur over the coming 5 to 20 years:

Plug-in hybrids, semi-hybrids, full-electric vehicles and battery technologies are a few of the developments arising from the emergence of the electrified powertrain. As these technologies gradually find their way into mass production and reach a state of consumer readiness, automotive companies need to reflect on where their own offerings fit into this evolving market, and how they will manage the migration of their role and products.<sup>139</sup>

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<sup>139</sup> <http://www.automotiveworld.com/comment/92065-the-automotive-industry-must-prepare-for-e-mobility/>.

These expectations are to some extent already reflected in Table 3.4, which provides the top 7 subsectors for patent-filings in 2012. The auto industry's greatest single source of new patent activity was in alternative-powered vehicles, with 22,688 new patents, an increase of 42.6% relative to 2010. Other important categories are navigation systems, safety and pollution control. The more traditional automotive subsectors (suspension, gearing, et cetera) are, with the exception of transmission, losing ground. Currently, the top patent holders are: Toyota (Asia), Robert Bosch (Europe), and General Motors (United States).

**Table 3.4 top 7 subsectors for patent-filings in 2012**

Subsector	Patent-filings 2012
Alternative-powered vehicles	22.688
Transmission	11.859
Navigation systems	11.594
Safety	10.286
Seats, seatbelts and airbags	8.614
Pollution control	7.262
Suspension	6.393

Source: Thomson Reuters Derwent World Patents Index (DWPI).

### 3.3.4 The strategic role of standards and patents

#### Standard-setting arrangements

Standards being developed for the automotive industry can be sub-divided into four groups<sup>140</sup>:

- Vehicle components and engineering;
- Basic mechanical and electrical parts;
- Materials;
- Management systems.

The major standardisation organisations relevant for the automotive industry are the International Standardisation Office (ISO), the European Telecommunications Standardisation Institute (ETSI), and SAE International. We briefly describe the role of these organisations in the development of standards in the automotive industry.

#### SAE International

SAE International, formerly known as *Society of Automotive Engineers*, is a US-based “global association of more than 128,000 engineers and related technical experts in the aerospace, automotive and commercial-vehicle industries.<sup>141</sup> SAE International's core mission is to foster life-long learning and voluntary consensus standards development. For the automotive industry, the SAE publishes more than 1,600 technical standards and recommended practices for passenger cars and other road going vehicles. SAE standards also covers other aspects of the car, such as headlamps, other vehicle lighting, brakes, automatic transmission fluid, communication networks, electric vehicle charging systems, vehicle ergonomics, and numerous aspects of car design, construction, performance, and durability.

<sup>140</sup> “The Economic Benefits of Standards: Types of Standards relevant to the Automotive Industry”, ISO and Roland Berger Strategy Consultants, 2012, p21.

<sup>141</sup> SAE website, Link: <http://www.sae.org/about/>.

### *International Standardisation Office (ISO)*

In the ISO category 'road vehicle engineering' (chapter 43), standards have been or are being developed in a broad range of automotive segments, including: road vehicle systems, internal combustion engines, commercial vehicles, passenger cars, electric cars, motorcycles and mopeds, cycles, special purpose vehicles, and diagnostic, maintenance and test equipment.

The ISO11898 family of standards covers the CAN, or Controller Area Network, designed to allow microcontrollers and devices to communicate with each other within a vehicle without a host computer. The CAN was originally developed by Bosch in 1983 and officially released at the society of Automotive Engineers (SAE) congress in 1986. The first CAN-based chips came on the market in 1987, produced by Intel and Philips. Bosch holds a patent and licenses the use of the protocol. On top of the CAN bus each manufacturer has developed its own standard applications, which includes GMLAN (for General Motors), RV-C for recreational vehicles, Energy Bus for electrical vehicles, and SAE J1939 for heavy road vehicles. CAN bus connectors are not standardised but several de facto standards for mechanical implementation have emerged.

### *European Telecommunications Standardisation Institute (ETSI)*

ETSI produces globally-applicable standards for Information and Communications Technologies (ICT), including fixed, mobile, radio, converged, broadcast and internet technologies. To this end, ETSI is home to numerous standards relevant to the connected car including, inter alia, standards in Intelligent Transport Systems (ITS) and Machine-to-Machine (M2M) communications. In addition to standard development, ETSI is also very active in the testing and deployment of standards (under development). For example, in December 2013, ETSI will host the 4th ETSI M2M Workshop which will examine major issues facing wide-scale M2M deployment. One of the more relevant group of standards for increased connectivity between cars and platforms is the Cooperative Intelligent Transport System (C-ITS). The EU Directive 2010/40/EU of 7 July 2010 defines C-ITS as "systems in which information and communication technologies are applied in the field of road transport, including infrastructure, vehicles and users, and in traffic management and mobility management, as well as for interfaces with other modes of transport."<sup>142</sup>

## **Interoperability of standards**

### *Connected cars*

Interoperability of standards is becoming increasingly important with the development of connected cars. We provide a few examples of efforts aimed at increasing interoperability, efforts which reflect the role of public policy in setting automotive standards. First, consider the Cooperative Intelligent Transportation Systems (C-ITS). The value of C-ITS standards as a tool to reduce fragmentation in the regulatory environment was given a tremendous boost by trilateral cooperation on the global harmonisation of standards between the EU, US and Japan, which resulted in an MOC on C-ITS in 2011.<sup>143</sup> Korea and China are set to join as well.

Another example is the successful collaboration in the ISO is ISO/TS16949, a meta-standard that integrates US and European automotive standards into a single standard for the entire automotive

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<sup>142</sup> EU Directive 2010/40/EU, Link: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:207:0001:0013:EN:PDF>.

<sup>143</sup> Memorandum of Understanding on Cooperation in the Field of Intelligent Transport Systems (ITS). The agreement, concluded under the terms of the "Implementing Arrangement between the USDOT and the MLIT of Japan on Cooperation in Transportation Science and Technology," formalises and advances the existing technical cooperation and information exchange on ITS between the US and Japan. More information: [http://www.its.dot.gov/press/2010/japan\\_mou.htm#sthash.cllVKq5e.dpuf](http://www.its.dot.gov/press/2010/japan_mou.htm#sthash.cllVKq5e.dpuf).

industry. It sets out “requirements for design, servicing, installation and production of automotive-related products”<sup>144</sup>.

Finally, ETSI has also made efforts at increased interoperability. In May 2012, the European Commission sponsored an ETSI event in Nuneaton, United Kingdom, to test the interoperability of the so-called e-Call service with the objective to “provide a realistic environment for vendors to test their implementations against each other”.<sup>145</sup>

E-Call is a pan-European in-vehicle ICT-enabled emergency service required for all new cars manufactured in the EU from 2015. In case of a serious accident, the e-Call system will automatically initiate a 112 emergency call to the relevant Public Safety Answering Point (PSAP), which will establish a voice connection between the PSAP and the occupants of the car. As soon as a connection is established, a minimum set of data (MSD) related to the accident (including location, time and direction of the car) is transferred to the PSAP. E-Call can also be triggered manually in case the automatic function is disabled.<sup>146</sup> In addition to its primary function as an emergency service, e-Call regulation marks an important breakthrough in terms of opening the car to its broader environment and creating a fully connected car. The regulation itself will likely result in a wide-scale usage of connected vehicles in Europe. As an ICT-based service, e-Call can be used as an embedded unit with an integrated network device (e.g. GSM) or a phone-based solution, consisting of an in-vehicle system and a mobile phone. Many of the standards for e-Call are either approved or under final approval. A full list of e-Call standards can be found on the website of iCar Support, a European Commission funded project coordinated by ERTICO – ITS Europe.<sup>147</sup>

Other countries are developing similar emergency call services to e-Call and have been following European e-Call standardisation developments closely. Examples include Russia’s ERA Glonass, a similar service to e-Call with specific add-on features to suit its local mobile infrastructure, and Brazil’s SIMRAV, a national anti-theft system. Japan, New Zealand, and Israel have expressed interest in e-Call as well.

### *Electric cars*

The increase in regulatory obligations and standardisation mandates is an important indicator for future trends. For example, the multitude of standards related to electric vehicles is indicative of the trend of electric cars to expand on a global scale. Consider, for example, global trends to produce an electric vehicle grid. China, confronted with massive environmental challenges as it tries to balance its growing middle class demands for more cars with the ever-increasing pollution levels of its cities, is creating so-called green rings around its larger cities for traffic that will operate solely on electricity. Such a grid will comprise buses, cars and other transportation systems – all dependent on an adequate and steady supply of battery-operated plug-in apparatus. These developments will help increase the market potential for e-mobility technology, contributing to increased competitiveness and a more sustainable road transportation system around the world.

### *Interoperability challenges*

Despite the developments described above, there is still a long way to go before the automotive industry will reach full interoperability of standards. According to an Ecorys study on non-tariff

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<sup>144</sup> <https://www.gov.uk/motor-industry-management-systems-certification>.

<sup>145</sup> ETSI: e-Call 2012 News and Events, Link: <http://www.etsi.org/news-events/events/592-2012-ecall>.

<sup>146</sup> GSMA mAutomotive, Connecting Cars: The Technology Roadmap, February 2013, Version 2.0, p18.

<sup>147</sup> Link: <http://www.icarsupport.eu/ecall/ecall-standardisation/>.

measures<sup>148</sup>, full interoperability of automotive standards is not likely in the medium term, despite potential gains in trade and investment, because of differences in national or regional level objectives, such as health and safety or environmental policies. This effect is increased by the emergence of e-technology applications, which will likely emerge based on different national/regional standards development efforts.

An example where the car industry is confronted with continued diversity of existing standards is in the field of infotainment – ranging from AM and FM to DAB (+) to DRM (+) and HD Radio. It has prompted NXP Semiconductors, an e-technology supplier, to apply software defined radio (SDR). While SDR concepts have been used for years in military applications, it is only recently that designers of car radios have started using SDR that support both traditional analogue radio systems (AM and FM) and digital radio systems. According to NXP “migrating the radio functionality from hardware to software brings cost advantages for global car production, and also offers more flexibility on the manufacturing side for future radio features.”<sup>149</sup>

While telematics and infotainment have provided an impetus to open up the car system to an interconnected grid (vehicle-to-vehicle and vehicle-to-infrastructure), the level of interoperability remains a challenge. Consider, for example, the on-going question of the boundaries of the automobile as an object and its interface relationship with other technical systems. Should the industry attempt to absorb and completely incorporate emerging technical systems in order to convert them to "onboard" systems? Or, in contrast, should it rely on mobile technologies (i.e. mobile phones, portable computers) and open up the automotive system by creating the most effective interfaces possible?

#### *The role of platforms*

One way in which the automotive industry is circumventing these interoperability challenges is in the increasing use of so-called platforms in the development of automotive standards. An automobile platform is a “shared set of common design, engineering, and production efforts, as well as major components over a number of outwardly distinct models and even types of automobiles, often from different, but related marques”<sup>150</sup>. It is a good basis for integrating fast-moving innovations in the value chain because they can be easily built on by new players with additional competences, while knowledge, competences, risks and costs can be shared because of standardised interfaces.<sup>151</sup> Finally, platforms are better suited to accommodate advanced technologies needed for the connected car.

#### *Digital cars*

Automotive platform developments will be crucial in moving the car from a software based system to a digital system (car-to-cloud). This, in turn, will have an impact on standard development in the future. Trend experts from the Telematics Research Group, now part of IHS iSuppli, a global market research firm in automotive telematics, navigation and safety systems,<sup>152</sup> already argued in 2009

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<sup>148</sup> Ecorys Study: “Non-Tariff Measures in EU-US Trade and Investment: an Economic Analysis”, 2009. Link: [http://trade.ec.europa.eu/doclib/docs/2/Link: http://www.icarsupport.eu/ecall/ecall-standardisation/. /docs/2009/december/tradoc\\_145613.pdf](http://trade.ec.europa.eu/doclib/docs/2/Link: http://www.icarsupport.eu/ecall/ecall-standardisation/. /docs/2009/december/tradoc_145613.pdf).

<sup>149</sup> EBU Technical Review – 2012 Q2, M. Steigemann.

<sup>150</sup> Brylawski, Michael (27–29 September 1999). Uncommon Knowledge: Automobile Platform Sharing's Potential Impact on Advanced Technologies, pre-print for the 1st International Society for the Advancement of Material and Process Engineering (SAMPE) Automotive Conference.

<sup>151</sup> Platforms, in essence, facilitate the transaction between buyers and sellers. As is the case in other industries, a platform is a common place to launch technologies, rules, agreements (like standards) and institutions, on which different players can innovate and develop additional technologies, products or services. From: A. Gawer. *Platforms, Markets and Innovation* (2009). Massachusetts: Edgar Elgar Publishing.

<sup>152</sup> See link: <http://www.isuppli.com/About/Pages/Default.aspx>.

that the fundamental foundation for a digital car had been laid down. In the 2015-2020 time frame, analysts expect the digital car to function with the help of so-called electronic control unit (ECU) domain clusters, gigabytes of RAM, ROM and HD, 10-plus electronic buses, multiple communication links, and an internal wireless LAN. In that same medium-term time frame, highways could see widespread vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications.<sup>153</sup>

## The role of IPR

### *The traditional role of IPR*

The traditional development of IP in the automotive industry is primarily done by an approach which has become known as the 'Holst Model'. This is a collaborative approach that helps to reduce R&D costs (multiple R&D investors) and ensures that all parties that have helped develop the IP get a user right to it (return on investment). Parties that join in a later phase pay an entry fee: they do not have an immediate right to the IP, but they can buy that right if they want it. Given that entry has been fairly limited in the past, the incentive to use IP as a source of revenue has been limited as well.

In line with the collaborative approach, the number of disclosure events of Standard Essential Patents (SEPs) is relatively low in the core sector of the automotive industry. For example, the number of disclosures is 27 for the Transport technology area, while it is 2208 and 965 for Telecommunications and IT respectively.<sup>154</sup> Furthermore, while standard wars are quite common in industries such as communications technology and consumer electronics, it is a rare phenomenon in automotive, and occurs mainly in the 'smart' parts of the automotive supply chain. A case in point: the tensions between car entertainment platforms such as SYNC (Ford) and ConnectedDrive (BMW) with smartphone applications such as Eyes Free (Apple).<sup>155</sup>

### *Changes in the role of IPR*

Recent developments have changed, and will continue to change, the strategic role of IPR. First, there is a clash of worlds between the traditional automotive industry mode of working and the new players with a background in the ICT and/or CE sectors, where patents are used more strategically (i.e. to generate revenue, currency in IP negotiations, et cetera).

The level of collaboration in a given IP environment will depend on the type of product concerned (and the companies involved). If the product is highly specialised and less integrated across players, patenting will be less collaborative. Similarly, technology hardware will tend to be patented more quickly than software "models" (which are more easily adapted to circumvent patent descriptions and standardisation mandates).

One example involves Nokia, who, despite its fleeting involvement with cars prior to 2010, suddenly announced its formal collaboration with NAVTEQ and a range of automotive partners, including the Consumer Electronics for Automotive working group (CE4A), a new connectivity technology called 'Terminal Mode' that helps cars and smart phones connect together.<sup>156</sup> More specifically, this technology, which was developed in collaboration with the Nokia Research Center, connects mobile devices to in-car infotainment system. It was proposed as an industry standard to connect *all* smartphones that adopt it (not just Nokia smartphones) to support in-car infotainment systems. Immediately thereafter, Mercedes announced its intention to use Terminal Mode for its 2012 C-

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<sup>153</sup> See link: <http://www.sae.org/mags/sve/VEHIC/6308>.

<sup>154</sup> Data derived from the quantitative analysis as part of this Study reported in following Chapter.

<sup>155</sup> Article: <http://www.themalaysianinsider.com/drive/article/telematics-car-wars-go-inside-the-vehicles>.

<sup>156</sup> Link: <http://research.nokia.com/news/9356>.

class, its next generation car, underpinning the success of the Nokia lobby and broader appeal of the technology in the automotive industry. Since then, Nokia's position in the automotive value chain appears to have been consolidated and efforts to develop and protect new technologies have increased accordingly. In June 2012, for example, Nokia filed a patent on a new technology that detects vibrations in the steering wheel to let the driver control music, GPS and other components of the car's center stack just by touching particular spots on the wheel itself.<sup>157</sup> Nokia's mobile know-how makes it likely the company will develop a smart phone type application or mobile device rather than trying to build anything itself in the wheel. Experts believe, however, Nokia will more likely license the patent rather than try to build anything itself.

Despite Nokia's success, many firms that do not have a strong background in either telecom or automotive (like producers of navigation devices) are finding it difficult to gain access to relevant IP in the automotive industry. Car makers are demanding increasingly fully integrated systems which can provide new features like *intra-car-connectivity*. This in turn forces players to implement a wider range of connectivity standards from the ICT industry. Implementing these types of standards as an industry outsider is very costly. As such, specialised suppliers familiar with both industries are best positioned to provide units/products/sub-assemblies that can be readily integrated in the car. The licensing of the technology, in turn, will increasingly be embedded in product supply.

Licensing occurs after the IPR and standard have been set and/or defined and ready to become part of the standards adoption process in the market. Collaboration with respect to licensing in automotive usually takes the form of joint marketing of the complementary technologies. Consider, once again, Nokia's efforts with NAVTEQ and CE4A. This form of collaboration lowers search costs for technology adopters and lowers enforcement costs for patent owners.

### 3.3.5 *Stylised industry characteristics*

The following observations can be made on the role of knowledge creation and knowledge flows, patents and licensing, and their relationship to standards, vis-à-vis the role, strategies and actions of firms in the smart automotive industry.

#### **Value chain developments:**

- A range of new players has emerged in the automotive industry. These players are showing up in the smart dimension of the automotive value chain, from upstream e-component suppliers, light-weight materials manufacturers and IT connectivity experts, to downstream e-mobility experts and car dealers. The emergence of these players has led the big players to include these smaller, more specialised players in their (value chain) operations;
- Most players realise that the only way to benefit from this rapidly changing and more complex business environment is through voluntary collaborations. Therefore, the favoured business strategy is to collaborate in the pre-market phase, as the smart automotive market, while developing rapidly, is still in its infancy and it is still unclear which technologies and standards will dominate in the future;
- New business models need to be developed that better align investment incentives with market and technological developments. It is still uncertain which models will finally emerge. In all likelihood, it will become increasingly attractive for firms to share the costs, risks and competences needed to develop relevant new technologies and develop the standards around them. Platforms can provide an important networking function in this regard.

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<sup>157</sup> Article on Nokia's use of smartphone technologies for automotive: <http://www.engadget.com/2012/06/15/nokia-patent-application-uses-steering-wheel-touch-for-media-controls/>.

- The true complexity of the smart automotive market appears in the interaction between car makers, industry trends, new business models, and the resulting developments in standardisation and legislation. The future of the industry will depend on car makers to invest heavily in R&D focused on the development of new technologies;
- Unlike the consumer electronics industry, ICTs will not subsume the car as a 'product'. In the automotive industry, ICTs actually serve to enhance the functionality of the car and replace certain (outdated) functions currently implemented through other technologies. Specifically, ICTs will enable a car to expand their functionality to become internet 'hubs' of the future, allowing its users to access the Internet and be entertained by music and film. Moreover, ICTs will help improve safety and utilisation of the road infrastructure by enabling cooperative driving, using car-to-car and car-to road side communication;
- The emergence of the electrical car challenges the traditional R&D base of the automotive industry: internal combustion engine technology. Today, all major OEMs are investing substantially in new e-technologies such as powertrain, hybrids, electrical, and hydrogen. That said, as electrical cars are still limited in range and battery costs remain high, the transition to e-cars will be a slow and evolutionary process.

The use of internet and other technological innovations in automotive has made the means of production, distribution, financing and design of auto-related products and services much more accessible to a broader public. This has given some (groups of) end users the option to develop their own products. These so-called 'DIY communities' (do-it-yourself) will continue to form to share knowledge, build reputation, and help each other. Established firms, in turn, will use these means to help bind DIY communities to their own (firm-based) innovation processes (e.g. through crowdsourcing) or by offering – as platform providers – generic and standardised building blocks for further DIY product development.

#### Patenting/licensing:

- Under the so-called 'Holst model' the IP generated as a result of collaborative R&D remains within the consortium, with all participants having the same usage rights. New entrants will have to pay an entry fee depending on the IPR value that has been set or created prior to their entry;
- In the automotive industry IPR is typically applied directly into products. IPR as a separate revenue stream is not (yet) being pursued;
- Cooperative driving involves car-to-car communication, car-to-roadside communication and automatic systems taking over the driving role from the chauffeur. Cooperative driving systems will require adaptation of safety regulations and hence the related standards.

#### Standardisation:

- The automotive industry is a highly standards-based industry, linked both to the vastly automated car manufacturing process and the ICT-enabled just-in-time supply chain. Within each OEM, standardisation is applied across designs to allow the same car parts to be used in multiple designs and brands;
- Standards may, when pursued as a strategic tool, play an enabling and protective role for dominant and traditional automotive firms, who will not be open to too much competition. Firms with long business cycles (traditional automotive OEMs) that merge with companies with short business cycles (app and mobility providers) are unlikely to survive in a dynamic, fast evolving industry. It is more likely that vertical integration of OEMs will continue while app developers, telematics and infotainment providers will be added on to existing platforms. Standards, then, will become an important instrument to secure longer-term (returns of) investment;
- With the introduction of manufacturing based on the assembly line, the automotive industry has become a global leader in standardising its supplies. However, the emergence of new, high-

tech technologies requires new forms of collaboration. As such, the industry is increasingly making use of automotive platforms;

- Standardisation activities for automotive are focused on ISO, ETSI and SAE International. Participation is led by the large OEMs and Tier 1 suppliers. But, given the increasing importance of car-to-road, car-to-car and car-to-cloud communications, the standardisation process necessitates ever-closer collaboration between private and public stakeholders;
- It is likely that electric vehicles and the further digitalisation of the smart automotive market will have the biggest influence on the nature of standards that will be developed in relation to the connected car of the future. Instead of hardware, we will see an increase in software solutions. Given the large mix of technologies that are being developed in (single) applications, cooperation in the development of standards in this market is likely to occur rather naturally, as a result of the continued need to integrate different technologies;
- The applications of ICTs in cars provide for added value and an increased competitive advantage. To this end, major car makers (OEMs) are developing and implementing car-platform dependent solutions. Ultimately, a battle will emerge between car-platforms and device-platforms. The question then arises: will the car become 'just another' device connected to the operating system (OS)-platform?
- Unlike mobile devices, where switching platform providers is very common, it is unlikely consumers will be willing to switch their cars unless the difference in service is profound. Nevertheless, the shift from car-owners to car-users will likely continue as cars become increasingly tied to their surrounding infrastructure, public transportation systems become smarter, and new platform collaborations emerge. To this end, the car will become less of a product and more of a service to be used if and where convenient;
- ICT-enabled driving includes stand-alone (drive-alone) solutions and road infrastructure-based solutions have an immediate impact on safety. Governments will therefore need to keep improving and adapting safety requirements and develop new ones. This must be done from a regional if not global perspective. Close collaboration between all stakeholders will be necessary as the development of vastly different technologies might lead to fragmented solutions, inhibiting knowledge transfers and new innovations.

### 3.4 Smart Grids

This section has as focus the electricity supply industry and in particular the 'smart grid' dimension.

As an infrastructure industry it is characterized by the need for interconnection and interoperability and as such it reflects an important role for standardization. These standards are more related to the voltage/frequency and plug compatibility and less so with interface protocols. Innovation and hence patents are important to the industry firms and largely used for product differentiation.

The section is intended to provide, at high-level, information on the 'smart electricity grid' industry structure relevant for the assessment of knowledge generation and knowledge flows, patenting and licensing, in particular in relation to standardization. The section is structured as follows: Section 3.4.1 provides an industry definition and the rationale for our focus on the 'smart grid' segment of the electricity network industry followed by a brief historic overview of the industry developments by describing in broad terms the industry dynamics and the role of standards and patents, being concluded with an overview of the industry value chain and the major industry players by type of equipment and the related standards and standards organisations (in Section 3.4.1 respectively 3.4.2). The subsequent section (3.4.3) elaborates the market dynamics and the business environment. In Section 3.4.4 the strategic role of standards, patents and licensing is addressed.

Section 3.4.5 concludes with a summary of the industry characteristics, as a result of the desk research and the industry interviews.

For specifics of the standards setting organizations mentioned in this section we refer to Chapter 2 covering the institutional and regulatory framework of standardization.

#### 3.4.1 *Industry definition and focus*

For the purpose of this study the electrical grid industry is defined as comprising the network equipment. The infrastructure includes the high, medium and low voltage level equipment, as well as associated planning, operations, maintenance and management systems. The network equipment includes power lines (overhead and underground), transformers and switches. The equipment includes the hardware, the software and the associated support services. The service provisioning includes the customer care and billing systems.

The industry focus for this study is the 'smart grid' in combination with 'smart metering'. The 'smart grid' dimension is of particular interest as it represents the technological convergence between three industries: the electricity industry (EL), the communications technology (CT) industry and the information technologies (IT) industry. In other words, by adding CT and IT to the electricity grid, we can make the grid smarter. This means more efficient operations by means of more intelligent ways of matching electricity demand with supply, e.g. using time dependent electricity prices. Next to this, it can support a much more decentralized generation of electricity, such as the generation of electricity by private citizens and other bottom-up initiatives. Moreover, consumers can be informed about their consumption pattern and may adjust this pattern, thereby reducing electricity consumption. By shifting their demand (to lower tariff periods) they can reduce the costs of their consumption and they can more easily switch their suppliers.<sup>158, 159</sup>

#### 3.4.2 *Industry structure and developments*

##### **Industry developments**

Until the liberalization, the electricity industry was a typical example of an utility industry, with a vertically integrated industry structure and with regional supply monopolies. With the liberalization competition was introduced in the generation of electricity and in the retail services, allowing multiple service providers to use the single and unique distribution network. The long-distance transport networks typically remained under central (government) control. The liberalization facilitated the trading in electricity and typically allocated the responsibility for matching the electricity supply with the demand in near real time with the Transmission System Operator.

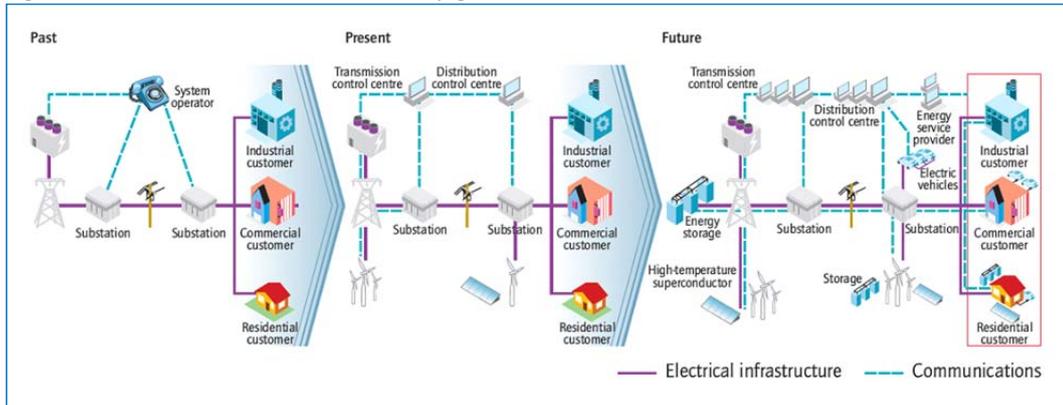
The transition to smart electricity grids is depicted in Figure 3.6, showing a transition from local and largely manual supervision and operations of the electricity supply system in the past changing into the current day remote monitoring and operations of the generation, the transmission and distribution parts of the grid. This will convert in the future to an intelligent grid with two-way communication for monitoring and operations of a much more diverse network in terms of electricity generation and storage, both centralized and decentralized, as well as much more intelligent user environments. (source: IEA, 2011).

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<sup>158</sup> EC (2006). European Smart Grids technology platform: Vision and strategy for Europe's electricity networks of the future. Brussels: European Commission DG for Research Directorate J - Energy.

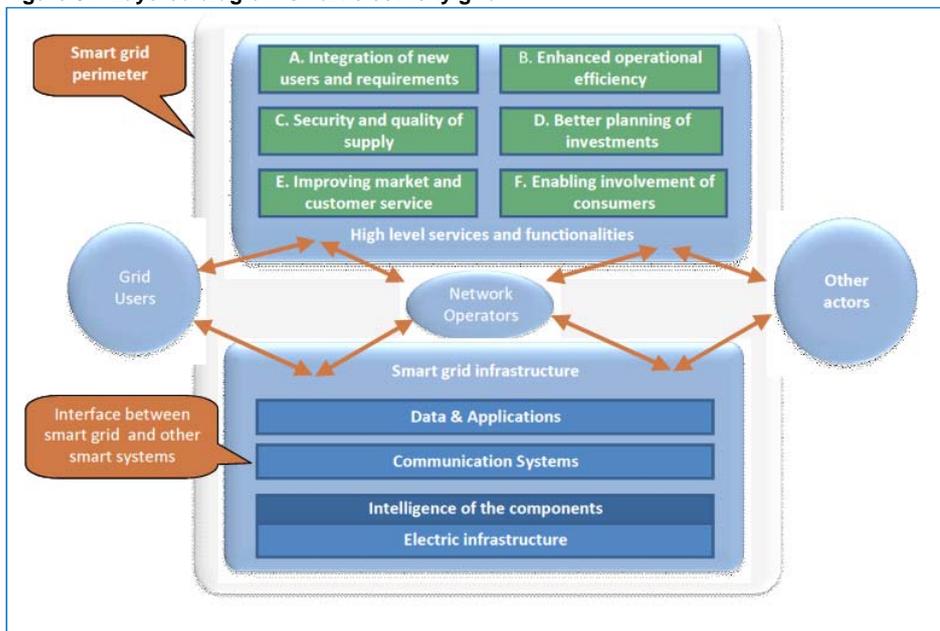
<sup>159</sup> EAC (2008). Smart grids: Enabler of the new energy economy. Washington: Electricity Advisory Committee.

**Figure 3.6 The transition to smart electricity grids**



This smart grid is enabled through the wide deployment of Information and Communications Technologies, in sensing, metering and control - using 2-way communications. Figure 3.7 presents a layered perspective of the smart electricity grid (source: EC, 2010).

**Figure 3.7 Layered diagram smart electricity grid**



The key feature related to Smart Grids is that two industry practices are coming together with the technological convergence between electricity and ICTs, and consequently experts have to work together while having different backgrounds and different ways-of-working. This results in benefits of the technical convergence which will evolve into business benefits, which subsequently will benefit the consumer in terms of lower costs of energy supply, a cleaner energy supply, and a more sustainable energy supply.

Ideally, in the process of convergence the best practices of the three worlds are being combined and pitfalls being avoided, in particular, practices that run counter to economic development and growth. As such the trend observed in the ICT world of increasing patent protection, increasing litigation, and patent thickets frustrating the wide deployment of standards, are hindering knowledge flows and thus economic development, which is becoming a major concern.

At the user side we can observe much more diverse and growing use of electricity, e.g. for the electrical car (leading to an increase of 70-100% in the electricity consumption per household), for heat pumps (increasing the peak load), as well as local generation of electricity through combined heat-power systems, solar panels and wind turbines. The latter requires the grid to be able to support two-way electricity flows. These developments have a major impact on the design requirements for the distribution network, in terms of capacity and (real-time) quality control. (Van Oirsouw, 2012).

In order to meet these design requirements, the ICTs were first introduced within the electricity grid by adding sensors and actuators to the network components, facilitating remote monitoring and control. The grid management is being provided by the SCADA (supervision, control and data acquisition) management software. More refined management of demand and supply required much more information from electricity users than provided by the once a year reading of the electricity supply meters. This resulted in the introduction of 'smart meters', providing a two way information channel between the supplier and the user. In first instance used to obtain near real time information on electricity usage and in the near future providing the capability to switch on/off loads to optimize supply, under much more nuanced quality of supply contracts and related tariffs. These smart meters also facilitated the local production of electricity and feeding electricity back into the grid; allowing for a two-way electricity flow with the metering of electricity consumption and supply. Moreover, the increasing use of electric cars will require demand management to avoid extreme peak loads and thus a smart connection to the grid.

The technology areas affected by smart grid technologies are depicted in Table 3.5. (adapted from: IEA, 2011).

**Table 3.5 Smart grid technologies**

Technology area	Hardware	Systems and software
Wide-area monitoring and control	Phasor measurement units (PMU) and other sensor equipment	Supervisory control and data acquisition (SCADA), wide-area monitoring systems (WAMS), wide-area adaptive protection control and automation (WAAPCA), wide-area situational awareness (WASA)
Information and communication technology integration	Communication equipment (Power line carrier, WIMAX, GSM, LTE, RF mesh network, cellular) routers, relays, switches, gateways, computers (servers)	Enterprise resource planning software (ERP), customer information system (CIS)
Renewable and distributed generation integration	Power conditioning equipment for bulk power and grid support, communication and control hardware for generation and enabling storage technology	Energy management systems (EMS), distribution management system (DMS), SCADA, geographic information system (GIS)
Transmission enhancement	Super conductors, FACTS, HVDC	Network stability analysis, automatic recovery systems
Distribution grid management	Automated re-closers, switches and capacitors, remote controlled distributed generation and storage, transformer sensors, wire and cable sensors	Geographic information systems (GIS), distribution management system (DMS), outage management system (OMS), workforce management system (WMS)
Advanced metering infrastructure	Smart meter, in-home displays, servers, relays	Meter data management system (MDMS)
Electric vehicle charging infrastructure	Charging infrastructure, batteries, inverters	Energy billing, smart grid-to-vehicle charging (G2V) and discharging vehicle-to-grid (V2G) methodologies
Customer-side systems	Smart appliances, routers, in-home display, building automation systems, thermal accumulators, smart thermostat	Energy dashboards, energy management systems, energy applications for smart phones and tablets

## The supply chain

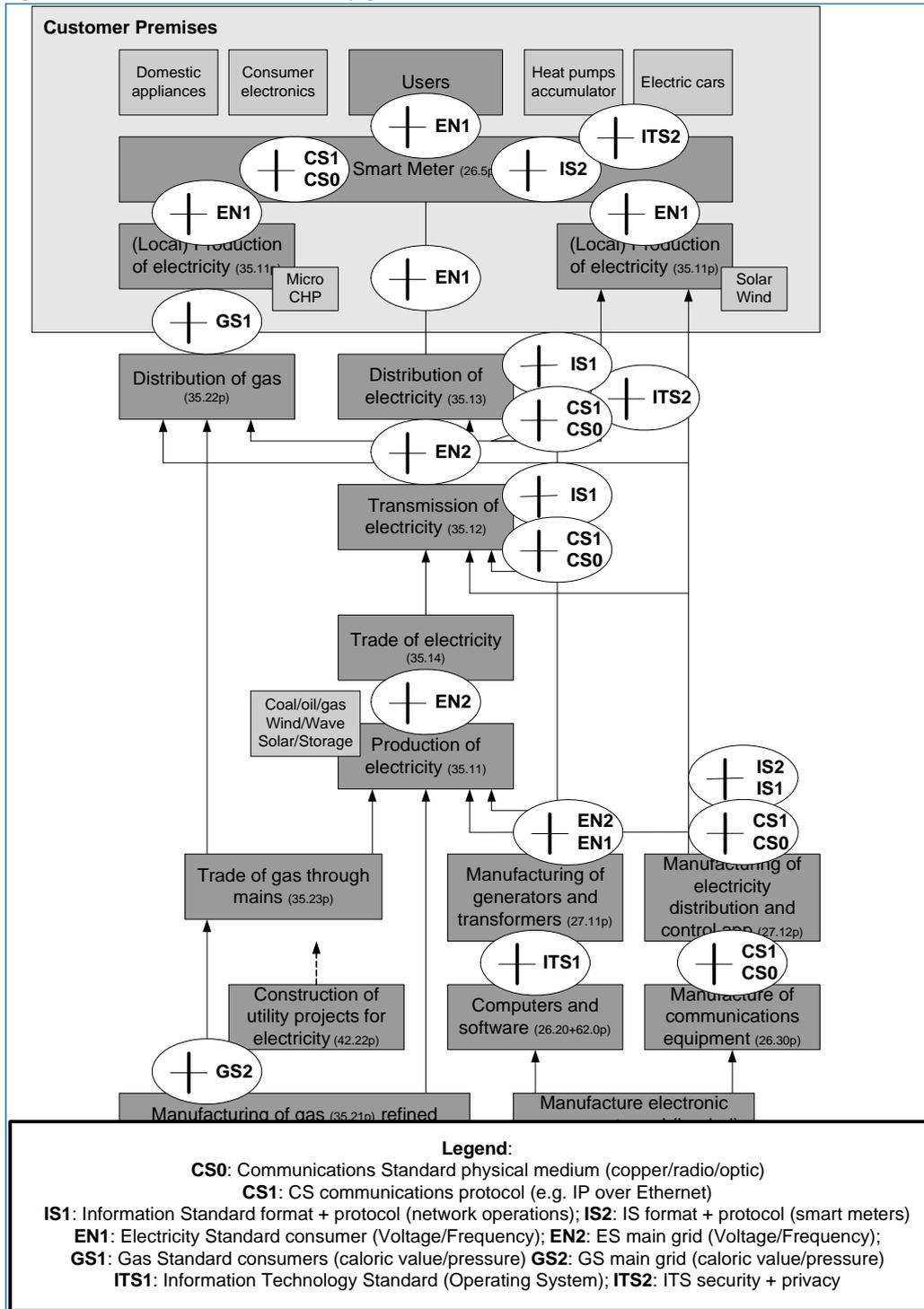
The major steps in value adding activities within the electricity supply industry are depicted in

**Figure 3.8.** The value chain is centred on the supply of electricity, with on the one hand the elements that constitute the electricity infrastructure – generators, transformers, wires – and on the other hand the actual electricity generation and distributions – the fuels, the production, the trading and delivery. The upper-part of

**Figure 3.8** gives special emphasis to the customer premises equipment such as the smart metering and the decentralized generation of electricity. As a smart grid, the network and components are enabled by the application of information and communications technologies providing a two-way communications channel for monitoring, metering and control.

Figure 3.8 furthermore presents the categories of interoperability standards applicable to the smart electricity grid: the EN, CT and IT standards.

Figure 3.8 Value chain smart electricity grids



Source: based on Eurostat NACE codes; source author.

### Market size

The electrical and electronics sector in the EU27 amounted to €319 billion in production and €142 billion in value added in 2006. Approximately €32 billion of this total amount accounts of production for the energy sector, which covers generators, transformers, electrical distribution and control apparatus, insulated wire and cable.<sup>160</sup>

<sup>160</sup> Elektra (2007). Twenty solutions for growth and investment to 2020 and beyond. Brussels.

Overall, the smart component will represent approximately 9% of the annual investment in grid maintenance and renewal in the coming decades. This is future investment and thus will not yet be visible in the Eurostat data. Hence to reflect the relative importance of the ICTs.

A list of companies that are investing in smart electricity grid technologies have been identified based on their smart grid product portfolio using various sources on the Internet, see Table 3.6. It should further be noted that SCADA (supervision, control and data acquisition) systems are broadly used in the production and processing industry and now being tailored to the use in smart electricity grids in combination with remote sensors, controllers and switches. The same applies to ERM (Enterprise Resource Management) systems. (Source: author).

The overview suggests an industry structure characterized by a small number of large players (ABB, Alstom, GE, Schneider, Siemens) providing a broad portfolio of equipment for the (smart) electricity grid. These large players complement their equipment offering with comprehensive grid management and maintenance systems. In this sector also specialized firms are active (Satec, Ruggedcom, Advantech, etc.). In addition there is a much broader range of smaller specialized companies focusing on metering equipment (Landys+Gyr, Itron, Elster Group, etc.). This is complemented with firms that focus on general enterprise management systems being tuned towards application in the electricity industry (SAP, Oracle, HP, etc.). Moreover, we can recognize the typical system integrators, operating on a project basis (IBM, Accenture, Logica).

Note that this overview, with a focus on smart grid suppliers, should be considered against the background of a much larger set of electrical equipment suppliers for the 'standard' grid.

**Table 3.6 Smart grid equipment and software suppliers**

Node in the value chain	Sample of suppliers	
Electric car charging systems suppliers	ABB GE Eaton Fuji Electric	Schneider Electric Signet Systems
Home/building energy management systems	Schneider GE Honeywell Johnson Controls	
Smart meter suppliers	Landys+Gyr (Toshiba) Itron Elster Group Silver Spring Networks Trilliant Sensus	Aclara Schneider Electric Iskra GE Echelon
Meter Data Management Systems (MDMS) suppliers	Itron Siemens Oracle	Ecologic Analytics Aclara
Phasor PMU and data concentrators (PDC) suppliers	ABB GE Energy	
Supervision, control and data acquisition (SCADA) systems suppliers	ABB GE Intelligent Platforms Schneider Electric Satec	Advantech Ingeteam Iconics Yokogawa

Node in the value chain	Sample of suppliers	
	Ruggedcom	
Grid management, outage management systems (OMS) suppliers	ABB Schneider Siemens	
Back-office operations, ERM systems, asset management suppliers	SAP Oracle HP	Microsoft IBM
Integrators	Oracle IBM	Accenture Logica

Taking a look at investments in this specific sector shows that during the decade 2000-2010, in Europe €5.5 billion has been invested in approximately 300 smart grid projects. (EC, 2011; JRC, 2011) To accelerate the deployment of smart grid technologies the European Electricity Grids Initiative (EEGI) was established June 2011, with its main emphasis on innovation at system level, to clarify technology integration and business cases, and avoiding duplication of efforts through a wide-ranging knowledge sharing approach. The EEGI identified financing needs of about €2 billion for implementation priorities in the period 2010-2018. To be complemented with public-private partnerships for ICT with a funding of €1 billion and leveraging €2 billion of private sector spending. (EC, 2011).

According to Pike Research the European investments in smart grid technologies will reach €56.5 billion during the period 2010-2020 and 240 million smart meters will have been deployed.<sup>161</sup> This should be compared to the €1.5 trillion investment the International Energy Agency is predicting in its 2008 outlook for Europe to invest over the period 2007-2030 to renew the electrical system from generation to transmission and distribution, and for maintaining and expanding the current system. (as quoted in: JRC, 2011) This suggests that the smart grid investments represent close to 9% of the total investments on an annual basis. From a business perspective these investments are mainly justified on the basis of expected reduction in operational costs of the distribution system operators, e.g. elimination of meter reading costs (JRC, 2011)<sup>162</sup>. The deployment of smart grids is furthermore supported by the European Commission through the Taskforce for the implementation of smart grids into the European internal market (SGTF) established in 2009 under the framework of the Third Energy Package and its associated Expert Groups.<sup>163</sup>

Over the last decade, EU spending on technology R&D and small-scale pilot projects to verify and demonstrate the function and benefits has been around €300 million, financed mainly through the Framework Programmes 5-7.<sup>164</sup> Smart grid related R&D is not separately recorded by Eurostat.

For a quick reference, this compares to €1.4 billion of R&D in electrical machinery and apparatus in Germany against €100 billion of revenues in 2008. This represents a ratio of R&D to sales of 1.4%. (OECD, 2013).

<sup>161</sup> The estimate for the USA is \$43 billion by 2014 and the global market at \$171 billion. (Zpryme as cited in: NIST, 2010).

<sup>162</sup> According to a study by the Ministry of Economic Affairs of the Netherlands administrative losses were estimated at €120 mln, of which €72 in fraud and €18 in measurement errors. (as quoted in: UCP academy, 2013).

The large scale deployment of automatic meters under the Telegestore project launched in 2001 Enel in Italy by was mainly driven by reducing non-technical losses. By 2006 30 million meters had been deployed. (IEA, 2011; JRC, 2011).

<sup>163</sup> Expert Group #1: Reference Group for smart grid standards; #2: Expert Group for regulatory recommendations for privacy, data protection and cyber-security in smart grids; #3: Expert Group for regulatory recommendations for smart grid deployments; #4: Expert Group for smart grid infrastructure deployment. (EC, 2011).

<sup>164</sup> The Research Framework Programmes are multi-annual programmes funded by the European Commission (DG Research) that subsidises (trans-European) Research Networks on a project basis.

### 3.4.3 Market dynamics: led by the large integrated suppliers

The following analysis provides a general characterization of the electricity supply industry, reflecting the 'rules of the game' in the industry, which are, at large, applicable for the smart grid dimension.

#### Rivalry

The electricity supply system is a large complex technical system requiring large (lumpy) investments and with high demands on the quality of supply. Electricity system operators therefore tend to procure infrastructure equipment on the basis of large contracts awarded to large firms as lead contractors, such as ABB, Siemens, Schneider, Alstom. These lead contractors will engage with smaller, specialized subcontractors. Whereas standards provide compatibility among equipment from different suppliers, it is the compatibility of the support software systems between monitoring and operations that drives the selection of vendors. These systems provide the 'stickiness' in this industry.

(Smart) meters are part of the distribution grid and typically owned by the distribution grid operator. The meter suppliers form a group of specialized providers. Procurement is based on large scale and typically long term contracts. The (rare) large scale replacement of meters is performed by specialized installation firms, often a main contractor with many local subcontractors, so to be able to deliver within a specified period of time. The leading (smart) electricity metering providers are Landis+Gyr (Zwitzerland), Itron (USA), Elster (Germany, electricity metering originally part of ABB), and Iskra (Czech). The metering business of Siemens has become integrated in the business of Landis+Gyr. Many of these companies are also involved in gas, heat/cooling and water meters and the corresponding systems to read these meters.

The building and home automation system providers form another group of specialized suppliers. Notwithstanding this general characterization of the industry, some large firms provide a very broad portfolio of products, such as GE.

#### New entrants

Both specialized and low costs providers represent new entry opportunities. Typically the large firms acquire (over time) these new firms to improve their market position and reduce competition, such as through the acquisition of boiler suppliers based in Eastern Europe.

The transition to smart grids using smart components provides an opportunity for entry. This also applies for suppliers of smart monitoring, control and operations software, often combined with geo information systems (GIS).

#### Substitutes

At recurring instances, a wave of industry enthusiasm occurs around an alternative energy carrier such as hydrogen (for instance in the wake of the 1973 oil crisis, or more recently in the context of diversifying energy sources in order to increase security of supply). The opportunities which decentralized generation provide through solar panels and wind turbines, has re-enforced the position of the electricity grid. This also applies for the relative success of electric cars compared to hydrogen fuelled cars. Typically the large firms keep up with research and experiments in the fields of alternative energy supply, to be able to judge the new developments first hand and being able to adapt their strategies if and when required.

### Buyer power

The buyers of electricity infrastructure equipment are few in each country. In recent years consolidation of electricity generation companies has occurred (e.g. involving Vattenfall, RWE, E.ON), as well as consolidation of grid operating companies (e.g. involving TenneT). Hence, for the large infrastructure projects buyer power is very concentrated.

### Supplier power

There are many smaller and medium sized specialized firms that provide equipment to the electricity infrastructure industry. In the construction of new power plants and new grids, these firms are often subcontracted by the larger system supply firms, such as ABB, Alstom, GE, Siemens. Once their position is established with the grid owner, direct follow-up sales are common.

#### 3.4.4 The strategic role of standards and patents

Against the backdrop of the industry structure described above, a number of observations can be made regarding on the one hand the role of knowledge creation and flows next to the issue of patents and licensing, and their relationship to standards. Subsequently this can be put in perspective vis-à-vis the strategies and actions of firms. These observations are presented as a position or as a hypothesis, with supporting evidence from the research and/or the interviews. Note that the observations made in the sections on communication technology and consumer electronics are also relevant for the smart electricity grid industry.

With regard to all these networks, the equipment and systems in the smart grid are provided by many industry sectors that historically have not worked together (IEA, 2011). It is necessary in a smart grid to have an exchange of information between control systems operated by the network operators whose networks are interconnected. Moreover, customer-owned smart appliances, energy management systems and electric vehicles need to be able to communicate with the smart grid. Following this interoperability it is essential for the smart grid to operate seamlessly and securely by means of agreements on standards, definitions and protocols for the transport of data.

Within the electricity network the interoperability standards are a common good facilitating the interconnection of equipment from multiple suppliers into the electricity network. This includes on the one hand the voltage levels and frequency, on the other the physical aspects of interconnection (plugs and sockets). In Europe, the standards making for the electricity network takes place under the auspices of the European Committee for Electrotechnical Standardization (CEN/CENELEC) and the International Electrotechnical Commission (IEC)<sup>165</sup>.

Unlike the situation in the ICT and CE industries, the number of patents disclosed as part of the standards making under the auspices of CEN and CENELEC has remained small: a total of 21 patents over the period 1996-2012. The ownership is broadly spread: 15 firms in total of which 12 firms declaring 1 patent, two firms declaring 2 patents and one firm declaring 5 patents. Only one firm, Qualcomm, is directly related to the communications industry. See also the Annex.<sup>166</sup>

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<sup>165</sup> For instance, the EN 50160 standard defines the quality of the voltage and IEC 61000-3-2 and 12 define the quality of the current, whereas an example related to smart grids is the EN- standards 50470/62053/62054 series on electricity metering. In addition standardization activities related to smart grids take place under the IEC Smart grid initiative; IEEE Smart grid; IETF Smart energy activities; and 3GPP and ETSI work on M2M (machine-to-machine communication). The NIST identified some 75 standards that would be affected by the transition to smart grids and 15 high-priority gaps and harmonization issues in addition to cyber security. (NIST, 2010).

<sup>166</sup> Source: <http://www.cencenelec.eu/ipr/Patents/PatentDeclaration/Pages/default.aspx>.

While the electricity industry players collaborate under the auspices of CEN/CENELEC to develop interoperability standards, the European Commission can guide this standards setting work by issuing mandates. The issuance in March 2009 of M441 to the European standardisation organisations CEN, CENELEC and ETSI kicked off the work on standards for the interoperability of smart utility meters (electricity, gas, water and heat), including the necessary communication protocols. Another important mandate – M468 of June 2010 – concerns the development of standards for the interoperability of chargers for electric vehicles and charging points. In this area the work led to two camps with two proposals for the connector. Ultimately the European Commission had to intervene with a decision on the establishment of a mandatory standard within the European Union. In March 2011 followed M490 on the development of standards for facilitating the implementation of high-level smart grid services and functionalities. (EC, 2011)<sup>167</sup>

### Standardisation arrangements for smart metering

Standards have always been and continue to be important for two main reasons:

- The metrological standards are a crucial part of the business, in terms of accuracy, durability, safety, and electro-magnetic compatibility (EMC);
- The concept of smart metering adds a new standardization dimension, with the need for interoperable communication protocols and data formats.

Standards are typically been developed in close collaboration by the leading smart metering providers and their customers, i.e. the energy utilities. This is the reason why the International Electrotechnical Commission is the primary SSO. In addition, the standards are the result of a consensus finding process, hence it includes options. The concerning choice of options is set by the large network operators, e.g. EDF (France) and Iberdrola (Spain), which is done in their procurement specifications (companion specifications to the standards). These grid operators provide for volumes large enough to make customization affordable.

As the standards are the result of a consensus finding process they include options, as described above. This flexibility provided by the options inhibits interoperability to be achieved by just implementing according to the standards. Complementary detailed specifications (“companion specifications”), which is restricting the options, are necessary to reach interoperability. To resolve this issue, in particularly for the smaller and medium sized grid operators, the leading metering companies have established the interoperability certification association IDIS (Interoperable Device Interface Specification). This association has defined such a “companion specification” (by selecting the appropriate options provided by the standards) and developed a set of test specifications to issue a certificate of compatibility (to be applied by independent testing houses, such as Kema). Membership of IDIS is open to those manufacturers having a certified product in their portfolio (as to avoid free riders). Membership implies participation in the maintenance and development of the IDIS companion specifications and of the test specifications.

Sometimes grid operators define a proprietary protocol, as for instance Enel did in Italy for its (first generation) smart meter deployment of approximately 30 million meters. Enel specified the entire meter and just outsourced the production of the meter according to Enel’s blueprints.

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<sup>167</sup> In the USA the standardization activities related to smart grids are organized under Energy Independence and Security Act of 2007 (EISA 2007) and delegated to the National Institute of Standards and Technology (NIST) to coordinate the activities. (EAC, 2008).

## Standardisation arrangements for smart grids

Table 3.7 below combines the information of the smart grid technologies in Table 3.5 with the value chain depicted in Figure 3.8. It shows the link to the ICTs and information on the related standards.

The role of grid operators in standards setting and in the development of IP is largely linked to standards as norms for interconnection and safety. In this environment IP is typically contributed freely, without a subsequent licensing trajectory. Being norms these standard do not cover particular product- or process-technologies and hence norms rarely lead to SEPs.

The exception to the rule is the development of new technologies (e.g. DC) requiring the establishing of new norms and safety standards, which may be of a strategic nature to the innovating firm.

The transition towards smart grids, with distributed generation and smart metering, will further expose the industry to the ICTs and increase the need for IT security, cyber security and associated standards.

**Table 3.7 Value chain smart grid, ICTs and standards**

Node in the value chain	Electricity grid components	CT	IT Systems & software	Standards
Electric cars at customer premises	Charging infrastructure, batteries, inverters		Billing, smart grid-to-vehicle charging (G2V), discharging (V2G) methods	SAE J1772/IEC 62196
Smart domestic appliances, incl. thermal accumulators, smart thermostat	Routers, in-home display, building automation systems	Home area network (HAN)	Energy dashboard, energy mgt systems, energy appl. for smart phones and tablets	EN13321/50090 IEEE 1901 PLC; Zigbee Smart Energy Protocol
Smart metering	Smart meter, in-home displays, servers, relays	PLC, RF mesh network, GPRS, LTE, PSTN, FttH	Meter data management system (MDMS)	EN50470/62053/62054/62056; IEC 62056, 14908; ETSI Open Smart Grid Protocol (OSGP)
(Local) Production of electricity (and storage)	Power conditioning, communication and control hardware		Energy mgt systems (EMS), distribution mgt system (DMS), SCADA, geographic info system (GIS)	
Distribution of electricity	Phasor (PMU) and other sensor equipment; phasor data concentrators (PDC)	GPS receivers; modems, sub-station local-area network (LAN); wide-area network (WAN); PLC, telephone lines, leased lines, private network circuits	Sup. control and data acquisition (SCADA), wide-area monitoring systems (WAMS), wide-area adaptive protection control and automation (WAAPCA), wide-area situational awareness (WASA)	EN61334/61850; IEEE C37.118-2011; IEC 61850; OPC-DA/OPC-HDA MS Windows based being generalized to XML; IEEE 1901 PLC IPoEthernet
	Automated re-closers, switches		Geographic information systems	

Node in the value chain	Electricity grid components	CT	IT Systems & software	Standards
	and capacitors, transformer sensors, wire and cable sensors		(GIS), distribution mgt system (DMS), outage mgt system (OMS)	
Transmission of electricity (enhancements)	Super conductors, FACTS, HVDC		Network stability analysis, automatic recovery systems	
Mfg of electricity distribution and control app.			MDMS, EMS, SCADA, WAMS, WAAPCA, WASA, GIS, DMS, OMS	

### The role of IP

For the grid suppliers, the strategic purpose of IP is to ensure a freedom to operate. It is an essential asset for product development and differentiation in the industry and thereby allows for entry into new technology and new product markets. As a producing entity (PE), IP is generally not considered as a primary source of revenue.

The grid operators typically pay for the embedded IP as part of the equipment procurement process. There is no separate licensing trajectory.<sup>168</sup> The IP development of grid operators has a focus on the core task of network operations, operations systems and maintenance processes and procedures.

### IP creation/acquisition

The major equipment providers produce IP mainly in-house and complement their needs through licensing-in. If IP is exchanged in the market this is typically through bilateral negotiations. Patent pools are not used in this industry.

### Licensing

The firms in this industry typically do not license out IP. A reason for selling IP is that (parts of the portfolio of) IP has become of less strategic importance (market exit) or subject of a changing IP landscape.

### 3.4.5 Stylized industry characteristics

The following observations can be made on the role of knowledge creation and knowledge flows, patents and licensing, and their relationship to standards, vis-à-vis the role, strategies and actions of firms in the smart grid industry.

#### Value chain developments:

- The electricity grid industry is a highly standards-based infrastructure industry, linked to interconnection and interoperability throughout the electricity supply chain;
- As in other sectors of the economy, the electricity supply industry becomes increasingly ICT enabled. But, unlike the communications technologies and consumer electronics industries, ICT convergence is not leading to a 'unification' of service. For example: there is no Internet-driven paradigm subsuming a voice-driven paradigm; there is no 'reduction mechanism' turning audio

<sup>168</sup> In the context of this study we consider software licensing (shrink-wrap or otherwise) as part of IP embedded in products.

and video into data in a particular format. The core business will remain the generation transport and distribution of energy in the form of electricity;

- The electricity grid industry is not, or at least to a lesser degree, characterized by network effects. Hence: a 'winner takes all' market is less likely, dynamics surrounding standardization are modest, and battles for dominance are rare. This is not to say that competitive rivalry is not intense;
- The standardization practice is one of collaboration among suppliers and network operators. The development of norms and safety standards are facilitated by the representative organisations within the industry. The industry rules suggest that technology-based solutions are to be found within the electricity paradigm. This implies an evolutionary rather than a revolutionary entry of ICTs;
- On the one hand the market for ICTs in smart buildings is expected to lead the market for ICTs related to smart homes, on the other hand distributed generation and the use of electric cars drive the need for smart electricity in the homes;
- The extent to which grid operators will differentiate electricity tariffs, will determine whether consumers will become a force driving the deployment of smart meters;
- As long as smart meters are owned by the distribution grid operators, the market dynamics will be to a large extent determined by the grid operator;
- Three industries are coming together in the household: energy (electricity), communications and consumer electronics. They are mutually dependent. The ICT industry appears leading, it could become the driving force in home automation, however so far unsuccessfully attempted by many parties;
- The deployment of private mobile networks for data collection in electricity grids will be a test case for accessibility of the telecom networks for outsiders;
- Without smart metering, the typical electricity consumer is unaware of the electricity price as consumption is typically only measured once a year. A change in attitude will take a long time with current 'low' electricity prices. Smart homes with smart domestic appliances will be an important driver for upgrades. Flexibility in communication protocols and software upgrades will allow meter providers to adapt in a timely manner to the change in needs evolving from the changes in home energy management practices;
- In addition, the introduction of Electric cars has the potential to make demand management (supported by the smart meters) a must. However, the number of electric cars being used today is too small to provide a valid business case for the introduction of demand management;
- To enable a successful take-off of transactions in the smart grid industry, a shared understanding and buy-in of the overarching business model will be required. With distributed generation this involves a diverse set of actors and hence an institution with a role similar to that of the GSMA for the mobile communications industry is required within the smart grid industry;<sup>169</sup>
- The capabilities of smart meters to monitor and influence consumer behaviour have invoked consumer response. Consumer groups and politicians are taking part in the regulation of smart meter requirements, including privacy and security;
- The world of distribution network management and the world of metering are still two worlds apart. For network management the operations department is responsible for metering, whereas it is the customer department responsible for billing. This is also reflected in the different Technical Committees with the standardization, IEC TC 57 respectively IEC TC 13. As more real time oriented metering data becomes available, metering data is becoming more relevant for network operations and hence the two worlds are moving closer;

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<sup>169</sup> This perceived need is closely linked to the M490 mandate.

- The industry has a tendency to address and resolve new challenges and opportunities internally and, hence, is less inclined to engage with external parties (e.g. the telecoms operators for communications solutions). Potential problems in collaborating with the ICT sector are magnified, such as security and privacy, whereas the potential benefits are down played. Nonetheless, ICTs will change the electricity sector, as ICTs have or are changing other economic sectors;
- Home automation supported by 'smart apps' are foreseen by for instance the providers of 'domotica' solutions. Also local generation of electricity is changing the electricity market, which results in a transition to new business models that are using the opportunities provided by smart grid technologies;
- The industry is (slowly) opening up to outsiders and to collaboration. Outsiders are inviting the industry insiders, e.g. IBM and its Smarter Energy Research Institute. At the national level working groups are emerging with telecom operators aimed at exploring alternative solutions to connect the 'smart home' to the 'smart grid', e.g. with KPN on 'how to arrange access to the home in the future', on the role of gateways, and who will provide which service;
- ICTs are largely 'self-install', thus what are the implications for the 'nano-grid'? The roles of the various players in the value chain need to be revisited, including the value add of distributors, resellers, installation firms. As well the emergence of new players, such as energy traders next to IBM, Cisco and also Google (which is investing in wind and solar parks);
- The initial momentum will come from smarter buildings, where investments in smart solutions provide a more immediate return. In the same perspective the combination of renewables and storage solutions at industrial parks should be mentioned (including the use of cooling/freezing systems as 'storage' systems, as well as industrial solutions for energy storage such as salt melting);
- In some markets the deployment of smart meters is in a very early phase and the legal requirements are not sufficiently firm yet, let alone subscribed by all grid operators. This results in the danger to delay upgrades, or it will lead to firms investing in "intermediate products" (e.g. very cheap mechanical meters) so to reduce potential failed investments once smart metering legislation has become stable. To reduce these risks and to be prepared for the future, modular smart meters can be provided with options to plug in a variety of communication modules (PLC, GPRS, M-bus, Ethernet) at a later date, combined with software upgrades;
- Charging points along highways for electric cars will need ICT solutions to avoid congestion. Further, charging electric cars when visiting friends and family will require new billing solutions. Also private versus business use of an electric car will require appropriate billing solutions, including authorizations.

#### Patenting/licensing:

- Interdependency of firms on technology related patents is low;
- Patent infringement are typically addressed and resolved without the need to involve the court;

#### Standardisation:

- Standards are an important means of assuring that product implementations do not include hidden IPRs (disclosure of SEPs and FRAND process);
- Tender specifications from large grid operators require disclosure of IPRs as part of the tendering procedure. The IPR ownership provides for competitive advantages;
- While open standards are used, product differentiation exists by means of product quality and provision of cost effective end-to-end solutions. Reducing installation costs (approx. 25%) and systems integration and software costs (approx. 25%) are important differentiators;
- The distributed generation of electricity requires adaptation of standards and norms for the distribution grid. Such adaptations are taken place at a sub-regional/national level, but need to become Europe-wide to assure the benefits of scale economies can be realized;

- Early experience with distributed generation should be allowed to flow into the standardization process, to assure workable standards are developed. Specifications should not be ‘frozen’ prematurely;
- Privacy and security issues are complicating the standardization process of smart meters.

### 3.5 Cross industry conclusions: trends impacting standardization and licensing

The developments in the four standards-based industries as described in the previous four sections provide a few clear trends as to the role of standards and licensing. These trends impact the issues and barriers related to an efficient licensing process in different ways. This is reflected in the summary below.

#### **Trend: Changing role of IP in the CT industry**

In the communications industry the once vertical integration between the supply of infrastructure and of devices has ceased to exist. In the supply of smart devices the rivalry is characterized by ‘competition for the market’ aimed at obtaining leadership in the underlying operating systems and associated application platforms.

With the high intensity of rivalry among OS platforms and related devices, the OS platform firms have been increasing their IP portfolio's in order to fight the competitive battle on all fronts, including offensive and defensive IP-based litigation.

#### *Implications for standardization and licensing*

In the standardization of mobile infrastructure products and services a continuation of close collaboration among equipment vendors may be expected, perhaps with participation of operators. The IP development and contribution to standards, however, will come from the equipment vendors. The need for compatibility and interoperability of network equipment from different vendors will lead to a continuation of the practice of cross-licensing. Firms with unique and strong IP positions will most likely continue to leverage their position through bilateral negotiations with the technology adopters.

The standardization of mobile devices is related on the one hand to the (open) infrastructure standards and on the (more closed) operating system standards. The owner/leaders of the operating systems determine the degree of openness of their platforms and hence the related licensing policies. So far these OS platforms are not recognized as essential standards hence no SEPs are involved. As the platforms are competing for market leadership achieving interoperability among platforms is not an objective and hence cross licensing is not to be expected. It is to be expected that building a strong position in Market Essential Patents will be pursued which can be leveraged as part of the competitive game.

#### **Trend: Re-valuation of IP portfolios – fragmentation and concentration**

Increasing competitive pressure forces firms to exploit all available opportunities for value creation. This implies a re-valuation of IP portfolios to increase the monetisation of IP assets. Non-core IP is more often sold to a non-producing entity (NPE) that seek to cash in on royalties. Also as firms exit certain product lines or even the industry, IP portfolios are sold (sometime by auction). New industry players, seeking for currency for cross-licensing arrangements, are acquiring old-players IP assets.

#### *Implications for standardization and licensing*

As a consequence, the trade in IP has increased. The divesting of parts of IP portfolios leads to fragmentation of IP owners, this countered by a trend of concentration as a consequence of new players acquiring large IP portfolios.

The sale of IP increases the position and role of NPEs in the IP licensing market.

#### **Trend: Increasing adoption of ICTs within non-ICT industries**

Following the period up to 1990s where the economic benefits of ICT deployment were mainly obtained within the ICT sector itself, from 1990s the deployment of the ICTs in other economic sectors allows the benefits of ICT deployments to be reaped across the economy at large. Within these other sectors the ICTs are adopted largely as ready-to-use modules, sub-assemblies or products provided by suppliers specialized of ICTs in a particular industry. For the automotive industry these are for instance Blaupunkt (media) and Bosch (controls). In the smart grid industry, for instance smart meter producer (Landys+Gyr) provides electricity meters with a plug-in option for a variety of communications solutions.

These specialized firms may develop IP for industry specific applications, which depending on the type of IP and of the firm competitive strategy may be licensed (example is the CAN by Bosch) or deployed in its own products for product differentiation.

#### *Implications for standardization and licensing*

Outside the core ICT industry the adopters of ICTs tend to use where possible readily available chips, units or products, conforming to the appropriate standards. This means these firms may participate in ICT related standard setting organisations, but more likely as adopters rather than contributors of IP. The prevailing IP licensing will be cash-based, as cross-industry cross-licensing is less likely.

#### **Trend: Increasing number of adopters will benefit from patent pools**

he increasing number of standards adopters within and outside the ICT industry makes the opportunity for bundling of IP into patent pools by specialized firms more attractive.

#### *Implications for standardization and licensing*

The increased availability of patent pools facilitates the faster and wider adoption of the underlying technology. Moreover, it will greatly reduce the transaction costs for adopters outside the ICT industry.

#### **Trend: Norms related to new technologies**

The increasing number of standards adopters within and outside the ICT industry makes the opportunity for bundling of IP into patent pools by specialized firms more attractive.

#### *Implications for standardization and licensing*

The increased availability of patent pools facilitates the faster and wider adoption of the underlying technology. Moreover, it will greatly reduce the transaction costs for adopters outside the ICT industry.

## 4 Barriers for efficient licensing of standard related patents

Intellectual Property rights grant market power to the inventors as to provide incentives for innovation. If the technology concerned does not have a substitute technology, the inventor enjoys significant market power. SEPs typically concern technologies for which no substitutes are available if one wants to implement a specific standard (but there may be substitute standards). A SEP thus confers a certain degree of market power to its owner, and could therefore enable its owner to extract 'monopoly rents' from its up- or downstream counterparts (if it is vertically integrated) or to keep competitors out of the downstream market (which is also referred to as foreclosure).

The IP policies adopted in most SSOs precisely aim to mitigate the risk of such abusive uses of monopoly power granted by SEPs. These policies usually require SEP owners to commit to timely disclosure their SEPs and license on FRAND terms. Such commitment aim to establish a balance between, on one hand, the SEP owners' legitimate claim for compensation as a counterpart for sharing proprietary technology that was costly and risky to develop and, on the other hand, the need to provide all implementers with visibility as to their ability to implement the standard at a reasonable (royalty) costs and on a level playing field. In this respect, disclosure and FRAND have become cornerstone institutions of standard setting processes in many industries, as illustrated in the previous chapters.

However, the IP policies currently in place in most SSOs may not be sufficient to remove all barriers for an efficient licensing of standard essential patents. The timing and quality of information conveyed through disclosures is often disputable, thereby inducing a lack of transparency regarding SEPs. The definition of FRAND also remains vague and possibly controversial when it comes to precise issues (such as the possibility of calculating reasonable royalties, or to combine FRAND with reciprocity clauses) so that it is not always clear to what exactly a SEP owner commits (see Section 2.2.3 for the detailed argument on this subject). Against this background, the purpose of this chapter is to highlight and analyse barriers that still hamper the efficient licensing of SEPs, before considering policy options to remove them in the next chapter. Nothing in this chapter should be understood as attacking current safeguards in SSO IP policies. Our purpose is rather to examine whether and how to reinforce and complement them.

On the basis of the analysis in chapter 3, interviews with stakeholders (see also Annex I) and on the basis of quantitative analysis of SEP data (see Annex II) we have identified a number of barriers that licensors and licensee face in closing licensing agreements in an efficient manner. We provide a general picture and explanation of these barriers in section 4.1. We then discuss in more details two particular issues that tend to amplify these barriers, namely the lack of transparency regarding SEPs (section 4.2) and the development of opportunistic business behaviours resulting in more frequent SEP litigation (section 4.3).

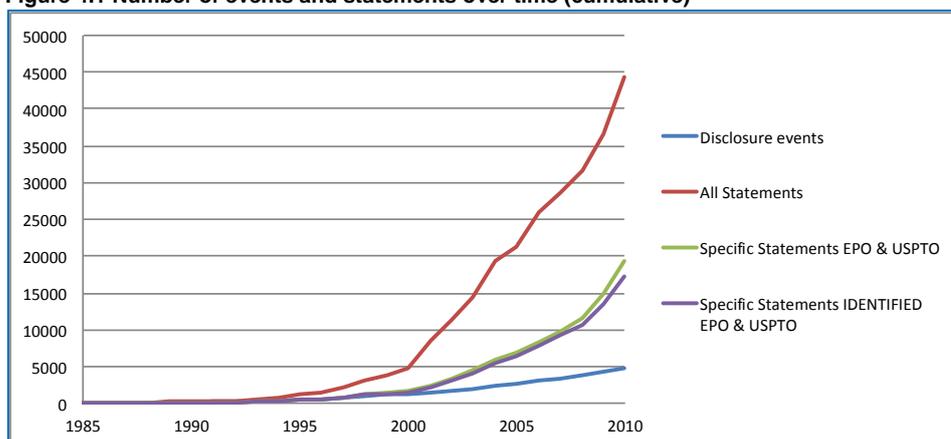
## 4.1 The main problems to be solved

### 4.1.1 Growing number of standard essential patents

The first patents in standards were discussed in the 1930s already<sup>170</sup>. As highlighted in the previous chapters, it should be emphasized that many standards by their very nature are technologically neutral, and thus a priori do not comprise patented technologies. In cases where the standard by its nature comprises technologies, the choice of these technologies should be based on best-available options, taking into account their costs and added value in terms of performance. SSO IP policies moreover require that parties holding patents that may cover future standard specifications also disclose them in a timely fashion during the standard-setting process.

The first patent policies that prescribed disclosure of SEPs were introduced in the 1980s and 1990s. The disclosure data is typically recorded by the SSOs and can usually be found alongside disclosure data in their patent database. The cumulative numbers of recorded disclosures and statements made as part of the patent application process clearly show that the phenomenon of patent disclosure has grown during the last decades (Figure 4.1). Although not all declared patents will eventually become essential, this suggests a parallel increase in the number of SEPs over this period.

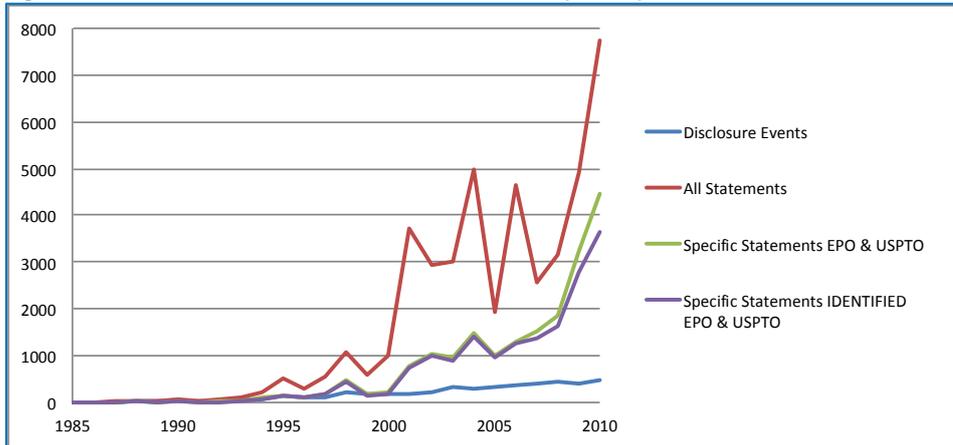
**Figure 4.1 Number of events and statements over time (cumulative)**



However, when considering the individual annual totals, we see that the growth rate is far from smooth (Figure 4.2), demonstrating ups and downs. This is likely due to the cyclical nature of the standardization process: in some years SSOs work on 'big' standards that attract a peak of disclosures, while in other years it is less activity. At any rate, the amount is increasing.

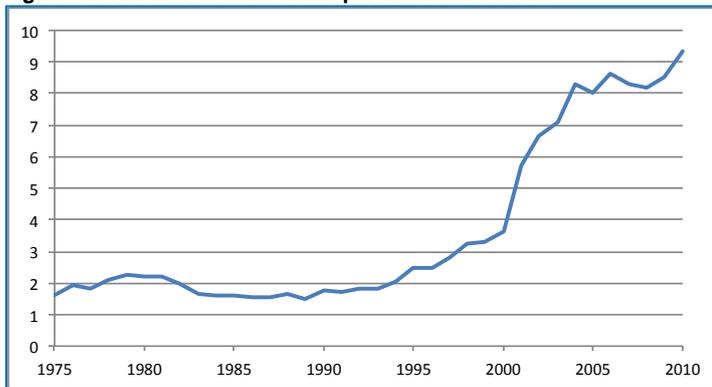
<sup>170</sup> See: Bekkers, R., & Updegrave, A. (2012). A study of IPR policies and practices of a representative group of Standards Setting Organizations worldwide. Washington, DC: National Academies of Science. Available from [http://sites.nationalacademies.org/xpedito/groups/pgasite/documents/webpage/pqa\\_072197.pdf](http://sites.nationalacademies.org/xpedito/groups/pgasite/documents/webpage/pqa_072197.pdf).

**Figure 4.2 Number of events and statements over time (annual)**



The two figures reveal that the number of statements is growing faster than the number of disclosures. This can be attributed to the increasing number of statements/patents per disclosure event, as we observe in Figure 4.3.

**Figure 4.3 Number of statements per disclosure event**



The growing number of SEPs suggested by these graphs is related to two different factors: (1) a growing number of patented technologies included in standards; and (2) a growing number of patents declared as SEPs to the SSOs. These are different issues. The first stems from technological developments and the choice by the SSO not to develop around patented technologies. The second results from a strategic incentive for IPR owners to have as many patents in their portfolio that are recognised as SEPs. Moreover, the second leads to a problem of over-disclosure and over-inclusion of patented technology in standards. Therefore, it can be an amplification of the already difficult problem of organizing the market for licenses between SEP owners and implementers of patents-encumbered standards.

#### **4.1.2 Transaction costs and market failures**

We review below different barriers hampering the licensing of standard essential patents. We focus for now on barriers that directly result from the inclusion of several patented elements in a standard, to the detriment of SEP owners and/or their licensees. We will pay specific attention to the lack of transparency on SEPs, which amplifies these problems (section 4.2) and to problems that caused by the deliberate behaviour of SEPs owners and standard implementers (section 4.3).

### Transaction costs

Implementers of standards face substantial transaction costs when they need to deal simultaneously with numerous SEP owners. For quite a few popular standards, there are several dozen different patent owners; in some cases there are almost a hundred patent owners. Entering into licensing negotiations with all these owners requires considerable resources and time – e.g. for collecting information and knowledge about the size and ownership of portfolios, for assessing validity and essentiality of patents in a portfolio, for the actual negotiations and for ex-post monitoring. Moreover, in today's practice, many SEP licenses have a restricted contract period and, therefore, need to be re-negotiated at expiration of the contract term. This results in additional costs.

Of course, the same can be said for SEP owners facing tremendous transaction costs if the number of standard adopters increases. Setting up a licensing programme and actively identifying infringements may cost 20 to 30 FTE (full time equivalent) per year (around 2 to 3 million euro). This does not include the costs of enforcement once an infringement has been identified. After being detected the infringer may agree to take a license for the coming years, but negotiations usually remain tough on the issue of paying royalties for all units already shipped so far. Furthermore, the ability to prosecute may be hampered by the fact that some jurisdictions have weak enforcement regimes.

### Difficulty for patent holders in getting implementers to license their SEPs

As a matter of current practice, patent holders in some industries (for instance in ICT) allow implementation to occur before the licence is agreed. Apart from whether this is allowed, patent holders will normally put the "technical details" of the innovation into the public domain as part of the standardization process. This in itself already puts adopters in a position to implement the standard before the licence is agreed. Though mitigating the standard time-to-market problem, it often leads to a loss of licensing fees by the SEP owners, including:

- the cash flow issue of delayed agreement of licences;
- the problem that licence agreements are typically forward-looking and often do not compensate fully for the time period up to the conclusion of the agreement.

Patent owners can also be harmed (in terms of missed royalties) if they cannot oversee who is infringing their IPR and/or the severity of the infringement (in terms of number of products that incorporate the IPR and the number of units sold). Furthermore, the fact that only some adopters license in the IPR whereas others do not (they infringe) results in an uneven playing field in the downstream market. This problem is sometimes aggravated by the fact that not all jurisdictions have effective enforcement regimes. Consequently, companies operating from/within these jurisdictions have lower incentive to license and, even when exporting to other jurisdictions with firmer enforcement regimes, these transactions often go unnoticed by the patent holder because of the lack of transparency. Companies operating from/within these jurisdictions can also leverage deficient local enforcement regimes to obtain substantially lower royalties. In all cases, this creates not only a direct loss for SEP owners, but also an indirect pressure since unfair competition from implementers in deficient jurisdictions makes it more difficult to charge normal FRAND royalties on other implementers.

### Royalty stacking and categorical discrimination

If technologies are complements, the adopter of the technology (and ultimately the end-user) is subject to multiple monopolists, each of which is eager to extract rents (royalties). Even if these individual royalties are capped by FRAND conditions, the cumulative payable royalty may still become excessive. While several authors have argued that, in the context of formal standards setting, the conditions for royalty stacking can be present (see, for instance Lemley and Shapiro

(2006))<sup>171</sup>, others such as Geradin et al. (2008)<sup>172</sup> argue that there is no direct evidence of this actually taking place.

A particular concern exists as to whether or not there would be categorical discrimination between licensees that can enter into a cross license (because they also own SEPs) and licensees that cannot. This could happen in a situation in which all SEP owners enter into attractive cross licenses with each other (e.g. without any net monetary compensation) but, at the same time, demand a high licensing fee from all licensees that cannot enter into cross licenses (because they do not own SEPs and/or other relevant patents). If this high fee does not reflect the actual burden of the R&D and other investments that cross-licensing parties have incurred, then one could speak of categorical discrimination.

Both the problem of royalty stacking as well as the problem of categorical discrimination is affected by the degree of vertical integration, albeit in opposite directions. Royalty stacking typically occurs if licensing agreements are cash-based. In industries with a high degree of vertical integration, most of the licensing is based on cross-licensing agreements. Categorical discrimination, on the other hand, is only possible if the owners of SEPs are vertically integrated.

#### 4.1.3 Time-to-market

In Chapter 3 we noticed several times that a major benefit of having a standard is that it decreases the time-to-market of a technology. However, it also became clear that having established a standard does not automatically imply that the standard will also be implemented in the market. A major problem can arise if transaction costs and market failures impede the implementation of a standard.

The value of a fast time-to-market for technology implementers may differ from one industry to the next. A key determinant is whether or not a standard is competing for the market with another standard. This was illustrated in Chapter 3. For example, although some SEP owners of the GSM standard were concerned that the take-up of the standard (and thus the time-to-market) could be hampered by transaction costs for implementers, the failure to form a pool as to deal with these risks<sup>173</sup> did not eventually obstruct a quick mass market take-up of the technology, notably because there were no competing standards in Europe (see section 3.1.2). Another example is the success story of JVC's VHS standard that won the VCR standard war because of its active licensing programme lowering transaction costs for implementers and thereby reducing its time-to-market (see section 3.2.2.). Similarly, the One-Blue Pool became a success because its members were concerned that failure to form a pool would impose high transaction costs and lead to royalty stacking, putting the standard at a disadvantage vis-à-vis the HD-DVD standard (see section 3.2.2.).

The value of a fast time-to-market for the economy at large was illustrated by Ecorys et al (2011)<sup>174</sup> comparing the roll-out and adoption rate of the GSM-standard in Europe to the roll-out and adoption rate of other 2<sup>nd</sup> generation mobile communication standards in the USA. Ecorys et al noticed that the benefits from the GSM standard largely resulted from economies of scale in the production of network equipment and handsets. It resulted in lower prices and a rapid uptake of mobile

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<sup>171</sup> Lemley, M.A.; Shapiro, C. (2006): Patent holdup and royalty stacking. In: Texas Law Review, 85, pp. 1991-2049.

<sup>172</sup> Geradin, D.; Layne-Farrar, A.; Padilla, A.J. (2008): The complements problem within standard setting: assessing the evidence on royalty stacking.

<sup>173</sup> Favoured by some of the SEP owners, but it notably failed because not all SEP owners had the same preference.

<sup>174</sup> See Ecorys, TUDelft and TNO (2011) "Steps towards a truly internal market for e-communications" commissioned by DG Connect (European Commission).

communication (in Europe),<sup>175</sup> resulting in an additional welfare gain of between 0.3% and 0.46% annual growth of GDP.

The time-to-market problem is mitigated in some industries (for instance in ICT) by the fact that, as a matter of current practice, patent holders allow implementation to occur before the licence agreements have been finalized.

## 4.2 Lack of transparency regarding SEPs

While many standard setting bodies (SSOs) provide public information on the patents that members or other parties have disclosed as being essential to standards, it is not easy to use and interpret that information and not all information being required is provided. One of the problems is that patent disclosures are on the basis of self-declaration. While many SSOs have rules on what must be disclosed, these rules cannot and do not guarantee that all actual essential patents are on the list or that all listed patents are actually essential.<sup>176</sup> Nor do the databases provide information about the validity of the patents, the scope of the patent or about the ownership of patents. Consequently, it is not always easy for adopters to assess whether they infringe a patent and/or whether the patent is actually enforceable.

Below we elaborate on these problems. However, we want to emphasize that the SSO databases as such are not the source of the problem. The problem is that there are so many SEPs and SEP owners that no individual company can easily process all of the information that needs to be processed, unless they invest in a large department of IP experts that work full time on identifying the patents and assessing these for validity, essentiality, scope, enforceability and so on. Indeed the SSO databases are the main instruments available to resolve the lack of transparency, but in their current state they also have shortcomings.

The uncertainty surrounding the definition of essentiality and the identity of SEP owners are two such shortcomings that, besides the growing number of SEPs, strongly contribute to the lack of transparency regarding SEPs. In the following section, we present each of them in turn, and shortly conclude by highlighting the consequences of the lack of transparency on the licensing of SEPs.

### 4.2.1 *Uncertain definition of essentiality* **Essentiality, validity and scope**

The fact that the data and the transparency of SSOs' public information sources are limited has several explanations. Some of these, we have already mentioned (over-disclosure and blanket disclosures). The problem of over-disclosure and blanket disclosures would be mitigated if SSOs had rules in place about updating the information. However, the need for updating the information does not resolve the issue of over-disclosure and blanket disclosure. There are various reasons why patents (or patent applications) are essential at one point in time, but may no longer be essential at a later time.

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<sup>175</sup> By 2000 the mobile penetration rate in most EU countries was between 60 to 90%, whereas only 40% of Americans had a mobile phone connection. Only in 2008 did the United States have a penetration of around 80%. By that time, the European economy showed mobile penetration rates (far) beyond 100%.

<sup>176</sup> In Chapter 2 these rules and their consequences for the accuracy of the resulting disclosure data are discussed in detail.

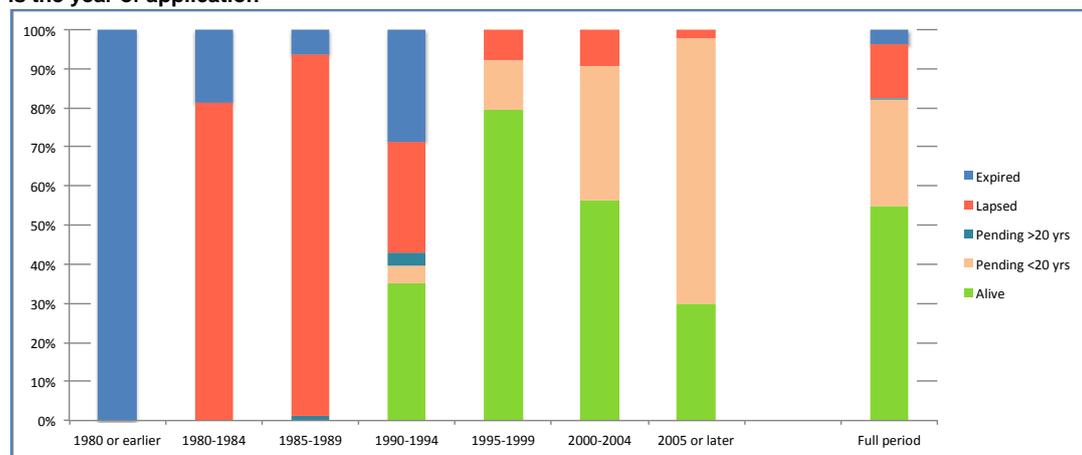
Briefly, the main reasons can be: (1) a later final version of the standard no longer covers the patented technology; (2) the scope of the issued patent was narrowed or modified and no longer contains claims that are essential to the standard (the patent examiner has turned the ‘dreaded tiger’ into a ‘little cat’), (3) the patent application was rejected, successfully opposed or abandoned; and (4) patents with essential claims have been successfully challenged in court or rescinded on re-examination by the relevant patent authority.

The occurrence of the categories (1) and (2) has to be seen in the light of the timing of disclosure specified by SSO. If an SSO requires disclosure to be done as early as possible (allowing for early understanding, better opportunities to seek FRAND commitments and opportunities to design around the invention if appropriate), the risk whether (1) or (2) takes place is higher than when the SSO specified disclosures at a later point in time when the standards and the patents are more mature. This calls for the requirement of updates at multiple instances in time.

### Enforceability

In addition, not all disclosed inventions are legally enforceable. The patents may still be pending, the patent term may have expired or the owner may have failed to pay the renewal fees. Using the so-called Inpadoc Legal Data for all the identifiable disclosed patents at 13 large SSOs, we find that only slightly more than 50% of disclosed inventions are enforceable. While quite a few of the remaining patents are still pending (and may never be granted), a surprising share of this remaining category (around 30%) concerns patents granted for which the owner had failed to pay the renewal fee.<sup>177</sup>

**Figure 4.4 Legal status of disclosed EPO patents, based on a total of 2351 patents. The horizontal axis is the year of application**



Meaning of the legend: 'Alive': the patent has been granted and is enforceable; 'Pending <20 yrs.': there has been a patent filing but no patent grant yet; 'Pending >20 yrs.': there has been a patent filing, but 20 years have passed so a future grant is impossible; 'Lapsed': the patent was granted, but the owner failed to pay the fees, rendering the patent not enforceable;<sup>178</sup> 'Expired': as the name implies, the patent has reached its maximum lifetime and is no longer enforceable.

### When is there an infringement?

Yet another element is that not every device that is based on a standard necessarily infringes each SEP for that standard. For instance, mobile phones will not infringe the technology elements in the standard that are unique to the mobile infrastructure (such as routing in the network), while mobile infrastructure will not infringe the technology elements that are related to the mobile devices (such

<sup>177</sup> A similar analysis on the (larger) group of disclosed USPTO patents shows a similar pattern (not shown).

<sup>178</sup> For the EPO, the situation is somehow more complex, as lapsing occurs nationally. We consider a patent lapsed if it was applied for in Germany and/or France and/or the UK and subsequently lapsed in at least one of these countries.

as the SIM card).<sup>179</sup> Products may not implement certain optional features of the standard; SEPs that are only essential to these specific features will then not be infringed. Finally, whether or not a SEP is infringed may depend on the specific release of the standard that is being implemented – for many standards new features are added all of the time, with the potential inclusion of new SEPs.

To summarize, we distinguish between three categories:

1. Disclosed SEP is no longer essential (or valid, or is limited in scope);
2. Disclosed SEP is not enforceable;
3. Disclosed SEP is not infringed in particular implementations of the standard.

In addition to these cases that are based on ‘truthful’ declarations (at least at the time they were made), there is also a concern about untruthful declarations. In such untruthful declarations, parties declare patents as SEPs while they know – or should have known, if they had spent reasonable efforts – that these patents are not essential (this issue will be further discussed in Section 5.2). Moreover, there is a concern whether or not the party that made the disclosure is the actual owner (we discuss such transfer issues in Section 5.6).

Even leaving these ‘untruthful’ declarations and ownership changes aside, the three categories mentioned result in a significant incompleteness in the database - at least if we assume that the database should represent actual SEP existence and ownership. An interested party could, to some degree, address the lack of information in category 2 (SEP does not represent a legal right) by consulting public sources, but this task is considerably less trivial than it seems and invokes considerable costs, especially if such information is desired for a standard for the full set of SEPs. Resolving the information questions in categories 1 and 3 is even more difficult since an in-depth analysis is necessary for each patent in the context of either the standard or the product in question and, for a reliable outcome the construction of claim, charts will be necessary. In case of multiple patents, the costs for a third party (without access to the private information that the patent owner has at its disposal)<sup>180</sup> will be prohibitive. This creates significant information asymmetries.

In the past, a number of technical studies have sought to determine the degree of essentiality of disclosed essential patents. Three studies concluded that only 20%, 27% and 28% respectively of patent families declared as ‘essential’ were actually essential.<sup>181</sup> While some may not agree to the specifics of these studies<sup>182</sup>, the impression from talking with experts in the field and from analysing the outcome of court cases – where SEPs are often not found to be infringed by an implementation of the standard in a product (even while one may expect a plaintiff to select its ‘best’ patents for an infringement case) – is that many disclosed SEPs are actually not essential. According to informal talks to many insiders, this percentage might actually be in the range of 50%. Over-statement of SEP claims appears to be a highly pertinent phenomenon.

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<sup>179</sup> This is illustrated by the different sets of patent in the 3G3P patent pool for mobile infrastructure and for mobile terminals.

<sup>180</sup> The patent owner has supposedly examined the relevant claims in its patent (application) and the relevant elements of the standard at the time of original disclosure, and combined with information about changes in either patent or standard, he/she can make a new determination at lower costs than a third party that needs to start from scratch.

<sup>181</sup> These numbers are respectively reported in Goodman, D. J., & Myers, R. A. (2005). 3G Cellular standards and patents. Proceedings from 2005 IEEE Wireless Communications and Networking Conference. Fairfield Resources Intl. (2007), Analysis of Patents Declared as Essential to GSM as of June 6, 2007; Fairfield Resources Intl. (2008) Review of Patents Declared as Essential to WDCMA Through December, 2008. Other studies include Fairfield Resources International. (2010). Review of Patents Declared as Essential to LTE and SAE (4G Wireless Standards) Through June 30, 2009.

<sup>182</sup> For a critical discussion see Mallinson, K. (2011). Valuing IP in Smartphones and LTE. WiseHarbor. Retrieved from <https://sites.google.com/site/ipfinanceweblog/wisearbor/WiseHarborvaluingIP7Nov11pdf.pdf?attredirects=0&d=1>.

#### 4.2.2 Uncertainty about SEP ownership

Nowadays, it is widely understood that SEP disclosure is a phenomenon of considerable proportions, which contributes to an increase in the lack of transparency of patent ownership around standards. Nevertheless, it is important to keep in mind that the lack of transparency is a function of the number of both SEPs and SEP owners. In this respect, a standard comprising hundreds of SEPs, but only one SEP owner is much more transparent than a standard with hundreds of SEP owners.

Against this background, two particular problems pertaining more precisely to the identification of relevant SEP owners are worth being highlighted: blanket disclosures and transfers of SEP ownership.

##### **Blanket disclosures**

A specific, yet common phenomenon is known as 'blanket disclosures'. These are declarations whereby a party indicates its ownership of one or more patents for a given standard, while not revealing the identity of these patents. Consequently, the level of transparency of the disclosed information is much lower than with 'specific disclosures', that is, disclosures where these identities are indeed provided – see text box below.

##### **Transparency problems as a result of blanket disclosures**

A good illustration into the degree to which blankets hamper a good understanding of SEP existence and ownership - and the consequences in case of patent conflicts - is illustrated by the court cases in the US and Europe between Motorola (later Google) and Microsoft in the 2011-2013 time frame. These cases focused on the ITU H.264 standard for advanced video coding and the IEEE 802.11 series of standards on wireless local access networks. A U.S. district court concluded that 92 companies identified patents as essential to the 802.11 ("Wi-Fi") wireless local access network family of standards, but that 59 companies filed blanket declarations without identifying specific patents. The court accepted testimony that there are *possibly thousands of patents* declared essential to the 802.11 family of standards.<sup>183</sup> The same court concluded that approximately 33 U.S. companies declared patents essential to the H.264 advanced video coding standard and 19 additional companies provided blanket declarations to the ITU (one of the developers of the standard) without identifying specific patents.<sup>184</sup> This very much hampered the ability of the court to have a good understanding of the total existence and ownership of SEPs for the standards in the dispute.

Moreover, blanket disclosures facilitate over-disclosure and thereby contribute further to the transparency problem. The problem of over-disclosure focuses on the ever-growing extent to which standards cover patented technologies. If all these technologies indeed contribute to the value of the standard (like performance, cost-effectiveness, reduced consumption of energy or other inputs, etc.) and their contribution outweighs the costs of inclusion (including licensing fees, transaction costs, market access etc.), then a large degree of inclusion could be in line with the public interest. However, if these patents merely offer advantages to their owners, while not adding value to the standards and perhaps even making the standard unnecessary complex, then we could speak of over-inclusion. It could be argued that firms have strong incentives to ensure that their patented technology becomes part of a standard and that the strategies they develop for that purpose may in turn result in a significant degree of over-inclusion. This problem will be further explored in Section 5.7.

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<sup>183</sup> Microsoft Corp. v. Motorola, Inc., Findings of Fact and Conclusions of Law, 2013 U.S. Dist. LEXIS 60233 at paragraph 335 (W.D. Wash., Apr. 25, 2013).

<sup>184</sup> Ibid at paragraph 157.

The main reasons for using blanket disclosures and over-disclosure are as follows (see also Section 2.3):

1. There are strong incentives to play it safe. Several law cases<sup>185</sup> have shown that a company found to have (intentionally) failed to disclose is at the risk of not being able to commercially exploit its essential patents later on. Thus, many firms feel it is better to disclose too much than too little;
2. In light of the former reason, a blanket disclosure simply takes less time and effort than to specify each patent that is essential for a standard; in particular if it concerns hundreds of patents, but also if it concerns only one of the thousands of patents in your portfolio. This second argument indicates that there are not only negative effects of blanket disclosures. After all, they lower the barriers for IP owners to contribute to standard-setting events in the first place.

In an attempt to assess the importance of blanket disclosure, we analysed data from fifteen SSOs<sup>186</sup>, of which eight<sup>187</sup> have an IPR policy that allows firms to file blanket disclosures.<sup>188</sup> Another six<sup>189</sup> SSOs have policies that, while not formally permitted to do so, in practice allow blanket disclosures.<sup>190,191</sup> The eight SSOs allowing such disclosures that we reviewed represent about one third of all disclosure statements made (Figure 4.5a). Looking at it this way might be a bit imprecise. A single blanket statement may represent many distinct patents. Therefore it might be better to do such a comparison at the disclosure event level. After all, this is where a company can choose either to submit a disclosure with a single blanket statement or to make a disclosure with (one or multiple) specific patent statements. Perceived in this way, the share of blankets is no less than 60% of all disclosure events (Figure 4.5b). Most of the analyses in the remainder of this chapter are based on disclosure events, as we believe this is the most appropriate unit of analysis.

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<sup>185</sup> Including the Dell "VESA Local Bus" case and the RAMBUS JEDEC case.

<sup>186</sup> ANSI, ATIS, BBF, CEN, CENELEC, ETSI, IEC, IEC - JTC1, IEEE, IETF, ISO, ISO - JTC1, ITU OMA, and TIA.

<sup>187</sup> ATIS, IEC, IEC-JTC1, IEEE, ISO, ISO-JTC1, ITU and TIA.

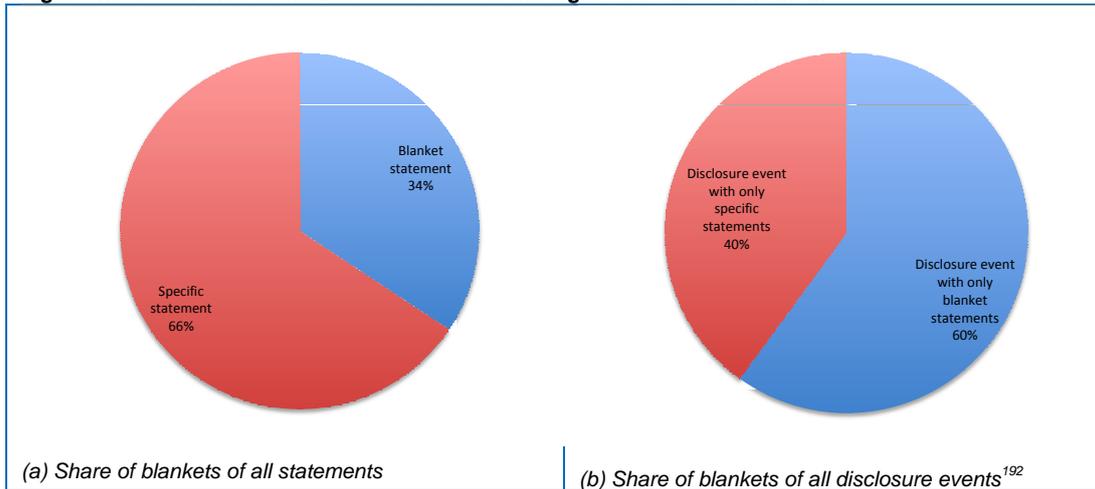
<sup>188</sup> See the following report for an in-depth discussion on the SSO IPR policies and the rules on blankets in particular: Bekkers, R., & Updegrove, A. (2012). A study of IPR policies and practices of a representative group of Standards Setting Organizations worldwide. Washington, DC: National Academies of Science. Retrieved from [http://sites.nationalacademies.org/xpedio/groups/pgasite/documents/webpage/pga\\_072197.pdf](http://sites.nationalacademies.org/xpedio/groups/pgasite/documents/webpage/pga_072197.pdf).

<sup>189</sup> BBF, CEN, CENELEC, ETSI, IETF, and OMA.

<sup>190</sup> These are cases in which a firm submits such a blanket regardless of the actual rules and, apparently, this submission is 'tolerated'.

<sup>191</sup> For the fifteenth SSO, ANSI, we cannot state whether or not blankets are allowed, as ANSI is actually an accreditation body and its underlying SSOs might have different rules on blankets.

**Figure 4.5 Occurrence of blanket disclosures at the eight SSOs that allow them**



There are some significant differences between technology areas when it comes to the phenomenon of blanket disclosures. Table 4.1 shows that the occurrence of blanket disclosure is highest in the areas of telecommunications, LAN and Audiovisual. The technology area of IT is an outlier here, where specific disclosures are clearly more common. The 'smaller' technology areas give a mixed picture. However, bearing in mind that the total number of declarations in these areas is often quite low, we are hesitant to draw any conclusions here.

**Table 4.1 Blanket and specific disclosure events for top standards in terms of disclosure events (only for selected SSOs)**

	Specific disclosure events		Blankets disclosure event		Total
	Freq	%	Freq	%	
1 Tele	359	31.7%	773	68.3%	1,132
2 LAN	82	29.0%	201	71.0%	283
3 IT	165	65.5%	87	34.5%	252
4 AV	137	33.9%	267	66.1%	404
5 Secu	88	56.1%	69	43.9%	157
6 Trans	4	33.3%	8	66.7%	12
7 Energ	5	55.6%	4	44.4%	9
8 Ind	29	54.7%	24	45.3%	53
9 MTS	11	78.6%	3	21.4%	14
Other	22	53.7%	19	46.3%	41
Total	902	38.3%	1,456	61.7%	2,358

Note: Category 'missing in original statement' with one single observation has been omitted in this table.

Turning now to specific standards, we investigated how often blanket disclosure events occur. As can be seen in Table 4.2, which shows the top standards in terms of disclosure events, blankets are (again) very common. With the exception of the JTC1 ISO/IEC 18000 standard, all top standards have considerably more blanket disclosure events than specific disclosure events. As a result, there is a great lack of transparency in the actual IPR ownership for these standards.

<sup>192</sup> Theoretically, a disclosure event could also be a mix of blanket and specific statements (which is strange, but a firm could on a single day at a single SSO make a blanket statement for standard A and three specific statements for standard B). Such cases do not occur in our data set.

**Table 4.2 Blanket and specific disclosure events for top standards in terms of disclosure events (only for selected SSOs)**

	Specific disclosure events		Blankets disclosure events		Total
	Freq	%	Freq	%	
JTC1 ISO/IEC 14496 incl. ITU H.264	66	37.7%	109	62.3%	175
IEEE 802.11	30	23.4%	98	76.6%	128
JTC1 ISO/IEC 18000	65	73.0%	24	27.0%	89
JTC1 ISO/IEC 13818 and H.222 and H.626	24	36.9%	41	63.1%	65
IEEE 802.16	28	45.2%	34	54.8%	62
IEEE 802.3	27	43.5%	35	56.5%	62
IEEE 802.1	19	39.6%	29	60.4%	48
ITU G.992	15	37.5%	25	62.5%	40
ITU G.729	13	34.2%	25	65.8%	38
ITU M.1225	9	28.1%	23	71.9%	32

### Transfer of SEPS

The number of SEP owners may not only grow along with the number of SEPs, but may also change as a consequence of IP transfers (which may lead to fragmentation or concentration). From Chapter 3 we learned that IP transfers are often initiated by a changing strategic role of IP for the selling party, which may be induced by a loss of market share at retail level. If that occurs the selling party is typically inclined to sell its portfolio to the highest bidder, which often is a Non-Practicing Entity (NPE)<sup>193</sup>. As a result, increased fragmentation of SEP ownership can generate more transactions costs or royalty stacking. Conversely, they may also contribute to lowering enforcement costs, transaction costs and royalty stacking if they reduce the number of SEP holders.<sup>194</sup>

Generally, SEP transfers contribute to the lack of transparency about SEP ownership, since their occurrence and the identity of the new owners are not part of information in the public domain. This lack of transparency is a result of patent offices and SSOs failing to keep databases up-to-date. Not only the recording of IP transfers by patent offices is far from perfect, but SSOs also fail to update their database on essentiality or even validity of the patent.

Recent studies conclude that about 13% and 5% of all patents granted in the USA and in Europe respectively are traded at least once<sup>195, 196</sup>. In an attempt to assess the importance of this driver we analysed the number of transfers of declared SEPs in Europe<sup>197</sup>. Using the year of reassignment as a proxy for the year of SEP transfer, we present in Figure 4.6 the evolution of annual volume of SEP transfers from 1997 to 2009. We can see that SEP transfers, having been almost non-existent until 2005, started to increase sharply afterwards and most actually took place at the end of the period. Although this trend applies to all categories of transfers, it is stronger in the case of “Bare” and “Acquisition” transfers, with a peak in 2009.

<sup>193</sup> A list of recent SEP transfers, including sales to NPEs, is provided in Table 2.17 of the next chapter. They include the following deals: Bosch IPcom (2007) Nokia Mozaid (2011) Kodak, IV and RPX (2012) and Nokia Sisvel (2012).

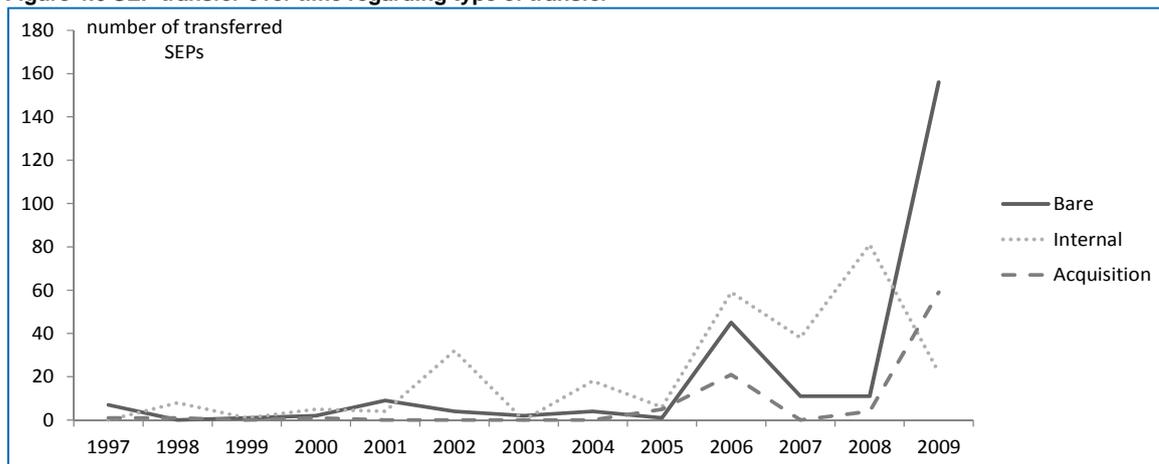
<sup>194</sup> Shapiro, C. (2001) "Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard-Setting". In Jaffe, Adam B. et al. Innovation Policy and the Economy. I. Cambridge: MIT Press, 119–150.

<sup>195</sup> Serrano, C. (2010) "The Dynamics of the Transfer and Renewal of Patents", RAND Journal of Economics, Vol. 41.

<sup>196</sup> Ménière, Y., Dechezleprêtre, A., Delcamp, H. (2012) "Le marché des brevets français, 1997-2009" Rapport d'étude pour l'INPI.

<sup>197</sup> The data cover SEPs applied for at or granted by the European Patent Office and French Institut National de la Propriété Industrielle.

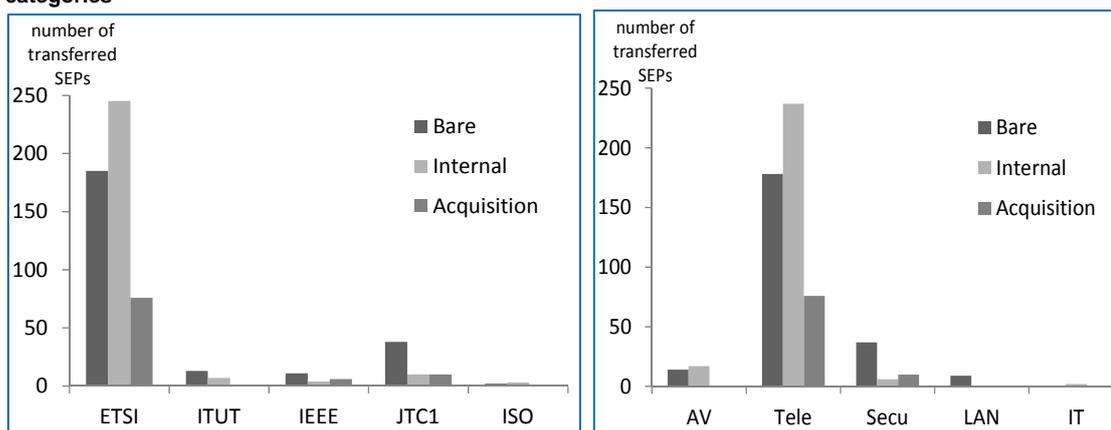
**Figure 4.6 SEP transfer over time regarding type of transfer**



Note: We checked the identity of the applicant and new owner of each transferred SEP in order to sort these transfers into three separate categories. In some cases, the former and new owners were subsidiaries of the same mother corporation. Such reassignments are likely to result from fiscal optimization and strategic motives at the group level. We label them as "Internal" SEP transfers if they take place between established entities of the same group, and as "Acquisition" if they immediately follow the acquisition of the initial SEP-owning entity by the group. Finally, SEP reassignments that are not identified as "Internal" or "Acquisition" correspond to bare SEP transfers between two legally independent entities, and are labelled accordingly as "Bare" transfers. Consequently, "Bare" and "Acquisition" transfers are especially interesting, since they imply a market-mediated transfer.

Figure 4.7 shows in turn that most of the transferred SEPs are related to ETSI and the telecommunication technology area. Other SSOs and technology areas only show very low numbers of transfers. While JTC1 accounts for about 50 SEP transfers, ITU-T, IEEE and ISO have very few. ITU-R, CEN or IEC standards were not subject to a transfer of declared SEPs. Although it is particularly strong in the case of "Internal" transfers, the domination of ETSI and telecommunication (Tele) standards remains true for each category of SEP transfer and probably reflects the much larger number of SEPs declarations that took place at ETSI during the period.

**Figure 4.7 Number of SEP transfers and type of transfer subject to standards in SSO and technology categories**



#### 4.2.3 Why is the lack of information a problem?

The lack of information and the asymmetric distribution of information among actors hinder the efficient licensing of SEPs. It leads to four potential problems:

- increase of transaction costs;
- increase of the time-to-market;
- excess royalty rates or skewed cross-licensing agreements due to asymmetric information; and

- increase of the risk to ambushes and/or hold-ups (see next section 4.3).

### Transaction costs

Generally speaking, transaction costs increase with the number of SEPs, the number of SEP owners, and the number of SEP adopters. They may create a substantial burden for the licensee and also, to a lesser degree, for the licensor. Imperfect information about SEP portfolios is a pervasive problem that clearly amplifies transaction costs. It increases the cost of searching for relevant SEPs and their owners, and the subsequent cost of negotiating licensing agreements (such as the costs of due diligence about the value and strength of SEP portfolios). Asymmetries of information may also lead to divergent expectations between two parties about the degree of essentiality of a patent or patent portfolio, which is a well-known factor of patent litigation<sup>198</sup>.

### Increase of the time-to-market

From Chapter 3 we have learned that in some industries (e.g. consumer electronics) the market players have created institutions that manage these information problems (such as patent pools). In other industries (e.g. communications technology) the structure of demand and supply is such that these institutions are much more difficult to realise. In the latter category of industries we might see vertically integrated firms engaging in cross licensing with other vertically-integrated firms in order to minimize transaction costs. Yet this is not always an option, notably if standards are adopted by entirely different industries – e.g. we have learned in Chapter 3 that communications technology standards are adopted by the automotive and smart grids industries.

If an industry fails to properly deal with the information problems, these problems will eventually translate into a slower take-up of the standard (lower volumes) and higher end-user prices. A second order effect is that the rate of innovation (notably based on these standards) is hampered as well. For example, the smartphone reflects the fact that the consumer electronics (CE) market has experienced a boost from innovating on top of existing communications technology (CT) standards, which in turn has increased the take-up and innovating of those CT standards. Similarly, From Chapter 3 one can learn that the automotive and smart grids industry can experience a significant dynamic boost from adopting existing CT and CE standards.

### Excess royalty rates or skewed cross-licensing agreements

Information asymmetry can generate serious barriers in the market for SEPs licenses and, consequently, in the market for standard compliant products. Firstly, there is a concern that implementers are disadvantaged in licensing negotiations due to information asymmetry about the extent and value of the SEP portfolio of licensors. As a result, they run the risk of making excess payments (or skewed cross-licensing agreements) when compared to the actual value of the licensed property or to what better-informed licensees are paying.

## 4.3 Problems related to specific business behaviour towards SEPs

Having discussed the issue of transparency in the previous section, this section discusses the behaviour of firms leading to increased uncertainty for which the risk of litigation is a proxy.

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<sup>198</sup> Schankerman, M. and Lanjouw, J. (2001) Characteristics of patent litigation: a window on competition RAND journal of economics, 32 (1). 129-151.

#### 4.3.1 What is the problem?

##### A change in business behaviour towards SEPs

In Chapter 3 it was observed that the changing strategic role of IP goes hand in hand with a change in business behaviour towards SEPs. Some companies change their IP enforcement policy from 'defensive' to 'offensive'; others choose to sell (part of) their portfolios to another party. That other party may be an NPE whose business model is aimed entirely at generating cash flows. Such NPEs may seek the boundaries of what is a Fair and Reasonable royalty rate, either during negotiations or immediately in the courtroom. Often these events can be classified as an ambush or a hold-up.

Chapter 3 also noticed that there is a changing strategic role for SEPs vis-à-vis (what some call) non-SEPs that are considered essential for marketing the end product. Also this change is caused by the dynamics in the downstream market where the 'competition for the market' is on-going and forcing companies to seek the boundaries of FRAND by using SEPs to negotiate access to non-SEPs or by tying non-SEPs to SEPs.

The changing strategic role of SEPs leads to a change in business behaviour. Some behaviour (or the combination thereof by different parties) such as unsolicited bundling SEPs and non-SEPs, or simply refusing to license-in, have the effect that there is increasing risks related to adopting and developing standards, which manifests itself in an increased risk of litigation. This in turn makes adopters hesitant to adopt a standard. The legal costs of an infringement case can easily run into millions of euros. As mentioned in section 3.1.4, this (in combination with lack of information on ownership and essentiality - see section 4.2) makes a company (notably small firms) potentially subject to extortion practices by patent *trolls*. But also for larger firms operating in an industry that is characterised by a grim competition for the market the risk of litigation needs to be taken into account. For example, in section 3.1.3 we gave the example of Google buying SEPs inter alia to support its vendors during the bargaining games, even in court. Eventually, these risks and costs translate (one way or another) into higher end-user prices and/or into a higher time-to-market. Again, a second order effect is that the rate of innovation of (notably on top of these standards) is hampered as well.

##### Patent hold-up and patent ambush

In the literature, the two main categories of strategic behaviour discussed are patent ambushes and hold-ups. *Patent ambush* refers to a situation where the standardizers are not aware that they are including patented technology, creating the risk that licenses may not be available (or not at acceptable conditions) and thus threatening the implementation of the standard. This risk is also known as *submarining*. However, it is important to note that while this situation may be the result of intentional behaviour by the patent owner, it may also be unintentional – where the patent owner was simply not aware of this technology being included in a standard somewhere in the world. *Hold-up* refers to a situation where implementers are locked into a certain technology by adopting a standard, so that a patent holder can negotiate a significant higher license fee (ex-post) than it could have asked for its technology before such a lock-in occurred (ex-ante). The hold-up phenomenon has been described excellently from a legal/economic perspective by Kobayashi and Wright<sup>199</sup> as well as in a 2011 FTC report.<sup>200</sup>

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<sup>199</sup> Kobayashi, B. H., & Wright, J. D. (2010). Intellectual property and standard setting. In ABA Handbook on the Antitrust Aspects of Standards Setting. American Bar Association.

<sup>200</sup> FTC. (2011). The Evolving IP Marketplace: Aligning Patent Notice And Remedies With Competition. Federal Trade Commission.

Obviously, in case adopters are not fully-informed about ownership and essentiality, the risk to these phenomena increases. Furthermore, the lack of knowledge about portfolios and essentiality of patents may also enable so-called *Patent Sharks* or *Trolls* to aggressively extort SEP adopters, requiring them to pay for an alleged infringement of one of their patents or be subjected to an injunction. The costs of a court case are often much higher than the requested royalties and parties are inclined to pay, even though they are not certain whether or not the demanding party truly owns any SEPs.

### Reverse hold-up

Another strand of literature<sup>201</sup> challenges the view that patent hold-up and ambushes are serious problems in practise. Proponents of this standpoint consider that it is rather SEPs owners who face a *reverse hold-up* problem whereby they may be “forced to accept royalties that are lower than the value of the contribution of their technologies to a standard”<sup>202</sup>. As a result, companies have reduced incentives to contribute technology to standards, which in turn deprives consumers of future consumption opportunities.

This situation seems counter-intuitive, since SEP owners enjoy undisputed market power over implementers, provided that their (patented) innovations have been included in the standard. However, SEP holders have limited bargaining power vis-à-vis implementers insofar as: i) they have already sunk the R&D cost of their innovations and ii) they have made FRAND commitments. Against this background, implementers may be able to use the threat of litigation to challenge allegedly non-FRAND offers and thereby obtain lower royalty rates. This strategy can be especially effective if the SEP owner has fewer resources than the implementer to sustain the (potentially high) cost of litigation. Small, financially constrained innovators or new entrants that cannot leverage a “reputation effect” are thus particularly at risk among SEP owners. Recent cases also suggest that one or several implementers could similarly leverage competition law (by challenging a SEP owner’s right to claim injunctive relief) to obtain advantageous settlements even from powerful counterpart.

#### 4.3.2 Problems leading to an increased risk of litigation

##### Is there an increased risk of litigation?

Recently, litigation cases that included standard-essential patents have attracted considerable attention. Yet are they really a recent phenomenon or just getting more publicity in the past few years? Moreover, are essential patents more likely to be litigated than comparable non-essential patents? Are essential patents more often litigated in one industry compared to another? Such questions are addressed in this section.

Our analysis below shows that:

- essential patents are indeed more likely to be litigated than non-essential patents: the estimated likelihood of litigation over their whole lifetime is around 16%, compared to 3% for a matched set of patents with otherwise similar characteristics. In other words, they are more than five times as likely to become litigated. Most litigation takes place after the patent is disclosed as being essential;

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<sup>201</sup> For an overview of these arguments, see Mariniello, M. (2013) European Antitrust Control and Standard Setting. Bruegel Working Papers 2013/01.

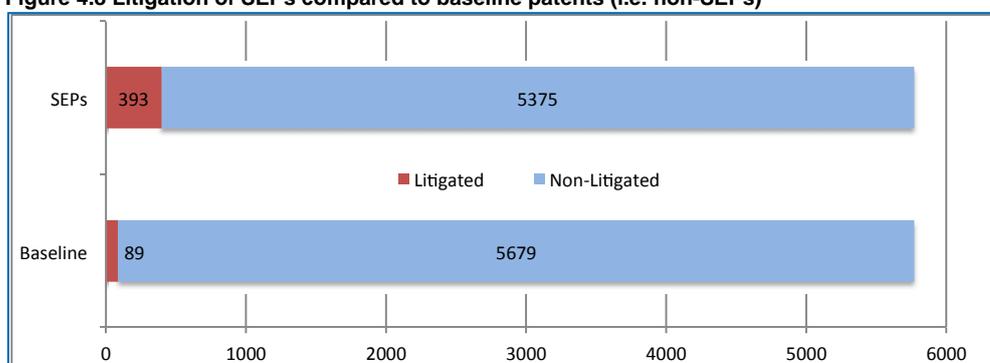
<sup>202</sup> Geradin, D. (2010). Reverse Hold-ups: The (Often Ignored) Risks Faced by Innovators in Standardization Areas. Paper prepared for the Swedish Competition Authority on the Pros and Cons of Standard-Setting. Stockholm, 12 November 2010.

- during the past 30 years, the frequency of litigations concerning IP has grown. The number of litigations involving SEPs has grown much faster than that involving non-SEPs;
- although in absolute numbers there are more litigation cases for telecommunications standards than for any other technology area we studied, the *relative* litigation rate of telecommunications, (6% of all patents) is lower than in LAN technology (14%), audio-visual standards (14%) and security technologies (12%);
- downstream players are less inclined to litigate than upstream players. For example, although it seems from the data that SEPs disclosed by universities are very often litigated (as much as 23%), a closer look learns that these are typically litigated *after* they have been transferred to other owners.

### SEPs and litigation

As SEPs generally have strategic value, it would not be surprising if they are litigated more often than other patents (referred to as non-SEPs or 'baseline'). Indeed, this is observed in our data. Figure 4.8 shows that 6.7% (393 of 5,768) of all essential patents in our dataset were subject of litigation (to date), whereas this was only 1.5% (89 of 5,768) for other patents.

**Figure 4.8 Litigation of SEPs compared to baseline patents (i.e. non-SEPs)**



The likelihood of a patent being litigated may change over the lifetime of the patent. Duration analysis allowed us to compute this probability and to compare it to the control sample. Figure 4.9 shows the cumulative litigation hazard over the 20-year lifespan of both essential and control patents. The yearly increment of the line represents the increase in the likelihood of a patent to be litigated at a certain age, given that it had not previously been litigated. It shows that the two groups differ greatly in their probability of litigation profile.<sup>203</sup> Essential patents are more likely to be litigated than the control patents and the associated estimated likelihood of litigation over the entire lifetime is around 16%, compared to 3% for a matched set of patents with otherwise similar characteristics. In other words, their likelihood to be litigated is five times greater. Furthermore, Figure 4.10 shows that the frequency of litigations has increased considerably over the past 30 years, notably for cases involving SEPs.

<sup>203</sup> Indeed we reject the null hypothesis for equality of survivor functions with 1 percent significance.

Figure 4.9 Lifetime Litigation Probability (20-Year Cumulative Litigation Hazard)<sup>204</sup>

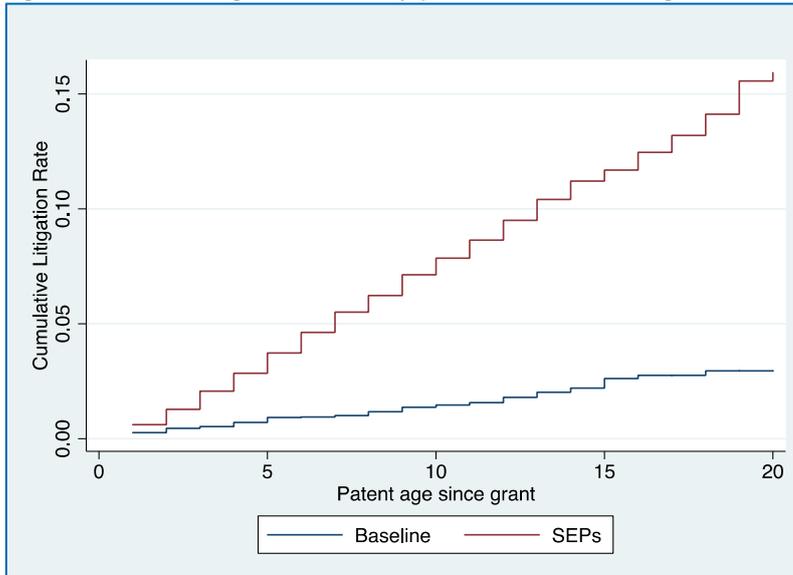
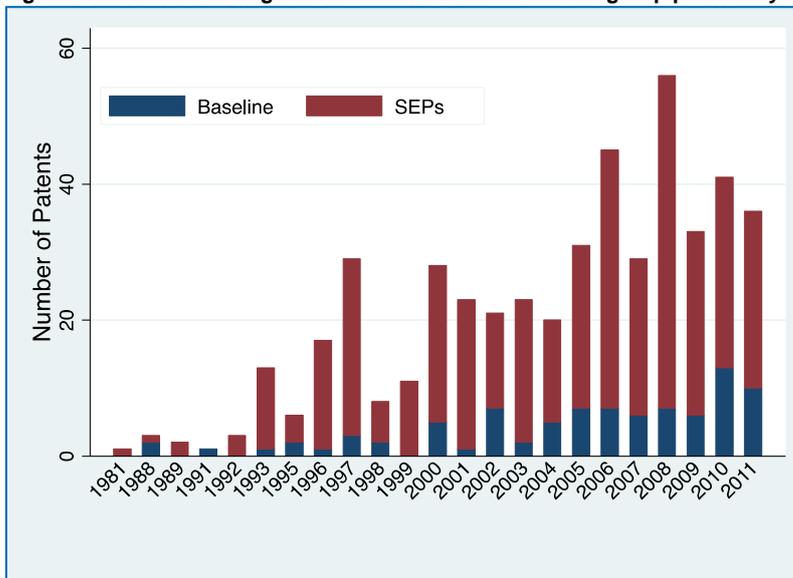


Figure 4.10 Number of litigation cases of SEPs and control group patents by litigation years



#### Litigation and technology area

Our data reveals that there are significant differences in litigation frequency between areas of technology. Although the telecommunications area is leading in terms of total numbers, its relative litigation rate (6%) is lower than that in LAN technology (14%), AV (14%) and security technologies (12%). Table 4.3 shows these results.

Table 4.3 Litigation cases by technology area

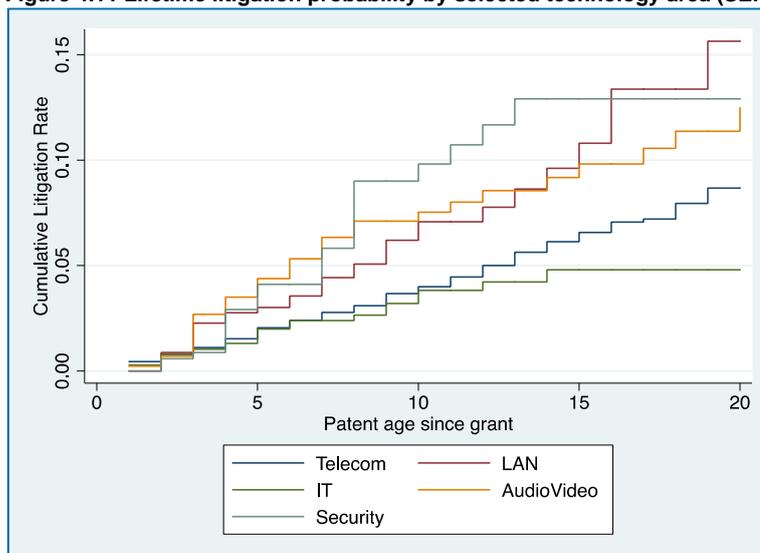
Category	Technology area	SEPs	Litigated SEPs	Percentage
1 Tele	Telecommunications via public networks.	4,284	244	6%
2 LAN	LAN/PAN/BAN networks, wired and wireless.	236	32	14%
3 IT	Information technology and Internet.	534	23	4%
4 AV	Audio/video systems, coding and compression,	221	32	14%

<sup>204</sup> The graph plots the Nelson-Aalen cumulative hazard function.

Category	Technology area	SEPs	Litigated SEPs	Percentage
	broadcasting, home systems, home entertainment.			
5 Secu	Security, identification, cryptography, biometrics.	182	21	12%
6 Trans	Transport, logistics, aerospace, intelligent transport systems.	3	0	0%
7 Energ	Energy generation and distribution and storage, fuel cells, power electronics.	6	0	0%
8 Ind	Industrial equipment, manufacturing, production	41	2	5%
9 MTS	Measurement, testing, safety standards, language standards.	22	1	5%
<b>Total</b>		<b>5,529</b>	<b>355</b>	

We also investigated the development of the likelihood of litigation over the lifetime of the patent. Figure 4.11 summarizes the results for all the technology areas in which we observed 20 or more litigation cases. Security patents are only litigated in the first 12 years of their life. Similarly, IT patents no longer undergo litigation as they approach the end of their life cycle. For LAN patents, in contrast, the litigation likelihood soars when they are 15 years old or more. The pattern for Telecommunication and AV patents falls in-between: their litigation likelihood grows steadily over the years, with no particular highs or lows.

**Figure 4.11 Lifetime litigation probability by selected technology area (SEPs only)**



### What drives the problem?

One reason for an increased risk to litigation we have already discussed extensively: the lack of transparency on ownership and essentiality.

### *The behaviour by some Non-Producing Entities (NPEs)*

Another reason for increased risk to litigation is mentioned in section 3.1.4 namely that some NPEs pursue a rather aggressive strategy: “you pay immediately or we go to court”. A rise in the number of NPEs owning SEP portfolios therefore increases the chances to observe litigation and/or extortion. Vertically integrated companies, on the other hand, are often dependent on each other for accessing SEPs. They generally place a strategic value to SEPs in terms of gaining a freedom to operate. Consequently, they have a greater willingness to cross-license (as opposed to litigate). In fact many vertically integrated companies see SEPs as a currency for such agreements (see

Chapter 3). However, as section 3.1 shows, when new business models enter the industry and fiercely compete for the market, some of the established companies lose considerable market share at the retail level. Consequently, the strategic role of SEPs changes for these companies. The need to generate cash flow forces them to sell their crown jewels to the highest bidder, which in many cases is an NPE.

#### *FRAND conditions not clear*

A third reason contributing to a higher risk of litigation is the fact that FRAND conditions are not always clear and leave room for disagreement about the level of a fair and reasonable royalty rate. Another possibility, in the case of cross licensing agreements, is that disagreement may arise regarding the question whether one party may require another party to (a) license out or (b) accept non-SEPs in return for SEPs.

- Ad a) One interpretation of FRAND commitments is that patent owners must be willing to license their SEPs for monetary compensation. While they may make a license subject to reciprocity for SEPs owned by the licensee, they may not make a license conditional to the licensing of non-SEPs owned by the licensee. One could argue that this discriminates between parties that do have patented (non-essential) technologies – but don't want to license out this IP – and those that do not own any IP. Nevertheless, there is a concern that SEP owners go far in obtaining non-SEPs owned by licensees. In areas such as smart phones, some non-SEPs (such as very visible features in the user interface of the phone) are considered to be very attractive in the marketplace, and SEP owners might be tempted to leverage their SEPs to obtain licenses for such non-SEPs. The non-SEP holder might, however, not be willing to license out its differentiating patents. In such cases, there are two concerns: (i) the SEP owners makes its license conditional to access to the licensee's non-SEPs; (ii) the SEP owner offers both a license for monetary compensation and a license including a cross-license of the non-SEPs, while pricing the former higher than it would (or could) have done had the licensee not owned these attractive non-SEPs;<sup>205</sup>
- Ad b) While FRAND commitments oblige a SEP owner to license out only its SEPs at a FRAND-compatible rate, some SEP owners would prefer to license out their full relevant patent portfolio, including the non-SEPs they own. In that case we speak of a form of unsolicited bundling. Depending on whether the licensee actually wants to license the non-SEPs at all and, of course, depending on the fee that is demanded for the bundle, this could create disadvantages for the licensee.

#### *Transfer of FRAND conditions*

Finally, there is a risk that FRAND conditions are no longer adhered to by the new owner after SEPs have been transferred. An important question is whether the FRAND commitments made by the original SEP owners have been (bindingly) transferred to the new owner. If not, the availability of licenses is no longer guaranteed and the risk of phenomena such as patent hold-up may increase considerably. Under such circumstances, implementers have fewer means to protect themselves against such practices. Particularly complex situations may arise when there are multiple, subsequent ownership changes ('cascading transfers') or when the original SEP owner has made a blanket disclosure (when in the case of partial transfer of its patent portfolio it is hard to determine whether the new owner is the new SEP owner). This problem will be further explored in Section 5.6. A particular case is when the transfer is the result of a bankruptcy. In such a case, a trustee in bankruptcy will usually sell the company's assets, including its patents. An important question is whether the new owner of any SEPs is still bound by the original FRAND commitment. Notably, the trustee has an incentive not to include such a condition as a part of the patent sale in

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<sup>205</sup> We would like to stress that if both licensee and licensor want to enter into a cross license for SEPs against non-SEPs, there is no problem at all. The problem only exists if the non-SEP owner does not like to enter into such an agreement.

order to increase the value of the portfolio. As a consequence, the risks of hold-ups and ambushes may increase.

#### *Relationship between litigation and the patent owner's business model*

Another interesting aspect is whether firms with different business models have a different likelihood of asserting their essential patents. We investigated this by considering the business models of the companies that disclosed these essential patents.

It is important to note that ownership changes may affect our results. While our data considers the disclosing party's business model (and thus does 'corrects' for patent transfers that take place between the moment of the original patent assignment and the moment the patent is disclosed as a SEP by its new owner), we cannot see whether or not a patent has changed ownership *after* this disclosure<sup>206</sup> and is subsequently subject to litigation. As there is no obligatory register for such transfers, we cannot observe such ownership changes.

Table 4.4 shows SEP litigation cases divided into the disclosing party's business model. First of all, we observe that for all business models, the average for SEPs is considerably above the average level for non-SEPs, which was found to be 1.5% (see above). Exceptions are the small categories of 'individual patent owners' and 'other business models', where there are simply no litigation cases at all. We also see some interesting differences. Downstream players are less inclined to litigate than upstream players. This is particularly true if we compare some of the larger categories in those two groups: Equipment suppliers (average 5.3%) and pure upstream companies (average 8.5).

**Table 4.4 Litigation cases showing the disclosing party's business model**

Business Model	SEPs	Litigated SEPs	%
UPSTREAM BUSINESS MODELS	1847	139	7.5%
<i>Of which...</i>			
Pure upstream knowledge developer or patent holding companies (excl. universities)	638	54	8.5%
Universities / public research institutes / states	42	10	23.8%
Components (incl. semiconductors)	885	66	7.5%
Software and software-based services	230	9	3.9%
Individual patent owner	52	0	0.0%
DOWNSTREAM BUSINESS MODELS	3575	194	5.4%
<i>Of which...</i>			
Equipment suppliers, product vendors, system integrators	3,235	170	5.3%
Measurement and instrument, test system	10	1	10.0%
Service providers (telecommunications, radio, television, etc.)	330	23	6.9%
OTHER BUSINESS MODELS	24	0	0.0%
<b>TOTAL</b>	<b>5,446</b>	<b>333</b>	<b>6.1%</b>

Note: "OTHER BUSINESS MODELS" include SSOs, forums and consortia (which are patent owners in some cases), technology promotion associations and a few entities too diverse to be categorized as upstream or downstream.

<sup>206</sup> Only in cases where the new owner had also submitted a disclosure, change in patent ownership was evident.

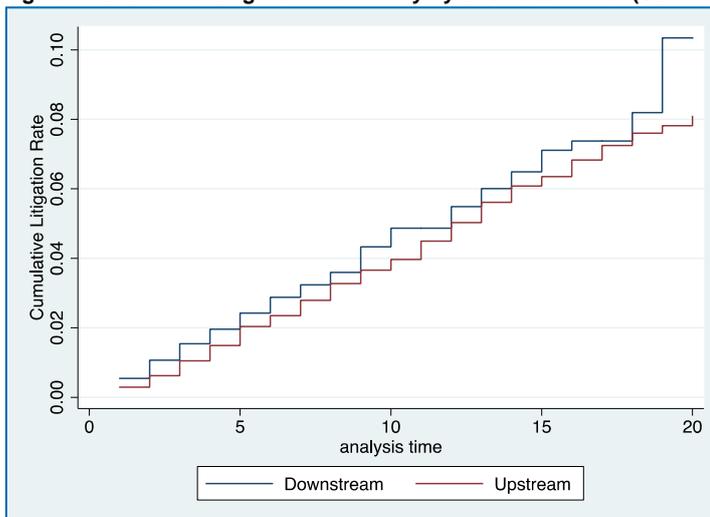
Intrigued by the high percentage of litigated patents that were disclosed by universities, public research institutes and governments (an average of 24%), we examined these 10 cases in more detail:

- Three patents were originally owned by a Korean government-funded research institute and disclosed to SSOs as such. However, although the INPADOC Legal Status file does not reveal a change in ownership, a commercial firm eventually made use of this file in a US litigation case;
- Two other patents were originally held by a Canadian university. Though we traced no ownership change in the INPADOC Legal Status file, it was a European vendor that subsequently disclosed owning these patents to an SSO. Later, this vendor litigated the patents;
- An interesting case is that of a patent developed by a Canadian inventor and initially assigned to a Canadian entity. Later ownership was formally transferred to the inventor, who was then reported to be living in California. The University of California then disclosed these as SEPs and a Californian firm later litigated them against another firm.

While each case is a story in itself, they often involve ownership changes before they become part of litigation.

We also investigated whether there are changes in litigation likelihood over time if we distinguish between different business models. As can be seen in Figure 4.12, these differences are quite small. As shown above, upstream owners have a higher tendency to litigate, but this pattern is equal over time.<sup>207</sup>

**Figure 4.12 Lifetime Litigation Probability by Business Model (SEPs only)**



#### 4.4 Conclusion

We concluded that there is a growing number of standard essential patents. In addition (and partly related to that) there is a growing lack of transparency about essentiality of patents and ownership of patents. Furthermore there is a lack of clarity on what FRAND actually means (in terms of being *non-discriminatory* and in terms of *fair and reasonable*). The growing number of patents makes the problem of royalty stacking more prominent, as well as the risk to categorical discrimination

<sup>207</sup> We cannot reject the null hypothesis of the two estimated functions being the same: the rank test for equality of survivor functions has a  $\chi^2(2)$  value equal to 2.28.

between licensors that own SEPs themselves and those that do not. The lack of transparency and of clarity on FRAND may lead to excess royalty rates or skewed cross-licensing agreements due to asymmetric information. The combination of that large number of SEPS and the lack of transparency drives up transaction costs up thereby hindering the licensing process because: 1) licensors find it more difficult to enforce IP rights and 2) licensees find it more difficult to identify which IP to license in and who owns it. It contributes to an increased risk to ambushes and/or hold-ups. All in all, these problems accumulate to an increase in the time-to-market and an increased risk of litigation.

To sum up we identified the following risks:

- Over-inclusion of patented technologies in standards because participants have strong incentives to include them being facilitated by the use of blanket disclosures;
- Both Standards implementers and SEP owners are facing substantial transaction costs;
- There are risks that the cumulative payable royalties for SEPs is above reasonable levels or even prohibitive for implementing products ('Royalty stacking');
- There are risks of incidental or categorical discrimination against parties that do not own SEPs;
- There are risks that after a SEP transfer the new owner does not consider itself bound by an earlier licensing commitment;
- There are risks that SEP commitments are no longer in force after bankruptcy proceedings of the owner;
- Standard implementers run the risk of falling victim to patent hold-up and patent ambush. The problem increases with the growing number of *patent trolls*. Licensors on the other hand can be a victim of a reversed hold-up. This notably applies to smaller patent owners having fewer resources than large implementers to sustain the (potentially high) cost of litigation;
- Implementers are being disadvantaged in licensing negotiations (making excess payments or entering into skewed cross licenses) because of information asymmetry regarding the extent and value of the SEP portfolio of licensors;
- There are risks of unsolicited bundling of SEPs with non-SEPs in the absence of an unbundled offering;
- There are risks that access to SEP is made conditional to an exchange for the licensing of non-SEPs.



## 5 Improving the framework for IPR-based standardization

Taking the concerns that were identified in the previous chapter as the starting point, this chapter explores various policy routes that have the potential to alleviate these concerns. Over the last years, in response to the wide range of concerns as reported above, numerous solutions or measures have been suggested by stakeholders, either in SSO meetings, in the public domain, or otherwise. The range of these solutions is varied and the underlying problems of a particular solution are not always clear. In fact, some solutions seem to be related to multiple perceived problems, whereas some problems may be addressed by multiple solutions. **Table 5.1** aims to categorise both problems and solutions and their relations. The table is based on what we have learned from interviews conducted in the context of this study and from a material/literature review. Following the last chapter, we number the perceived problems as P1 to P10, and the proposed solutions from S1 to S16. While **Table 5.1** reports on what we call the primary solutions, some solutions also alleviate other problems, often indirectly. We discuss this in Annex IV. Whereas all items in this table will be clarified later in this section, a number of these have been selected for further analysis. If so, this is indicated by a section reference in **Table 5.1**.

Note, however, that the mere fact that a certain problem or solution is listed here does not necessarily mean that we endorse it. Nor does the table or the numbering suggest any ranking. Also note that any suggested solution is pertinent to a specific SSO/technological area of standardization to the extent (and only to the extent) that the underlying problem has occurred or is likely to occur.

**Table 5.1 Panoramic overview of reported problems and suggested solutions**

Reported problem or concern	Suggested solution(s)
P1.a Standards implementers are an actual or potential victim of patent hold-up and patent ambush.	<p>S1. Clarify FRAND conditions by developing principles on the determination of the royalty rate and royalty principles (§ 5.5);</p> <p>S2. Develop dispute resolution mechanisms or arbitration (e.g. in SSOs) as a potential attractive alternative to courts. (§5.4.);</p> <p>S3. Provide more transparency on actual SEP ownership (§5.2);</p> <p>S4. SSOs to state in more detail what the actual objectives are of their IPR policies;</p> <p>S5. Conduct SEP landscaping;</p> <p>S6. Rules defining the circumstances under which patent owners are allowed to seek (preliminary) injunctive relief or exclusion orders for infringements of SEPs;</p> <p>S7. Set rules under which licensors are required to provide a royalty or royalty schedule ('cash-only option') for licensing their SEPs in certain circumstances (e.g. in case of an actual dispute);</p> <p>S8. Creation of a database of royalty rates (anonymous) for benchmarking purposes.</p>

Reported problem or concern	Suggested solution(s)
P1.b IP owners are being disadvantaged in licensing negotiations (receiving too low payments) because of asymmetric buying power.	S1. Clarify FRAND conditions by developing principles on the determination of the royalty rate and royalty (§ 5.5); S2. Develop dispute resolution mechanisms or arbitration (e.g. in SSOs) as a potential attractive alternative to courts. (§5.4.); S8. Creation of a database of royalty rates (anonymous) for benchmarking purposes.
P2. Standards implementers and patent owners facing substantial transaction costs (not related to royalty stacking).	S3 (Increase transparency) (§5.2); S9. (Patent pools, §5.3).
P3. Implementers are being disadvantaged in licensing negotiations (making excess payments or entering into skewed cross-licenses) because of information asymmetry about the extent and value of the SEP portfolio of licensors.	S3 (Increase transparency) (§5.2); S9. Promoting the use of patent pools (§5.3).
P4. Risks of incidental or categorical discrimination (e.g. against parties that do not own SEPs).	S7. (Cash-only option).
P5. Risks of unsolicited bundling of SEPs with non-SEPs (with the exclusion of an unbundled offering).	S7. (Cash-only option).
P6. Risk that access to SEP is made conditional to the licensing of non-SEPs in return.	S7. (Cash-only option); S10. Clarifying the scope of the reciprocity element of FRAND.
P7. The cumulative payable royalties for SEPs is above reasonable levels or even prohibitive for implementing products ('Royalty stacking').	S9. (Patent pools, §5.3); S1. (Clarify FRAND, §5.5); S11. Promoting or mandating coordination mechanisms between licensors, such as ex-ante disclosure of the highest royalty rates or other mechanisms that moderate cumulative demand.
P8. Risk that after SEP transfer the new owner does not consider itself bound to earlier licensing commitment.	S12. Define or strengthen SSO rules that bind future owners of SEPs to existing commitments (§5.6); S13. Promote use of a License-of-Right system (§5.6); S14. Setting rules on notification of transfer of encumbered patents ('recordation') (§5.6).
P9. Risk that SEP commitments are no longer in force after bankruptcy proceedings of the owner.	S13 (License-of-right) (§5.6).
P10. Over-inclusion of patented technologies in standards because participants have strong incentives to include them.	S5 (Landscaping); S15. Providing more guidance and/or rules on whether or not including a patented technology in a standard is appropriate (§5.7).

While the proposed solutions by nature will have effects on stakeholders, we stress that many have not only positive effects for implementers (i.e. patent users) but also for patent holders - apart from the fact that many patent holders are patent users at the same time. Seeking a balanced view, in the following sections, we discuss all the above potential solutions to address these problems in terms of costs, benefits and requirements for implementation. We start by providing a brief overview of the suggested solution (Section 5.1) and continue by discussing the solutions more elaborately (Sections 5.2 to 5.7).

## 5.1 Overview of suggested solutions

Below, we provide a short description of all the suggested solutions. If a topic is more extensively covered in the subsequent sections, we confine ourselves to a shorter description and provide a reference to the section where a more extensive analysis can be found.

**S1. Royalty rate and royalty base principles.** This proposed solution entails the further development of principles for determining royalty rates and royalty bases that are compatible with the FRAND concept. Such principles can assist parties – including third parties such as judges and arbitrators – to assess whether or not an offer made by a licensor is compatible with FRAND. [This solution will be further explored in Section 5.5.](#)

**S2. Dispute resolution mechanisms.** This suggested solution entails the development of a dispute resolution or arbitration mechanism (e.g. in SSOs) for the time- and cost-efficient resolution of SEP disputes. The dispute resolution mechanisms should or could address the FRAND rate, validity, essentiality and infringement. [This solution will be further explored in Section 5.4.](#)

**S3. Increased transparency on SEPs.** This suggested solution concerns a series of measures that aim to provide more transparency on actual SEP ownership, which may, among other things, reduce search costs and also facilitate the construction of benchmarks (for instance for determining reasonable fees). A number of possible solutions [will be further explored in Section 5.2.](#)

**S4. Clarify SSO objectives.** This suggested solution entails further efforts by SSOs to make the actual objectives of their IPR policies more explicit. Some argue that ex-post evaluation of licensing proposals and of behaviour in SSO settings (e.g. was a patent disclosed, at which time, etc.) is often made difficult because the SSOs have been silent about what their policies were aiming to achieve in the first place. An extensive discussion on this topic can be found in Bekkers and Updegrove (2012)<sup>208</sup>.

**S5. Conduct SEP landscaping.** This suggested solution entails the execution of patent landscaping studies in order to create a better view on the technology position of firms in a particular technical area and possibly also some clarification of whether or not these firms own patented technologies that are likely to be essential to a standard (given the requirements that are set at the outset of the development of a standard - also called 'charter'). This allows for early visibility of relevant patents, which is said to be valuable for *selected standards in development* (for which uncertainty exists and/or problems are feared) and perhaps for *specific technology proposals* suggested for inclusion in a standard. Most typically it would be performed at the beginning of working groups on a specific standard or when a new release of a standard is planned. The extent

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<sup>208</sup> Bekkers, R., & Updegrove, A. (2012). A study of IPR policies and practices of a representative group of Standards Setting Organizations worldwide. Washington, DC: National Academies of Science. Available at [http://sites.nationalacademies.org/xpedito/groups/pgasite/documents/webpage/pqa\\_072197.pdf](http://sites.nationalacademies.org/xpedito/groups/pgasite/documents/webpage/pqa_072197.pdf).

to which results are made public may remain a choice of the SSO; e.g. results may be made available to the public at no costs or only to (paying) SSO members. Patent landscaping might be particularly useful for identifying potential SEP owners that are not an SSO member (and hence have no disclosure obligation). It allows these parties to be approached about their willingness to license at, for instance, FRAND conditions. Patent landscapes have also been mentioned as a means for early phase identification of patent owners that may be reluctant to commit to FRAND conditions (including 'patent trolls'). In that case, the SSO might decide to 'design around' (i.e. not to include) specific patented technologies where possible. For patent owners (SSO member or not), the advantage of landscaping is that it results in receiving earlier requests to license under FRAND conditions. Doing such (selected) landscaping in the context of an SSO allows for sharing the (often considerable) costs of such an effort among all parties that benefit from the increased knowledge, instead of each party incurring these expenses or performing no landscaping at all (or at a lower quality level). A particular concern that SSO participants may have regarding a (centralized) patent landscaping activity is that they can be charged with intentional infringement of a patent if that particular patent was referred to in the document of a patent landscape study they received. This is one of the reasons why some parties prefer such activities to be organized outside of the SSO.

**S6. Rules on injunctive relief.** This suggested solution deals with rules defining the circumstances (or principles) under which patent owners are allowed to seek (preliminary) injunctive relief or exclusion orders for infringements of SEPs - effectively forcing the potential licensee to withdraw all of its standards-based products from the market. The underlying argument for limiting the possibilities for seeking injunctive relief is that a SEP owner has already committed itself as willing to license its SEPs for monetary compensation. Yet, during licensing negotiations, it could use the threat of injunctive relief to obtain a higher royalty rate than it would otherwise be able to negotiate. Giving the patent holder the extra leverage of an injunction threat after a standard has been adopted allows it to extract excess rent. In the US, the *eBay v. MercExchange* case (2006) re-established the traditional 4-part 'equitable' test: injunctions are only considered appropriate when the following conditions are met: (i) there is irreparable harm; (ii) monetary damages are inadequate; (iii) it is warranted in view of the balance of hardships and (iv) it serves the public interest. As a result, SEP owners will find it much harder to obtain injunctive relief because, among other things, they have already committed themselves to licensing in the first place and, thus, (almost by definition) monetary damages should be adequate as a remedy. However, this 4-part 'equitable' test applies only to regular US courts and not to the Exclusion Orders by the US International Trade Commission (ITC),<sup>209</sup> nor to courts in other countries (including those in the EU). While injunctions on the basis of SEPs have been asked for in European national courts, the European Commission (DG Competition) has opened two formal investigations in 2012 against companies suspected of abusing a dominant position by seeking injunctive relief against competitors; one against Samsung and one against Google/Motorola Mobility. In late 2012 and mid-2013, the Commission issued Statements of Objections against Samsung and Google/Motorola Mobility over SEP abuse. Samsung subsequently decided to take several steps back in law cases it had instigated in Europe against implementing firms; among other things it gave up seeking preliminary injunctive relief.<sup>210</sup> In a preliminary conclusion against Google/Motorola Mobility in May 2013, the Commission found this firm in breach of European competition law by seeking and enforcing an injunction against Apple.<sup>211</sup> Most recently, in October 2013, the European Commission

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<sup>209</sup> Even though the ITC does have a "public interest test", it did issue an Exclusion Order on June 4 2013 against Apple on the basis of infringing SEPs (see <http://www.foSSpatents.com/2013/07/itc-ruling-on-samsung-complaint-puts-up.html>). <http://www.mwe.com/Obama-Administration-Disapproves-ITCs-Exclusion-Order-on-Apple-Products-08-07-2013/>.

<sup>210</sup> See FOSSPatents, 21 December 2012, European Commission issues Statement of Objections against Samsung over SEP abuse. [www.foSSpatents.com/2012/12/european-commission-issues-statement-of.html](http://www.foSSpatents.com/2012/12/european-commission-issues-statement-of.html).

<sup>211</sup> See The New York Times, Business Day Technology, May 6, 2013. E.U. Rules Against Patent Move by Google's Motorola Unit.

launched a public consultation on the Samsung commitments following from the above competition case. It spells some of the potential solutions to resolve this issue<sup>212</sup>.

In the US, President Obama subsequently vetoed an exclusion order of the ITC of June 4, 2013 against Apple.<sup>213</sup> In a German case between Huawei and ZTE, the court decided to refer to the Court of Justice of the European Union (CJEU) five fundamental questions concerning the availability of remedies (primarily, but not only injunctive relief) to holders of FRAND-pledged SEPs prevailing in patent infringement actions.<sup>214</sup>

**S7. Cash-only option.** This suggested solution entails rules that require licensors to provide royalty rates or a royalty schedule ('cash-only option') for licensing their SEPs, should licensees request this. It particularly addresses the situation in which the prospective licensee owns valuable non-SEPs to which the licensor would like to obtain access. As put by some of its promoters: *"the F/RAND dispute resolution process should require that the licensor specify a cash price for its SEPs as an alternative to other pricing arrangements to aid in evaluation of the proposed license terms by the third party. Determining if a complex package of cross-licenses satisfies F/RAND is difficult for a third party. If the licensee has the option to choose a F/RAND cash price, but instead chooses to cross-license, then clearly it is better off."* Another promoter argued: *"Licensees should have the option of licensing individual SEPs on a cash-only basis. This rule would prevent the owners of SEPs from demanding cross-licenses of non-SEP patents through coercive means. [...] Without the cash-only royalty option for licensees, owners of SEPs may be able to circumvent the purpose of a RAND commitment and exercise monopoly power through the acquisition of cross-licenses on non-SEPs at below-market rates. Companies that, however, want to enter into cross-licensing agreements as part of licensing SEPs should not be prohibited from doing so"*. Arguably, cash-only options can also be helpful when a licensor engages in unsolicited bundling of its SEPs with non-SEPs. In that case, a cash-only option makes it easier for a licensee to obtain access to the SEPs it needs, no more, no less. The 'cash-only' option was put forward in September 2012 as a recommendation by the US DoJ<sup>215</sup> and re-iterated by representatives from the same organisations at the ITU Roundtable on Patents events in late 2012.<sup>216</sup> It was also proposed as a desirable solution by Kai-Uwe Kühn, Fiona Scott Morton and Howard Shelanski,<sup>217</sup> key individuals at European and American competition authorities<sup>218</sup> and advised in a petition by the American Antitrust Institute (AAI).<sup>219</sup>

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<sup>212</sup> European Commission (2013). Press release IP/13/971 of 7/10/2013: Antitrust: Commission consults on commitments offered by Samsung Electronics regarding use of standard essential patents.

<sup>213</sup> See Note 209 check number, above.

<sup>214</sup> See <http://www.fosspatents.com/2013/03/german-court-refers-huawei-zte-standard.html>.

<sup>215</sup> See US Department of Justice (DOJ). (2012). Antitrust Policy in the Information Age: Protecting Innovation and Competition. Antitrust Policy in the Information Age: Protecting Innovation and Competition. Talk delivered by Joseph F. Wayland, Acting Assistant Attorney General Antitrust Division, at the Fordham Competition Law Institute, September 21, 2012.

<sup>216</sup> Hesse, Renata (Deputy Assistant Attorney General Antitrust Division, & U.S. Department of Justice). Six "Small" Proposals for SSOs Before Lunch. Remarks as Prepared for the ITU-T Patent Roundtable on October 10, 2012 Geneva. 2012.

<sup>217</sup> Kühn, K.-U., Scott Morton, F., & Shelanski, H. (2013). Standard Setting Organizations Can Help Solve the Standard Essential Patents Licensing Problem. CPI Antitrust Chronicle, March 2013 (Special Issue).

<sup>218</sup> The three authors are Chief Economist at DG Competition, European Commission; former Chief Economist, Antitrust Division, US Department of Justice, and Director, Bureau of Economics, Federal Trade Commission. The paper adds a disclaimer that the views expressed in their article are their personal views and do not necessarily reflect those of their employers.

<sup>219</sup> American Antitrust Institute. (2013). Request For Joint Enforcement Guidelines On The Patent Policies Of Standard Setting Organizations: Petition to the Department of Justice and Federal Trade Commission, issued May 23, 2013.

Some experts have argued that a cash-only requirement would not be compatible with SSOs that allow FRAND licenses to be conditional to reciprocity.<sup>220</sup> We do not support this view because the licensor would have the same right to desire a cash-only option from the other party. As such, both parties would be required to specify a cash price for licensing out their SEPs only.

**S8. Database on royalty rates.**<sup>221</sup> This suggested solution entails the creation of a database on actual royalty rates charged by (anonymous) SEP owners in bilateral contracts. Such a database allows for the development of benchmarks facilitating standards implementers to negotiate for new licensing agreements. Furthermore, such a database assists implementers and others (judges, arbiters, anti-trust authorities, researchers, etc.) to develop a good understanding of executed contracts and creating a benchmark to assess specific cases (for instance cases where proposed fees are argued not to be FRAND). This idea may present some difficulties that need to be addressed if it is to be implemented. Firstly, SEP owners may need to be encouraged to contribute data to such a database unless forced to do so. They are likely to emphasize the confidentiality of such agreements. Secondly, there is a need to provide a set of stylised information on the context of the (anonymous) transactions to allow interpreting the conditions of specific (anonymous) licensing deals and averages of multiple (anonymous) deals. This context information could include: is it a cross-license deal? What are other terms and conditions? What is the business model of the licensee, and that of the licensor? What are the served product markets, at which volumes and in which countries?

**S9. Promoting the use of patent pools.** Patent pools bundle the essential patents of all participating SEP owners, and make them available to any interested adopter of the standard in a simple, one-stop-shop licensing process. Not only do pools significantly reduce transaction costs compared to the alternative of bilateral licensing with all the patent owners in questions, but they also increase transparency, reduce uncertainty and create a level playing field.<sup>222</sup> Finally, pools may (but do not have to) result in a lower overall fee than the sum of the individual bilateral licensing fees. [This solution will be further explored in Section 5.3.](#)

**S10. Clarifying reciprocity element.** One of the more complex elements of licensing conditions is whether or not the licensee has the obligation to license its own patents back to the licensor and, if so, to which patents this applies and at what rate. Such conditions are generally known as reciprocity conditions. Since it is generally understood that a licensor cannot demand access to non-SEPs of the licensee (see also at Problem P5, above), reciprocity should normally be restricted to SEPs only. However, this still leaves a number of different situations: does this mean SEPs for the same standard or SEPs for *any* standard? Does it imply that if the licensor makes its SEPs available at RF conditions, it can also demand RF conditions from the licensee in return? And, if so, may the licensor only require bilateral reciprocity (i.e. the licensee must offer its own SEPs on RF conditions to the licensee) or may it also require that third parties benefit from it (i.e. the licensee must offer its own SEPs on RF conditions to any party that requests a license to implement the standard)? SSOs differ greatly in their reciprocity rules and quite a few are silent on reciprocity (or silent on some of its dimensions). A more detailed discussion is provided in Bekkers and Updegrave (2012), Section 6.1.10 in particular.<sup>223</sup>

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<sup>220</sup> Teece, D. J., Egan, E., Grindley, P., & Sherry, E. (Undated). Reasoning about Reasonable royalties: Evaluating Patent Licensing in Platform Based Industries. Retrieved from <http://businessinnovation.berkeley.edu/WilliamsonSeminar/teece012413.pdf>.

<sup>221</sup> For a similar idea approached from an SSO perspective see section 5.2.4.

<sup>222</sup> Because pools, on average, reach many more licensees than individual licensing programmes do, many more of the potential licensees are indeed having a license and do pay according to the same fee structure.

<sup>223</sup> Bekkers, R., & Updegrave, A. (2012). A study of IPR policies and practices of a representative group of Standards Setting Organizations worldwide. Washington, DC: National Academies of Science. Available at [http://sites.nationalacademies.org/xpedito/groups/pgasite/documents/webpage/pga\\_072197.pdf](http://sites.nationalacademies.org/xpedito/groups/pgasite/documents/webpage/pga_072197.pdf).

**S11. Promoting coordination mechanisms.** Prompted by concerns about hold-up and royalty stacking, a number of mechanisms have been proposed to coordinate licensing fees asked by individual right owners. Below we briefly summarized such mechanisms:

1. *Patent pools* are further discussed in Section 5.3 below;
2. *Voluntary SSO mechanisms for ex-ante disclosure of most restrictive licensing terms.* Here, SEP owners can publicly post the (most restrictive) licensing fee for including their technology in a standard. Despite having some appeal, and being implemented in several SSOs (including IEEE and, more lukewarm, in ETSI), voluntary ex-ante schemes have not proven to be very popular. Very few voluntary postings, if any, can be found. The commonly expressed concerns by SEP holders are that (i) this may work in one sector/SSO/culture but not in another and (ii) it is hard to set a proper fee at an early phase when no information is yet available on the attractiveness and the economics of the final standard and on the position of their own patents in the total set of patents. It has also been argued that ex-ante schemes can easily result in non-information: if asked to state ‘most restrictive’ terms, IPR holders may be conservative and publish fee rates that are much higher than they will charge in reality;
3. *Mandatory SSO mechanisms for ex-ante disclosure of most restrictive licensing terms.* While being fiercely opposed by some, at least one SSO (VITA) introduced such a policy. A study published by the US National Institute for Standards (NIST) concludes that many of the feared side-effects (including participants leaving the SSO) did not take place after the introduction of this policy and that, in a survey, the policy impact was judged quite positively by SSO members;<sup>224</sup>
4. *Voluntary multilateral initiatives to reduce licensing fee.* Over time, a number of companies took common initiatives to moderate the cumulative licensing fee for a standard in which they had an interest, usually by committing themselves to low or lower fees and asking others to do the same.<sup>225</sup> One of the best-known initiatives was that taken for 3G W-CDMA mobile telecommunications. In 2002, “industry leaders NTT DoCoMo, Ericsson, Nokia and Siemens and Japanese manufacturers” reached an understanding on an arrangement to “enable the cumulative royalty rate for W-CDMA to be at a modest single digit level.”<sup>226</sup> A Nokia press release specified that “[u]nder this proposal no manufacturer should pay more than 5% royalties covering all essential WCDMA patents from all patent holders.”<sup>227</sup> This attempt, however, did not seem to have much effect and several of the involved companies were later quite actively monetising their SEPs after all, demanding fees that do not reflect their original intention. Nevertheless, a similar initiative was taken for 4G LTE. In April 2008 a group of leading telecommunication companies committed themselves to a framework for “establishing predictable and more transparent maximum aggregate costs for licensing [patents] that relate to 3GPP Long Term Evolution and Service Architecture Evolution (LTE/SAE) standards.” In particular, these companies announced “support” for “a reasonable maximum aggregate royalty for LTE essential IPR in handsets is a single-digit percentage of the sales price.”<sup>228</sup>

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<sup>224</sup> Contreras, J. (2011). An Empirical Study of the Effects of Ex Ante Licensing Disclosure Policies on the Development of Voluntary Technical Standards. National Institute of Standards and Technology (NIST).

<sup>225</sup> For these attempts, also see Stasik (2010), op cit.

<sup>226</sup> NTT DoCoMo et al. (2002). Industry leaders NTT DoCoMo, Ericsson, Nokia and Siemens, and Japanese manufacturers reach a mutual understanding to support modest royalty rates for the W-CDMA technology worldwide (Press Release, 1 September 2002).

<sup>227</sup> Nokia Press Release (May 08, 2002) Nokia advocates industry-wide commitment to 5% cumulative IPR royalty for WCDMA.

<sup>228</sup> Ericsson Press Release, (April 14, 2008), Wireless Industry Leaders commit to framework for LTE technology IPR licensing, undersigned by Ericsson, Alcatel-Lucent, NEC Corporation, NextWave Wireless, Nokia, Nokia Siemens Networks, and Sony Ericsson.

An attempt of Next Generation Mobile Networks (NGMN) Alliance to use a confidential process in which each SEP owner would disclose its maximum fee did not result in the anticipated outcome either as it resulted in (what some called) misleading and unrealistic figures.<sup>229</sup> Voluntary posting of maximum rates by SEP owners has had the same problem,<sup>230</sup> the problem being that an “announced” royalty rate may be significantly different (read: higher) than the “actual” royalty rate resulting from a bi-lateral negotiation:

1. *Pseudo pool aggregate royalty cap.* One of the most original yet promising ideas was submitted by Jorge Contreras as a written contribution to the ITU Roundtable.<sup>231</sup> It proposes an approach to be adopted by SSO that includes some features from patent pools, while preserving the flexibility and broad activity scope required in the SSO setting. In short (and not doing justice to the depth of his analysis) Contreras argues that (1) assuming bilateral licensing processes, the likelihood for FRAND terms is highest if the negotiations are concluded before inclusion of technology in standard; (2) in practice, however, such licenses are almost invariably negotiated after this inclusion, for a variety of reasons, (3) this creates risks for hold-up prices and risks for royalty stacking and (4) a process is proposed that would alleviate such risks. In his proposal, parties participating in the SSO would at the outset agree upon an objective reasonable maximum fee level and a distribution/allocation mechanism for the individual right holders. Several adjusting mechanisms are then proposed for changes over time, including a mechanism that discourages parties from making over-declarations of essential IPR. While further thinking and development would be necessary before such a mechanism could be implemented, and competition authorities would have to weigh its pro-competitive aspects against possible antitrust concerns, Contreras’ proposal is certainly interesting. It indeed has the potential for simultaneously addressing the hold-up and royalty stacking problems.

**S12. Strengthen transfer rules.** This suggested solution entails proposals to define or strengthen SSO rules that bind future owners of SEPs to existing commitments. Implementing it directly at the level of SSO IPR Policies is expected to be more flexible and effective than the safeguard currently provided by competition authorities. [This solution will be further explored in Section 5.6.](#)

**S13. Use of License-of-Right system.** The license-of-right provision is part of several national patent systems (including those in Germany, the UK and France). It allows the patent owner to voluntarily commit itself to licensing its patent to any interested licensee at reasonable rates. One interesting aspect is that this license-of-right is inseparably linked to the patent in question for the entirety of its lifetime, regardless of ownership changes or bankruptcy of the patent owner. It is this specific feature of the license-of-right provision that attracted the attention of people that were looking for a solid way to ensure that a (FRAND) commitment would be inseparably linked to a SEP. [\(In Section 5.6 we will come back to the License-of-Rights\).](#)

**S14. Recordation of SEP transfer.** This suggested solution entails the creation of rules that the transfer of SEPs is being notified to some official body (such as the SSO at which disclosure was made) and that this information would be made public. [This solution will be further explored in Section 5.6.](#)

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<sup>229</sup> See Mallinson, K. (2011). Patent Licensing Fees Modest in Total Cost of Ownership for Cellular. IP finance (weblog). Retrieved from <http://ipfinance.blogspot.nl/2011/06/patent-licensing-fees-modest-in-total.html>.

<sup>230</sup> See Stasik, E. (2010). Royalty Rates and Licensing Strategies For Essential Patents on LTE (4G) Telecommunication Standards. Les Nouvelles, September 2010.

<sup>231</sup> Contreras, J. (2013). Rethinking Rand: SDO-Based Approaches To Patent Licensing Commitments. Submission to the ITU Patent Roundtable. Retrieved from [http://digitalcommons.wcl.american.edu/fac\\_works\\_papers](http://digitalcommons.wcl.american.edu/fac_works_papers).

**S15. Guidance on inclusion of patented technologies.** This suggested solution is about the introduction of guidance and/or rules on whether or not including a patented technology in a standard is appropriate. [This solution will be further explored in Section 5.7.](#)

## 5.2 Increasing the level of transparency

This suggested solution refers to a series of measures that aim to provide more transparency on essential patents. More specially, we refer to transparency in terms of the existence of essential patents, their (current) ownership, their patent status, their factual essentiality (for the eventual standard) and the conditions on which they are available for licensing. We also refer to transparency in terms of patent identity, which allows stakeholders to validate various aspects of the patent, as well as facilitating the construction of (value) benchmarks, among other things.

The transparency measures discussed in this section are:

1. defining update requirements & disclosure scope for SEP disclosures;
2. requiring precise information to substantiate essentiality;
3. routinely checking essentiality;
4. entering licensing information in SSO database;
5. limiting the use of blanket disclosures;
6. adopting a stricter disclosure regime;
7. notifying of transfer of SEP ownership by recordation;
8. increasing collaboration between SSOs and patent offices.

All of the suggested measures relate to the essential patent disclosure mechanisms that most SSOs have and that was discussed in Chapter 2. Some of these measures help to increase transparency *during* the standardisation efforts while others aim to increase transparency once the standard has been adopted and licences are negotiated, but most serve both at the same time. Each of the measures is discussed below.

### 5.2.1 Defining update requirements & disclosure scope for SEP disclosures

#### Introduction and outline of the proposed solution

As explained in Chapter 4 (section 4.2.1), there are various reasons why patents (or patent applications) may be essential at one time, but no longer essential at a later point in time. Furthermore, we explained that not all disclosed inventions are legally enforceable and/or that not every implementation that is based on a standard necessarily infringes each SEP for that standard.

In addition to these cases with 'truthful' declarations (at least at the time they were made), there is also the concern about untruthful declarations. Yet even if we leave these 'untruthful' declarations and ownership changes aside, the three categories mentioned in Section 4.2.1 (which are: 1. Disclosed SEP is no longer essential; 2. Disclosed SEP does not represent a legal right; and 3. Disclosed SEP is not infringed in all implementations of the standard) result in a significant inaccuracy in the database.

In the previous chapter we explained that the limited quality of the SSOs databases hinders a market player from gaining access to the necessary information needed to enter into licensing negotiations (or only if it bears considerable costs of landscaping).

The proposal is to create an update requirement for patent disclosures.

## Benefits and costs

The main benefits of this proposal are that more accurate information in SSO databases will reduce search costs for all stakeholders, implementers (i.e. patent users) and patent owners alike. It will provide better quality information during licensing negotiations, which benefits patent users in order to negotiate a fair price (preventing over-pricing) and benefits patent holders so that the overall SEP situation does not get inflated. Benevolent patent holders are better protected against the negative impact of malevolent patent holders that disclose many patent applications that never materialize into actual patents. Finally, the proposal facilitates the construction of better benchmarks to be used in case of disputes.

The costs of implementing update requirements mainly lie with SEP owners (that participate in an SSO in such a way that disclosure requirements are triggered). While the 'first' (early) disclosure would remain similar to the disclosure they have to make under current rules, the 'second' disclosure will invoke additional costs. Although the additional costs will depend to some degree on the exact implementation of such an update requirement (see below), we distinguish the following situations:

1. The final version of a standard gets published. At that point, all parties that made disclosures earlier on must examine this final version of the standard and compare it with its previously disclosed patents. Assuming that the patent owner kept its earlier notes about the relation between specific patent claims and the specific parts of the (older/draft) standard at the time of the first disclosure, then the update should be a modest exercise, taking a skilled person approximately a half day of work per patent, equalling a cost of roughly 300 Euro per patent. This is about one fourth of our estimate of the total costs per patent for the first instance essentiality test, which we conservatively estimated at 1 to 3 days of work (approx. 600-1800 Euro) per patent;
2. The status changes of a particular patent that was disclosed earlier (e.g. the patent was granted, rejected, etc.). In that case, the patent owner needs to re-examine the patent in question, particularly in terms of any changes in patent claims and compare it with the most recent version of the standard. Again, assuming that the patent owner kept its early notes, then the update should be a modest exercise, taking a skilled person approximately a half-day of work per patent, equalling a cost of roughly 300 Euro per patent. This is about one fourth of our estimate of the total costs per patent for the first instance essentiality test, which we conservatively estimated at 1 to 3 days of work (approx. 600-1800 Euro) per patent.

If we now assume that event (1) is triggered for 75% of all disclosed patents,<sup>232</sup> and that event (2) is triggered for 50% of all disclosed patents,<sup>233</sup> then the total average cost would be 375 Euro per disclosed patent; a total increase of 32% of the disclosure costs.

It should be stressed that while SEP owners are confronted with additional costs, they are also one of the beneficiaries of the change, as they will obtain access to more accurate information on all the other SEP owners, facilitating both the assessment of their own patents in the wider setting, as well as facilitating negotiations with parties for cross-licenses.

## Implementation

Disclosure updates can potentially solve the problems identified. Some SSO already address disclosures updates in their policies. At IETF, for instance, the executive director can ask a party that has previously made a disclosure to provide updated information, such as the issuance of an

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<sup>232</sup> Unfortunately, the first disclosure of essential patents is often still made after the standard is already finalized.

<sup>233</sup> Here we make a (conservative) assumption that 50% of first instance disclosures are patent applications, and 50% are granted patents).

applied patent, the publication of a previously unpublished patent application, or the abandonment of a patent. Note, however, that these update requests are triggered by the IETF and that it is not the responsibility of disclosers to make such updates on their own initiative (although revised disclosures may be submitted at any time). At ETSI, updating disclosure information is ‘encouraged’, but there is no requirement to do so and we have no information on how often parties actually update this data.<sup>234</sup>

However, to our knowledge, no SSO has an update rule that requires all SEP owners to update their disclosures at specified events; i.e., a mandatory update requirement. Such a mandatory update requirement would be new and its implementation details would need to be discussed and analysed. In its design and implementation, a balance should be sought between the achievement of the overall goal on the one hand (more transparency and the benefits of reduced time-to-market) and the expenses on the other hand.

Note that our above proposal is aimed at preventing over disclosure, by imposing an update obligation for patents that were disclosed at an earlier stage. It does not address under-disclosure in the sense that new patents may have become essential over time. An update requirement that would also address under-disclosure would invoke much higher costs since it basically requires all potential SEP owners to perform a patent search.

One of the design elements, to be considered when finding this balance, is *when* updates are necessary. A reasonable proposal might be: *“A requirement that SEP disclosures are updated in any of the following situations (1) when a final version of the standard is published, (2) when a patent application is granted, rejected, or abandoned, invalidated, lapsed (renewal fees not paid) or expired”*. In this way, there are clear triggers when updates are required and, at least for the first trigger, the SSO can check whether or not all known SEP holders have reacted properly to the trigger, as long as parties are required to inform the SSO and whether or not the final standard did not bring about any changes in terms of their earlier disclosures.

One could also consider having an update exception for those SEP owners that do not wish to monetize their patents (such an exception is discussed in Section 5.2.5, below). The disadvantages of such an exception, however, are such that the database would include both parts that are under the update requirements and parts that are not. We feel that this option would not be very desirable, even if there would be an indicator in the database that shows for each patent whether or not the update requirement exists.

## Summary

The table below summarises the idea.

**Table 5.2 Summary of “defining update requirements”**

Dimension	Comments
Potential benefits	<ul style="list-style-type: none"> <li>• More accurate information in SSO databases reduces search costs for all stakeholders, provides better quality information at the time licensing agreements are negotiated, improves time-to-market, and facilitates the construction of better benchmarks to be used in case of disputes;</li> <li>• Patent users benefit by being able to negotiate a fair price;</li> </ul>

<sup>234</sup> See Bekkers/Updegrave (2012) op cit. Section 5.4.4 in particular.

Dimension	Comments
	<ul style="list-style-type: none"> <li>Patent holders are protected against patent inflation (especially when this is used as a strategy by malevolent patent owners).</li> </ul>
Potential costs	<ul style="list-style-type: none"> <li>Some SEP holders, who have taken advantage of the current information asymmetry, might find it harder to get the same advantages out of licensing negotiations.</li> </ul>
Expenditure directly related to implementation of measure	<ul style="list-style-type: none"> <li>The costs associated with (specific) disclosure will increase by an estimated amount 375 Euro per disclosed patent, resulting in a total increase of 32% of the disclosure costs;</li> <li>The SSO needs to make start-up costs to adapt their database and front-end and it will cost (in terms of resources) to make the appropriate changes to the IPR policies.</li> </ul>
Disadvantages, possible risks or consequences	<ul style="list-style-type: none"> <li>Possibly, more stringent disclosure requirements discourage participation in SSOs or Working Groups;</li> <li>Possibly, SEP owners will not respect such update requirements;</li> <li>A question is whether/how to implement this with retroactive effect.</li> </ul>
Necessary or desirable conditions / Relation to other proposals	<ul style="list-style-type: none"> <li>This change should go hand in hand with a change on blanket disclosure rules, otherwise SEP owners might try to circumvent the costs of these updates by filing blankets instead.</li> </ul>

Response by stakeholders to the suggested policy solution confirms the aforementioned “Disadvantages, possible risks or consequences”:

- The additional costs imposed on patent holders could be excessively high and not result in any sizeable benefits;
- There is a risk that, even after this re-declaration, companies will still disagree about whether the patent is truly essential or if the patent is valid;
- Any system that relies on the participants to self-report IPRs and essentiality will never be reliable;
- We see some problems with enforcement as there is no real “punishment” for when an entry is found to be out of date at some point in time.

### 5.2.2 Requiring precise information to substantiate essentiality

#### Introduction and outline of the proposed solution

Many modern standards are extensive and contain hundreds, if not thousands, of pages of technical specification. There also may be many different versions of the standards’ text (a variety of draft versions, as well as different revisions of adopted standards). One particular difficulty that all stakeholders (except the patent holder itself) face is that it is very hard to validate and assess essential patent statements if it is not clear which patent claims are believed to be essential for an exact part of the specification in the standard.

While some SSO disclosure databases provide more information than others, none currently provides full information in this respect. Even the information on the (version of the) standard for which the patent is believed to be essential is often un-harmonized, inconsistent and confusing, if not missing altogether.

This proposal is to require parties to provide well-structured information as part of the patent disclosure so that the claimed essentiality can be validated or assessed by any interested party.

### Benefits and costs

The main benefit of this proposal is that any interested party can actually validate or assess whether or not a claimed patent is indeed essential. An indirect effect is that this solution can help to prevent over-disclosure. By requiring patent owners to disclose this precise information, they will be prompted to look carefully at their own essentiality assessment before disclosing and may be prevented from unjust SEP disclosures.

This empowers the implementers (patent users) in assessing whether or not a patent owner indeed owns SEPs and the extent and value of the SEP portfolio. It helps patent holders so that the overall SEP situation does not become inflated. Benevolent patent holders are better protected against malevolent patent holders that systematically over-disclose patents and demand a (non-trivial) fee to implementers, making it harder for real SEP owners to negotiate a fair price.

The main costs are that patent owners will need to generate and provide the required additional information. However, if a patent owner already uses a proper, good faith internal procedure to assess essentiality, this information should already be at its disposal. As a result, the additional costs would be low. We estimate additional administrative costs of such parties to be a half-day of work (approx. 300 Euro) per patent. For a party that does not yet follow a proper, good faith internal procedure to assess essentiality, the costs may be higher.

At the side of the SSO, costs would arise to adapt the submission mechanisms (nowadays mainly via a structured web form). These costs would depend on the actual implementation (see below). The most valuable implementation, however, would be one in which the identity of standards documents is harmonized and categorised and the web-based submission requires patent owners to select the document from a predefined list.

### Implementation

An important element in the proposal is that submitters indicate:

1. The exact claim or claims of the patent in question that are believed to be essential. (It is important that the right 'version' of the patent is referred to, e.g. patent application or granted patent);
2. The exact document of the standard for which the patent is believed to be essential (precise title, date);
3. The exact part of the specification (subsection, text phrase) of the standard for which the patent is believed to be essential (precise page and text phrase identification).

It is also highly preferable if the SSO uses a standard, predefined categorization for (2).

This solution integrates well with the updating solution presented above. In fact, they strengthen each other: not only are the disclosures at different points in time more informative, but they also reduce the relative costs for implementing either solution.<sup>235</sup>

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<sup>235</sup> When claim/standard data is systematically recorded for this proposal, the efforts to fulfil the update requirement will decrease.

## Summary

The table below summarises the idea.

**Table 5.3 Summary of “Requiring precise information to substantiate essentiality”**

Dimension	Comments
Potential benefits	<ul style="list-style-type: none"> <li>• More accurate information in SSO databases reduces search costs for all stakeholders, provides better quality information at the time licensing agreements are negotiated, improves time-to-market, and facilitates the construction of better benchmarks to be used in case of disputes;</li> <li>• Empowers the implementers (patent users) in assessing whether or not a patent owner indeed owns SEPs and the extent and value of its SEP portfolio;</li> <li>• Helps patent holders so that the overall SEP situation does not get inflated. Benevolent patent holders are better-protected against malevolent patent holders that systematically over-disclose patents and demand a (non-trivial) fee to implementers, making it harder for real SEP owners to negotiate a fair price.</li> </ul>
Potential costs	<ul style="list-style-type: none"> <li>• Some SEP holders, who have taken advantage of the current information asymmetry, might find it harder to get the same advantages out of licensing negotiations.</li> </ul>
Expenditure directly related to implementation of measure	<ul style="list-style-type: none"> <li>• The costs associated with (specific) disclosure will increase by an estimated amount 300 Euro per disclosed patent. If the ‘disclosure update’ proposal above is also implemented, the overall costs will decrease;</li> <li>• The SSO needs to make start-up costs to adapt their database and front-end and it will cost (in terms of resources) to make the appropriate changes to the IPR policies.</li> </ul>
Disadvantages, possible risks or consequences	<ul style="list-style-type: none"> <li>• Possibly, more stringent disclosure requirements discourage participation in SSOs or Working Groups;</li> <li>• Possibly, SEP owners will not respect such update requirements;</li> <li>• A question is whether/how to implement this with retroactive effect.</li> </ul>
Necessary or desirable conditions / Relation to other proposals	<ul style="list-style-type: none"> <li>• This change should go hand in hand with a change on blanket disclosure rules, otherwise SEP owners might try to circumvent the costs of these updates by filing blankets instead.</li> </ul>

No response by stakeholders.

### 5.2.3 Routinely checks of essentiality

#### Introduction and outline of the proposed solution

Almost all, SSO SEP disclosures are on the basis of self-assessment and little (if any) check currently exists on the quality of that assessment.<sup>236</sup> There is an inherent risk that a company

<sup>236</sup> While some SSOs will nowadays check the formal requirements and check for instance whether the patent numbers are correct (by consulting a patent register), no checks are performed on actual essentiality.

declares patents as SEPs while it knows – or should have known if it had spent reasonable efforts – that these patents are not essential.

While over-disclosure might be deliberate behaviour (and in some court cases the question was asked whether or not such parties acted in ‘good faith’) it is important to stress that it is often the result of other incentives at work. On the one hand, there are strong incentives against under-disclosure: a failure to do so could result in patents that can no longer be successfully monetized or litigated and patent owners who might be accused of not respecting the SSO IPR rules. On the other hand, there are only weak incentives not to disclose a particular patent. As a result, companies might prefer to stay ‘on the safe side’ and disclose something as essential when in doubt. The exact wording of the IPR policy is not specific – usually requiring disclosure for patents that ‘*May be or May become*’ essential (ETSI), ‘*Cover or May cover*’ (IETF), ‘*May contain*’, ‘*Might become*’ (OASIS), ‘*Potentially essential*’ (IEEE)<sup>237</sup> – and seems to suggest that over-disclosure is less a breach of policy than under-disclosure.

In Chapter 5, we mentioned that several studies concluded that only 20%, 27% and 28% of patent families declared ‘essential’ were actually essential<sup>238</sup> and that this result was generally confirmed during interviews. According to informal talks with many insiders, this percentage might in fact be closer to 50%. Over-claiming seems to be a quite pertinent phenomenon.

If every SEP owner would have the same rate of over-disclosure, the actual consequences for the market may be small. However, this is not always the case and biased (or asymmetric) information may have negative consequences. This is especially so when:

- Specific patent owners conduct a much higher degree of over-claiming than others. If their licensing fees are largely based on the number of (claimed) essential patents, they receive a higher fee than they should. (The reader is referred to the Nokia/Interdigital case in the UK, where the judge found an overwhelming majority of Interdigital’s claimed essential patents not to be essential)<sup>239</sup>;
- Newcomers to the SEP scene disclose patents that in fact are not essential, thereby unnecessarily fragmenting the landscape.

Furthermore, court cases on SEP infringement show that in quite some instances, the essential patents were judged not to be infringements. This is an indication that quite a few declared SEPs are not in fact essential.<sup>240</sup> This signal is even more worrisome if you consider that for a court case, a patent owner will choose not just an average selection of SEPs, but its ‘best’ SEPs (of which it believes essentiality/infringement and validity are not at risk).

Aiming to increase the accuracy of SEP databases, the proposal is to introduce routinely executed essentiality check on submitted disclosures. Such a system would provide a counterbalance to the

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<sup>237</sup> See Bekkersbekkers & Updegrave (2012), op cit., Section 5.2.1 for a detailed discussion of the working of such obligations.

<sup>238</sup> These numbers are respectively reported in Goodman, D. J., & Myers, R. A. (2005). 3G Cellular standards and patents. Proceedings from 2005 IEEE Wireless Communications and Networking Conference. Fairfield Resources Intl. (2007), Analysis of Patents Declared as Essential to GSM as of June 6, 2007; Fairfield Resources Intl. (2008) Review of Patents Declared as Essential to WDCMA Through December, 2008. Other studies include Fairfield Resources International. (2010). Review of Patents Declared as Essential to LTE and SAE (4G Wireless Standards) Through June 30, 2009.

<sup>239</sup> See Bill Ray, The Register (2009). Judge rules for the Finns in Nokia/InterDigital spat - Verdict could trigger InterDigital licence apocalypse.

<sup>240</sup> In general, a judge in such a case will only determine whether a particular patent is infringed by a specific product. As a part of answering that question, he *might* consider the question whether the patent is essential to the standard, but then he also needs to assess whether the alleged infringing product does indeed implement that particular part of the standard.

strong incentives for over-disclosure, while arguable having less side effects on the degree of under-disclosure.

For the remainder of this section, the above idea is now phrased as follows: “SSOs performing a routinely executed essentiality check on received SEP disclosures”.

### Benefits and costs

Similar to the above two solutions, the essentiality check proposal helps implementers to negotiate a fair price, as well as helping patent owners to negotiate a fair price that otherwise could be negatively affected by SEP inflation, especially if due to malevolent patent owners who strategically over disclose.

The costs of an essentiality check of a given patent for a given standard strongly depends on the desired confidence level and the availability of prior information (for instance from the patent owner). This confidence level relates to the ‘quality’ of the assessment: how likely is the outcome identical to the hypothetical ‘perfect’ assessment? With increasing standards for the confidence levels, the costs grow quickly, as illustrated below. An ‘optimum’ confidence level is not necessarily the perfect one, but one for which the costs are legitimate in terms of the goal that one tries to achieve. The goal in the context of this solution is to prevent a high degree of over disclosure (and not necessarily a perfect decision for each individual patent).

We estimate the following broad range of costs associated with essentiality tests at different confidence levels:

1. Approx. 600-1,800 Euro per patent (1-3 days of work) for a first instance essentiality test performed by the SSO internally, with the confidence level appropriate for patent disclosure obligations at an SSO. (The level is often lower, as a patent in the same patent family will need fewer individual resources and because firms may possess previous information on their patents)<sup>241</sup>;
2. Approx. 5,000-15,000 Euro per patent for an essentiality test performed by a third party in the context of a patent pool. The lower boundary fee assumes that prior information from the patent owner is available and only up to three patent claims (selected by the owner) are tested; and
3. Approx. >20,000 Euro per patent for an extensive essentiality and/or infringement test in the context of a court case, including extensive search for technologies that may constitute alternative solutions.

In the context of an essentiality test in an SSO, one would like to have a justifiable balance between the objective of this activity, on the one hand, and its costs, on the other. The objective here is to reduce gross over-claiming of SEPs (with a significantly biased database as a result) and not to come to a ‘perfect’ assessment of each individual patent. In that light, a confidence level between (i) and (ii) would seem appropriate, resulting in an estimated cost of 3,000-4,000 Euro per patent. This confidence level is an improvement over the current self-reporting mechanism (and makes sure that every patent is tested against the same standard, independent of its owner or the strategy of this owner). It does not result in excessive costs. (This is comparable to the light-touch essentiality review offered by the DVB forum to its members.<sup>242</sup>)

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<sup>241</sup> Some might be deliberately applied for in the hope they will be essential. See, Kang, B., & Bekkers, R. (2013). Just-in-time inventions and the development of standards: How firms use opportunistic strategies to obtain standard-essential patents (SEPs). ECIS working paper 13.1. Available at [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2284024](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2284024).

<sup>242</sup> See <http://www.dvb.org/members/iprpolicy> at category E.

## Implementation

Routine checks of essentiality are already used in patent pools.<sup>243</sup> The idea of having routine essentiality checks in SSOs can learn from the experiences in patent pools. One of these lessons is that essentiality tests are both more affordable and more accurate if the owner of the patent already provides an indication of the exact part of the standard for which the patent is deemed essential, and for which patent claims this is the case. In fact, some pools have this as a requirement.<sup>244</sup> We would also like to stress the differences of the proposed measure with existing essentiality checks in pools. Most importantly, the required confidence level is lower than the one required for a pool. As a result, the required resources (and costs), on a per-patent basis, will be lower than the costs currently experienced by pool members.

An important consideration is when these essentiality tests are to take place. One possibility is at the time of submission. The advantage of this would be that 'bias' is already removed at an early stage. The disadvantage would be that both the standard and the patent (application) may change at a later point in time. As a result, a second test might be desired (possibly linked to the update requirement, if implemented), with the effect of raising the costs. Another possibility is to perform the essentiality tests solely at the time of the adoption of the standard.

One main design parameter is who is paying for these essentiality checks. One could think of different scenarios here:

1. The costs are charged to the submitting company. This will probably make these organisations become more careful about what they disclose, which is mostly a welcome development. On the other hand, it may also 'hit too hard' and lead to under-disclosure when firms refrain from disclosing patents that are actually essential. Moreover, if costs are passed on to the patent owner, another risk is such that a test could result in lower willingness to participate in SSOs or working groups (in order to 'escape' the disclosure trigger) or in SEPs not being disclosed;
2. The costs are charged to the users of the database. In this case, these users (implementers, prospective implementers, judges, competition authorities, consultants, researchers and other members of the public) would pay in order to resolve a part of the information symmetry. This solution, however, is at odds with the goals to make this information publicly available with the lowest possible threshold and thereby to promote adoption of the standard and to empower 'weaker' parties;
3. The costs are passed on to the overall budget of the SSO, or possibly to SSO members participating in a particular working group;
4. The costs are subsidized by a public fund. This would be perceivable in an SSO that is publicly co-financed (or that receives mandates from governmental organisations), but less perceivable in those that are not.

A specific concern that may arise here is whether or not the effects on behaviour of small- and medium-sized enterprises (SMEs) are different from those on larger firms. If so, this calls for specific policy attention.

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<sup>243</sup> This is because competition/antitrust authorities have made it clear that such pools should only include complementary patents, not substitute patents. By ensuring all patents in the pool are essential, this condition is by definition satisfied.

<sup>244</sup> For an extensive discussion of designing an essentiality evaluation process for a patent pool, including this particular element, see Goldstein, L. M., & Kearsey, B. N. (2004). *Technology Patent Licensing: An International Reference on 21st Century Patent Licensing, Patent Pools and Patent Platforms*. Aspatore. The reader is specifically referred to Chapter 2 ("The determination of essentiality") and to Annex 1 ("Application Form: A request for essentiality evaluation of a granted 3G patent"), which includes all the forms for the required information the patent owner needs to provide.

Another issue to consider is the question of who carries out the essentiality test. Patent pools have built experience in this field, and it is often believed that it is preferable to hire an external party that can carry out such tests at a high quality and a competitive rate, involving credible experts. Yet what happens if the patent owner of another party disputes the outcome of the essentiality check? Many pools have mechanisms in which the patent owner can challenge the outcome of an (negative) essentiality assessment.<sup>245</sup>

Finally, one could consider whether an essentiality test should also include a test on validity. We believe, however, that this is more a responsibility of the patent office and that it would be unwise to replicate such a test in the SSO context. It requires very specific knowledge and training to assess whether a patent meets the necessary criteria (including novelty and non-obviousness). In addition, it would raise tough questions in the event that a patent office actually issues a patent, while an SSO declares that it should be considered as 'invalid'. We believe it is better if the SSO just accepts the assumption of validity if the patent is actually granted and leave judgement on validity to patent offices and, if necessary, courts.

## Summary

The table below summarises the idea.

**Table 5.4 Summary of “routinely check of essentiality”**

Potential benefits	<ul style="list-style-type: none"> <li>• More accurate information in SSO databases will reduce search costs for all stakeholders, provide better quality information at the time that licensing agreements are negotiated and facilitate the construction of better benchmarks to be used in case of disputes;</li> <li>• Helps implementers to negotiate a fair price;</li> <li>• Helps patent owners to negotiate a fair price which otherwise could be negatively affected by SEP inflation, especially when malevolent patent owners strategically over-disclose;</li> <li>• As an indirect effect, firms might become more selective in submitting 'potentially essential' or 'probably not essential' patents, especially if they need to fund the testing themselves.</li> </ul>
Potential costs	<ul style="list-style-type: none"> <li>• Some SEP holders, who have taken advantage of the current information asymmetry, might find it harder to get the same advantages out of licensing negotiations.</li> </ul>
Expenditure directly related to implementation of measure	<ul style="list-style-type: none"> <li>• Estimated at approx. 3,000-4,000 Euro per submitted patent (note: the total number of disclosed patents may decrease as a result of this measure).</li> </ul>
Disadvantages, possible risks or consequences	<ul style="list-style-type: none"> <li>• Insofar as the costs of essentiality testing are passed on to the submitter, SEP owners might be less willing to disclose, even if the patents are really essential (resulting in under-disclosure);</li> <li>• Insofar as the costs of essentiality testing are passed on to the submitter, SEP owners might be less willing to participate in SSOs and/or working groups;</li> </ul>

<sup>245</sup> See Goldstein, L. M., & Kearsley, B. N. (2004), op cit., in particular page 118-119 and Appendix 1.

	<ul style="list-style-type: none"> <li>• Possibly all the above effects are stronger for SMEs.</li> </ul>
Necessary or desirable conditions / Relation to other proposals	<ul style="list-style-type: none"> <li>• It would be desirable if the SEP owner also provides information on the relevant paragraph/release of standard as input to assessment procedure (this makes the essentiality test more effective and of higher quality);</li> <li>• It would be desirable – or perhaps even necessary – if blanket disclosures were not allowed (see 5.2.4) because otherwise the patents under these claims would escape from this essentiality test.</li> </ul>

No response by stakeholders

#### 5.2.4 Entering licensing information in SSO database

##### Introduction and outline of the proposed solution

In Section 5.1, at Solution S11, we have already discussed voluntary ex-ante disclosure of most restrictive licensing terms, as well as several other attempts to have SEP owners signal their maximum rates. All of these attempts seem to have had little effect.

The central idea for this section is to see whether or not it would be possible to add other types of licensing information to SSO databases that would empower prospective licensees to ensure they receive FRAND offerings. The right for licensees to be treated in a non-discriminatory way is already ensured in the “non-discriminatory” leg of FRAND, yet the lack of insight a (prospective) licensee has into what others are paying (and what other conditions are agreed upon) is very limited. In fact, the “non-discriminatory” leg of FRAND has some similarities with the Most Favourite Nation (MFN) concept as known from international economic relations and international politics. The difference between the two frameworks is that within MFN, information is available on the treatment of other countries, which argues in favour of the implementation of MFN over FRAND. In a FRAND law case, the judge might order the SEP owner to produce information on licensing contracts with other licensees. However, if done in this manner, this information is generally treated as confidential within the case and will not become public.

Ideally, SSO IPR databases would be complemented with meaningful (yet possibly anonymous) statements on SEP licensing bracket figures for 5-15 parameters, to ensure that the data can be properly interpreted (and compared, if necessary).

Below, we propose three (conceptual) proposals that can add licensing information to SSO databases:

1. In a ‘licensee-helps-licensee’ approach, a party that has entered in a (non-cross) licensing agreement with a SEP owner can anonymously list the (cash) price it is paying for the license. This information could be added to the SSO IPR database, perhaps in a direct form or an aggregated form. Conditions for this to be successful are such that: (1) the SEP owner does not prevent the licensee from making public the high-level parameters of its licensing contract (a compromise here might be to have SEP owners agree that they will not oppose such claims as

long as they are anonymous<sup>246</sup>) and (2) the information contains enough insight into other relevant key parameters to ensure that apples can be compared with apples;

2. In an approach that is derived from the ex-ante approach yet inspired by the MFN principle, SEP owners could be required to publish the 'most attractive awarded cash price' in the SSO IPR database. In several aspects this proposal would differ from the 'regular' voluntary ex-ante approach: (i) this requirement would only come into force once the standard has been finalized. (In other words, this proposal would give up the very early timing that is sought by ex-ante proposals that aim to inform decisions about technology inclusion. Thus, it addresses concerns of SEP owners that they are not able to quote a price before it is revealed how their own included IPR compares to the final standard. In other words, a price cannot be quoted before it is first known how the final standard will take shape); (ii) the SEP owner would need to update this posting if it awards a more attractive price to a later licensee; (iii) the posting should include relevant parameters such as whether the price also include non-SEPs or other SEPs and (iv) the posting of the price is a requirement;
3. Licensing revenue information is collected from secondary information sources (e.g. data received by tax authorities) and then processed in such a way that it becomes informative in terms of individual standards. This processing is a clear challenge – in the hypothetical case of a small company owning only one patent, which is also a SEP, this might be very easy. While in the case of multinational firms active in many product areas, this might be very hard.

### Benefits and costs

The main benefits of any of the three above proposals are that (prospective) licensees would be empowered and are offered the information to make use of the non-discriminatory commitment that FRAND includes. Right now they must often second-guess what other (similar-positioned) licensees get as a deal. Even if licensors during negotiations insist that they receive a treatment that is certainly not worse than that of other licensees, how can they be confident this is true? Especially when SEP owners are in a process of changing business mode, for instance to a more royalty-driven revenue model, insight in previously agreed fees is essential for a prospective licensee.

In turn, patent owners benefit from this solution by having much better information on what other patent owners demand for their intellectual property. This may especially benefit SME SEP owners, who may find it hard to set an appropriate fee for their own SEPs in absence of good benchmarks or comparison points.

The administrative costs for this proposal are relatively modest, both for SEP owners as well as for SSOs. The indirect costs for SEP owners could be that they would lose some of the 'flexibility' that currently enjoy (although it might be argued that much of that flexibility is not FRAND compatible anyway).

A risk associated with proposals (1) and (2) might be that it could also strengthen the position of a SEP owner that already managed to secure 'above FRAND' rates from several licensees in the past ('We already have more than a dozen licensees that agreed to pay x, so that must mean our rates are FRAND').

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<sup>246</sup> I.e. the name of the licensee is not revealed. Obviously the name of the licensor needs to be revealed otherwise the entire proposal will not work.

## Implementation

the proposed ideas are of a conceptual nature at this point, so we will not discuss implementation issues. To our best knowledge, no SSO has required anything like our three proposals, though it is noted that VITA has a mandatory ex-ante disclosure process.

## Summary

The table below summarises the idea.

**Table 5.5 Summary of “entering licensing information in SSO database”**

Table 5.5 Summary of “entering licensing information in SSO database”	
Potential benefits	<ul style="list-style-type: none"> <li>• Empowers licensees to challenge discriminatory licensing proposals;</li> <li>• Patent owners, in turn, benefit from this solution by having much better information on what other patent owners demand for their intellectual property. This may especially benefit SME SEP owners, who may find it hard to set an appropriate fee for their own SEPs in absence of good benchmarks or comparison points;</li> <li>• Increases overall transparency and knowledge on royalty rates, which can benefit implementers, patent owners, judges and competition authorities.</li> </ul>
Potential costs	<ul style="list-style-type: none"> <li>• SEP owners might lose some of the ‘flexibility’ that they currently enjoy (although it might be argued that much of that flexibility is not FRAND compatible anyway).</li> </ul>
Expenditure directly related to implementation of measure	<ul style="list-style-type: none"> <li>• [Modest].</li> </ul>
Disadvantages, possible risks or consequences	<ul style="list-style-type: none"> <li>• Perhaps the proposals might also unintentional strengthen the position of a SEP owner that already managed to secure ‘above FRAND’ rates from several licensees in the past;</li> <li>• If licensing agreements are not standardised, it is difficult to compare them. If this is not done carefully, it could result in even more litigation.</li> </ul>
Necessary or desirable conditions / Relation to other proposals	<ul style="list-style-type: none"> <li>• [None].</li> </ul>

Response by stakeholders to the suggested policy solution confirms the aforementioned “Disadvantages, possible risks or consequences”:

- In theory, it could be helpful for standards developers and implementers to understand potential licensing terms and help SSO members to make an informed decision about alternative technologies at the time the standard is set and provide a benchmark to help licensors and licensees to agree to terms that are FRAND;
- In practice, it ignores the complex marketplace realities and how real-life licensing is done. It is usually very hard to compare several licensing agreements due to their differences. So a publication bears the high risk of a “wrong impression” and could even result in more litigation;
- In telecommunications, these proposals benefits NPEs only because almost all licenses between practicing entities have a cross-license. [Added by the authors: this argument is not

fully valid because not all cross-license deals are balanced, hence there remains a cash component in the transaction which is affected by a lack of transparency];

- The third proposal is difficult to implement because of the limited availability of the right information.<sup>247</sup>

### 5.2.5 Limiting the use of blanket disclosures

#### Description of idea

A blanket disclosure is a specific type of disclosure, in which the submitter declares that it believes that it owns one or more patents that may end up being essential to a specified standard, but it does not identify specific patent identities. Hence, the company could own one single patent, but possibly also a vast portfolio of patents that end up being essential. Some SSOs allow blanket disclosures, others do not, as shown in Table 5.6. Those SSOs that allow it, often leave the choice to the submitter whether to make blanket disclosures or to make specific disclosures (those in which the individual patents are specified). Sometimes making blanket disclosure is only allowed after certain conditions have been met.<sup>248</sup>

**Table 5.6 Examples of SSOs that allow or do not allow blanket disclosures<sup>249</sup>**

SSOs that allow blanket disclosures.	ATIS, IEC, IEEE, ISO, ITU, TIA
SSOs that do not allow blanket disclosures.	ETSI, OASIS, VITA, IETF <sup>250</sup>

As we have seen in the previous chapter (section 4.2.2), blanket disclosures are a frequent phenomenon. We concluded that the share of blankets is no less than 60% of all disclosure events (Figure 4.5b). Furthermore, we indicated that (although the prevalence of blankets will differ between technology areas), there is a fair overlap of technology areas between SSOs and, as a result, almost all technology areas are affected by companies making blanket claims, as shown in **Table 4.1**.

Blanket disclosures mask a very significant part of public knowledge on the existence and ownership of SEPs. Arguably, they are the largest single factor that prohibit a good overall understanding of SEP existence and ownership.

Blanket disclosures provide several advantages for holders of essential IPR. They prevent firms from incurring costs associated with specific disclosures. It has been argued that, particularly for firms with large IPR portfolios, such costs would be both very high and recurring and hence are the

<sup>247</sup> (e.g. licensing revenue is not always reported separately in annual reports etc.); moreover, it is difficult to determine cross-license value and other facts relevant to calculating individual rates.

<sup>248</sup> At IETF, for instance, blanket disclosures are only allowed if the owner also commits to licensing its patents on RAND-RF terms. At ITU, blanket disclosures are allowed only as far as the related licensing declaration does not contain a refusal to offer licenses to patents that end up being essential on either a FRAND or FRAND-RF basis (In the Patent Statement and Licensing Declaration for ITU-T or ITU-R Recommendation, option '3' reads as follows: "The Patent Holder is unwilling to grant licenses in accordance with provisions of either 1 or 2 above. In this case, the following information must be provided to ITU [...] as part of this declaration: granted patent number or patent application number (if pending); an indication of which portions of the above document are affected; and a description of the Patents covering the above document.").

<sup>249</sup> Based on Bekkers, R., & Updegrove, A. (2012). Op cit., Section 5.4.1 in particular.

<sup>250</sup> Unless a SEP owner makes a Royalty Free licensing commitment. In that case, a blanket disclosure is allowed.

main reason for not making specific disclosures. Some of these companies do not routinely, proactively seek to monetize their standard-essential patents, so making specific disclosure represents a sunk cost, as opposed to companies who do monetize their standard-essential patents where it can be argued that identifying their SEPs is an investment. There have been concerns raised about forcing costs on the first group of companies (sometimes referred to as “sleeping dogs”) as this may cause them to proactively seek licensing revenues to offset their costs associated with making specific disclosures. At the same time, the above costs have to be further assessed in light of the fact that SEP owners may benefit significantly from owning essential patents, regardless of whether or not they actually have licensing revenue strategies<sup>251</sup>.

At the same time, blanket disclosures have a number of disadvantages associated with them. Blanket disclosures can, in effect, shift search costs to other parties such as prospective implementers, Working Group members (if they require such information for designing around) or other stakeholders (to the extent that a SEP holder may proactively seek royalty-bearing licenses from implementers), supposing that the stakeholders decide to incur such costs. At the side of the patent owner, blanket disclosures may also reduce legal risks that might be associated with under-disclosure (see above). Shifting the search costs and/or creating information asymmetry concerning the exact magnitude and content of an essential IPR portfolio potentially provides other advantages for patent holders. For example, when seeking licenses or cross-licenses, lack of transparency about their portfolio might allow them to negotiate more advantageous deals than if they provided specific disclosures, especially if the negotiation partner has fewer resources or less knowledge to determine the actual value of their portfolio.

An overview of the pros and cons of blanket disclosures, taking the various stakeholders into account, is provided in **Table 5.7**.

**Table 5.7 Pros and cons of blanket disclosures**

	Pros of blanket disclosures	Cons of blanket disclosures
IPR owners	<ul style="list-style-type: none"> <li>• Lower costs associated with disclosure procedure, especially firms with large portfolios and/or participation in many standards;</li> <li>• Benefits from information asymmetry, especially in cross licenses with smaller IPR owners;</li> <li>• Harder (for others) to create benchmarks that are needed in FRAND disputes.</li> </ul>	<ul style="list-style-type: none"> <li>• Making it hard for an adopter to set its own optimal price;</li> <li>• Reduced understanding of SEP ownership of other patent holders.</li> </ul>
Working groups, standardization participants	An arguably higher willingness of IPR owners to participate and contribute, resulting in a better standard (=1).	Search costs are shifted to these parties (=2). Reduced understanding of SEP ownership (=3). Fewer opportunities to make informed decisions or to design around.
Actual or prospective implementers	As (1). Arguably might prevent the waking up of ‘sleeping dogs’: firms that now do not monetize their SEPS but will start	As (2, 3). Asymmetric information, possibly leading to higher prices for access to technologies, higher legal and commercial

<sup>251</sup> For an indication of such benefits please see page 161 (or 159).

	Pros of blanket disclosures	Cons of blanket disclosures
	doing so when facing costs associated with making specific disclosures.	uncertainty, and less opportunities to challenge what are believed to be unreasonable licensing demands; Harder to create benchmarks that are needed in FRAND disputes.
Policy makers, public authorities	As (1).	As (2, 3). Harder to assess and remediate anticompetitive behaviour.
Judges and juries	As (1).	As (2, 3). Harder to assess and remediate anticompetitive behaviour.

With the search costs being put forward as such a central issue in the defence of blanket disclosures, we investigated the data on blanket disclosures to see whether or not it was really the search costs that prevents companies from making specific disclosures. A description of our analyses can be found in Annex III; here we will just summarize the findings. Contrasting with firms that argue that search costs prevent them from making specific disclosures; our data shows that even when firms are free to choose, **the larger the patent portfolio of a firm for a given standard, the less likely it is to submit a blanket disclosures**. It is true, however, that firms that are active in many different standards at the same time, are more likely to submit blanket disclosures, all other things being equal. So what, then, are the actual reasons underlying the choice for blankets instead of specific claims? Hypothesizing that information asymmetry can be in the advantage of the patent owner, we considered the overall value of the relevant patent portfolios of SEP owners for specific standards and found that **the higher the value of the relevant patent portfolio or an organization for a standard, the less likely it is that that organization submits a blanket disclosure**. Summarizing, the determinants of blanket submission behaviour seem to have more to do with covering up low quality patent portfolios than with the supposed problem of the associated search costs.

### Costs and benefits

Abandoning blankets does, however, come at a price: IPR holders that are currently using such blankets would have to invest more effort to identify and specify their essential patents. The costs of searching through a patent portfolio and determining that patents are (likely to be) essential for a given standard or proposal for a standard will vary on the quality of the assessment. Estimates of various costs for different types of essentiality assessments have already been shown in Section 5.2.3. For blanket disclosures, the category (i) would be most appropriate, with costs per patent estimated at 600-1,800 Euro per patent (1-3 days of work) for the SEP owner.

It is difficult to estimate how many additional patents would require analysis if blanket disclosures were not allowed. The main reason for this is that we have no insight into the actual patent portfolios that underlie the current blanket claims. However, by making a number of reasonable assumptions, an estimate is possible. These assumptions are:

- Assumption 1: Blanket disclosure events are similar to specific disclosure events in terms of underlying patents, which means that many events comprise one or a few patents; some comprise hundreds of patents;
- Assumption 2: Parties that currently make blanket disclosures do properly follow the IPR rules, meaning that they must have searched their patent portfolio and already have determined that at least some of their patents are essential to the standard (although they may have stopped searching further at some point);

- Assumption 3: These firms that do eventually require licenses for their patents (revenue-bearing licenses or cross-licenses), will need to have assessed their SEPs by the time the first licensing process begins.

Taking the above into account, and considering that around 60% of all disclosure events in the main SSOs are currently blanket disclosure events, we estimate that *introducing a mandatory specific disclosure obligation will increase the overall costs associated with disclosure for all SEP owners to increase by about one fourth (25%).*<sup>252</sup> These additional costs are of course not evenly distributed over SEP owners. Those that currently make most use of blanket disclosures are likely the ones incurring higher future costs compared to those that already make specific disclosures. Here, it is interesting to consider how many firms fall into these categories. This is shown in **Table 5.8** for those 8 SSOs in our analysis that currently allow blanket disclosures. Around 26% of the firms predominantly make blanket disclosures (i.e. blanket declarations account for more than 80% of the total disclosures made by that firm). The remaining 74% of firms usually makes specific disclosures or does both.

Another interesting finding from this table is that relatively few firms seem to be categorically against making specific disclosures: 66% of the firms regularly make specific disclosures and another 8% makes almost exclusively specific disclosures. This is quite high, given that it is a voluntary choice; the policies in the 8 SSOs considered do not require firms to do so.

**Table 5.8 Disclosure events at the eight selected SSOs by three types of firm events (only for selected SSOs)**

SSO	Firms that predominantly make specific disclosures		Firms that predominantly make blanket disclosures		Hybrid firms		Total
	Freq.	%	Freq.	%	Freq.	%	Total
ATIS	7	11.3%	14	22.6%	41	66.1%	62
IEC	14	14.4%	28	28.9%	55	56.7%	97
IEC-JTC1	27	16.1%	53	31.5%	88	52.4%	168
IEEE	23	4.9%	139	29.6%	307	65.5%	469
IETF	20	10.4%	18	9.3%	155	80.3%	193
ISO	10	20.4%	17	34.7%	22	44.9%	49
ISO-JTC1	32	14.2%	64	28.3%	130	57.5%	226
ITU	48	5.5%	212	24.5%	606	70.0%	866
TIA	0	0.0%	78	34.2%	150	65.8%	228
<b>Total</b>	<b>181</b>	<b>7.7%</b>	<b>623</b>	<b>26.4%</b>	<b>1,554</b>	<b>65.9%</b>	<b>2,358</b>

<sup>252</sup> Suppose we currently have a total of 100 disclosure events. As we know that 40% of all events are listing specific patents, then we would have 40 specific events and 60 blanket events. Assume that the costs for a specific event are  $x$ , then the total cost for this group is  $40x$ . Assume that of the group of 60 blanket events includes 30 events for which the owner later will seek licenses. Then this owner is assumed occur the same search costs somewhat later on (assumption 3 in the text), so the total cost for this group will be  $30x$ . The remaining 30 events are companies that submit blankets and will eventually not license out their patents. These companies will incur some search costs (as they need to comply with the policy they have to determine that they own at least some essential patents, assumption 2 in the text) and on the basis of the average size of disclosure events, and the need to identify at least one SEP, we assume these search costs to be  $0.3x$ , so altogether  $0.3x * 30 = 9x$ . So the current, cumulative search costs for all these groups together is  $40x + 30x + 9x = 79x$ . Now, if blankets were no more allowed, then the total search costs would be simply  $100 * x = 100x$ . This is an increase of approximately 26%.

The additional costs for companies to make mandatory specific disclosures are real costs. Yet these costs should also be evaluated in the light of the considerable value that these companies often enjoy by owning essential patents. Such benefits exist regardless of whether or not they actually have licensing revenue strategies. More specifically, companies owning SEPs have a range of benefits, such as revenue-generating opportunities (every implementer of the standard is by definition infringing and, thus, by definition a potential licensee) and a good bargaining position for cross-licenses providing access to other companies' SEPs and non-SEPs. Moreover, integrated companies may have the advantage that a standard that incorporates its own SEPs (and perhaps a full series of SEPs related to a particular solution or design) is closer to its own technological strength, know-how, existing products or product platforms and markets/clients. As such, it may give them competitive advantages in the product market, a head start and less need to re-tool. Even the companies characterized as 'sleeping dogs' benefit from the 'dormant' SEPs they own, since few other SEP holders will come to them asking for licenses to their own patents, knowing that they might end up paying instead of receiving money if they "wake" the dog. The overall benefits from owning SEPs is reflected by the very high prices that are paid for such patents in transactions.<sup>253</sup>

There might be a particular concern that this measure also raises the costs of SEP owners that do not intend to monetize their patents in a direct or indirect fashion anyway (like universities, non-profit organisations, etc.). An exception, then, could be to allow blanket disclosures when its owner issues a royalty-free commitment.

As anticipated above, some have argued that abandoning blanket disclosures might result in companies refraining from participation in a Work Group or even an entire SSO. While this may be theoretically true, we do not observe any signal whatsoever that the SSOs that currently already do not allow blanket disclosures (such as ETSI, OASIS, VITA, and IETF; see Table 5.6) suffer from a lower willingness to participate.

The implementation costs on the side of SSOs are quite modest; almost all SSO's already have the mechanisms in place to let patent holders submit specific declarations. Only a SSO patent policy change is required.

### Implementation

As already indicated, many SSOs already require specific disclosures. Their policies can serve as an example for SSOs that would make the move towards this rule. There are not many particular implementation issues at stake.

We do wish to note here, however, that not allowing blanket disclosures is an important step – and perhaps even a condition – for many other ideas presented in this chapter to work. If not, any attempt to improve transparency might be welcomed by an even greater escape towards blankets.

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<sup>253</sup> Many of these value elements associated with owning SEPs is reflected by the high transactional value that SEPs have. We will give two examples here: In 2010, a consortium that included Apple, Microsoft and RIM acquired an important part of the former patent portfolio of the late Canadian firm Nortel for US\$ 4.5 billion. This portfolio is believed to contain a large number of essential patents for 4G technology, among other standards. In 2011, Google purchased Motorola Mobility for US\$12.5 billion, including a patent portfolio that Google valued at US\$5.5 billion. (Last number on basis of Google's Securities and Exchange Commission (SEC) filing. See CNET, July 25, 2012, "Google: Motorola's patents, tech are worth \$5.5 billion".) These transactions are probably the best illustration one can find of the value that companies attach to essential patents, even if it has to be noted that, in both examples, the portfolios obviously also included non-essential patents.

## Summary

The table below summarises the idea.

**Table 5.9 Summary of “limiting the use of blanket disclosures”**

Dimension	Comments
Potential benefits	<ul style="list-style-type: none"> <li>• More accurate information in SSO databases will reduce search costs for all stakeholders, provide better quality information at the time licensing agreements are negotiated, reduced time to market and facilitate the construction of better benchmarks to be used in case of disputes;</li> <li>• Benevolent patent owners are supported in getting a fair price for their essential patents and are better protected against other patent owners that use blanket claims to hide lower-quality portfolios;</li> <li>• Reduced information asymmetry between SEP owners and licensees, resulting in smoother and shorter licensing negotiations (i.e. reduced transaction costs) and fairer outcomes;</li> <li>• Less discrimination on the cost side (between those that already make voluntary specific declarations and those that do not);</li> <li>• (See also Table 5.7).</li> </ul>
<i>Potential costs</i>	<ul style="list-style-type: none"> <li>• Increases the average overall costs associated with disclosure for all SEP owners by about one fourth (25%). Parties that currently use no blankets will see no rise in costs at all, those that do will on average see an increase greater than 25%;</li> <li>• Some SEP holders, who have taken advantage of the current information asymmetry, might find it harder to get the same advantages out of licensing negotiations. (See also Table 5.7).</li> </ul>
<i>Expenditure directly related to implementation of measure</i>	<ul style="list-style-type: none"> <li>• SSO participants with patent portfolios will need to screen these more extensively than if they made blankets. Overall costs associated with disclosure for all SEP owners are estimated to increase by about one fourth.</li> </ul>
Possible risks or consequences	<ul style="list-style-type: none"> <li>• It could result in (some) firms refraining from participation in a Work Group or in an SSO;</li> <li>• Not all essential patents are always known at the time the standard is set.</li> </ul>
<i>Necessary or desirable conditions / Relation to other proposals</i>	<ul style="list-style-type: none"> <li>• Cooperation from SSOs and its members to change the disclosure.</li> </ul>

Response by stakeholders to the suggested policy solution makes clear that there are many different views (i.e. not facts), all confirming the arguments put forth in the above analysis:

- The main value of blanket disclosures is to know that any contribution from a particular company will be protected by a FRAND commitment. A good approach to increase transparency is to require specific declarations regardless of whether a blanket declaration is made. Recognizing that there are costs associated with specific disclosure, we are still a strong proponent of such a solution and believe that the benefits (see above) outweigh the costs;
- There will be less disclosures from companies and hence less certainty that an implementer will in fact be offered the SEPs on FRAND terms;
- The costs would be out of proportion and the tasks to disclose all SEPs impossible;

- The proposed measure presumes that all of the patents that are essential to the standard are known at the time the standard is adopted. This is not the case. It is often that companies discover later that patents they own are in fact essential to a standard. The blanket declaration allows for those patents to also be subject to a FRAND commitment;
- Banning all blanket regimes may be going a bit too far, but a requirement to provide (or refine) detailed disclosures as soon as feasible might be effective.

## 5.2.6 Adopt a stricter disclosure regime

### Introduction and outline of the proposed solution

Most SSOs have an extensive regime governing the disclosure of patents essential to the standards they develop. However, the exact obligations vary considerably across these organisations, as witnessed by the SSO policy review in Bekkers and Updegrove (2012)<sup>254</sup>. More specifically:

1. While organisations that participate in a Working Group (or comparable body), as well as those that submit technical proposals, usually have disclosure obligations, organisations that are a member of the SSO but are not meeting either conditions, usually have no disclosure obligation.<sup>255</sup> In ISO and IEC, there seems to be a rule that creates disclosure obligations by those organizations participating in the applicable national standardisation setting. However, this rule is quite ambiguous and it is questionable whether or not such parties can be bound by an ISO or IEC patent policy in the first place;<sup>256</sup>
2. Disclosure obligations often depend on the “knowledge of the individuals” participating in working groups.<sup>257</sup> If such individual does not know about particular patents, then there is often no disclosure obligation. The extent to which companies must ensure they send sufficiently knowledgeable individuals is not addressed in most IPR policies. And while some (not all) policies impose ‘good faith’ or ‘due process’ obligations, it is usually unclear how that affects disclosure obligations in terms of knowledge of individuals;
3. While quite a few SSOs have obligations for participants to also disclose essential patents owned by third parties,<sup>258</sup> this seems to be a rule that is hardly respected;
4. Some SSOs, such as W3C, do not require disclosure of essential patents, provided that the owner made a royalty-free commitment.

As a result of the above, the SSO disclosure databases are more incomplete than what is usually assumed by those that use the information. The information could be made more complete if disclosure rules are tightened and possibly harmonized. At the same time, the current rules are often the outcome of a bargaining process, where stakeholders felt (or argued) that *absolute* disclosure rules would require too many resources and thus would be unjustified.

This idea focuses on the issues 1) and 2) listed above. For the remainder of this section, the above idea can be rephrased as a proposal: *“Tighten SSO disclosure rules so that members or SSO participants have to disclose all their essential patents regardless of the knowledge of individuals participating in the process and regardless of actual participation in working groups.”* At the same

<sup>254</sup> Bekkers, R., & Updegrove, A. (2012). Op cit.

<sup>255</sup> Of the SSOs reviewed by Bekkers & Updegrove (op cit., page 50-52), only ETSI and IETF have disclosure obligations for members that do not participate in Working Groups.

<sup>256</sup> Bekkers & Updegrove (op cit, page 52), see also Bekkers, R., & Updegrove, A. (2012). Background studies for the NAS report, Washington, DC: National Academies of Science, Supplement background report 1 on ITU, ISO, and IEC, [http://home.tn.tue.nl/rbekkers/nas/Bekkers\\_Updegrove\\_NAS2012---S01---IEC\\_ISO\\_ITU.pdf](http://home.tn.tue.nl/rbekkers/nas/Bekkers_Updegrove_NAS2012---S01---IEC_ISO_ITU.pdf), page 6-7 specifically.

<sup>257</sup> For an extensive discussion see Bekkers & Updegrove (op cit., page 56-58 in particular).

<sup>258</sup> For an extensive discussion see Bekkers & Updegrove (op cit., page 53-54 in particular).

time, we suggest to drop mandatory rules for disclosure of patents of third parties: this does not seem to work and only creates false certainty.

### Benefits and costs

The benefit of the above proposal is that SSO disclosure databases will become more complete. As such transparency is promoted. Like in the above proposals, this benefits implementers by having better information on SEPs preventing non-availability or unexpected licence claims and benefits patent owners in preventing the risks of restricted (or even blocked) adopted adoption of standards in which they have a financial interest (in terms of licensing fee or cross-licenses).

The costs of the proposal to make disclosures rules independent of the knowledge of individuals participating in the process ('Issue 1') will invoke costs at companies. In the strictest version of such a rule, firms would have to implement internal procedures to ensure that they appropriately identify potential essential patents. One current SSO, VITA, already describes how such procedures look (see below). While there are certainly costs involved, it should be possible to keep such cost at a modest level compared to the resources these companies are already spending on SSO participation and on maintaining their patent portfolio. Companies should already have the required knowledge and skills in-house; we believe that there is almost no serious firm in this field that does not have a dedicated patent department; most have dedicated standardisation departments as well.

The costs associated with disclosure regardless of actual participation in working groups ('Issue 2') are rather substantial in the event that the SSO covers a wide range of technological areas. Especially companies that are active in many product markets may find it expensive to properly disclose any of their essential patents to SSOs that also have a broad focus, such as ISO or IEC. They will need to set up quite extensive patent scanning activities to ensure they also investigate all the areas in which they are not active in that particular SSO.

### Implementation

As argued above, SSO vary considerably in their disclosure rules even though disclosures rules independent of the knowledge of individuals participating in the process ('Issue 1') are not hard to design. ETSI already puts the bar higher than many other SSOs by requiring 'reasonable endeavours' instead of a weaker 'personally aware' condition. The VITA patent policy goes even further<sup>259</sup> as this policy does not let disclosure depend on the knowledge of participating individuals, but requires a "good faith and reasonable inquiry" into patents owned by the member. It explains that working group members must make reasonable efforts to identify, contact and discuss the standards with (i) individuals at their organisation who are experts in the relevant subject area and (ii) the company's attorneys responsible for the patent work in the relevant subject area." Note that this is not equal to a patent search (which are now virtually required by policies). Nevertheless this is a significant step compared to policies that leave it at the individual knowledge of participants, whatever that might be.

Disclosure being made obligatory regardless of actual participation in working groups ('Issue 2'). ETSI could serve as an example again, as it already requires disclosure regardless of whether or not a SEP owner actually participates in a Working Group, thus also addressing issue (1). It is very important to note, however, that ETSI has a quite focussed technological profile, which might make this rule more digestible than in a broad body such as, for instance, ISO (see above).

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<sup>259</sup> For details, see Bekkers & Updegrave (op cit., page 57 in particular).

## Summary

The table below summarises the idea. For the costs, we have split the two different scenarios that were discussed above.

**Table 5.10 Summary of “adopt a stricter disclosure regime”**

Table 5.10 Summary of “adopt a stricter disclosure regime”	
<i>Potential benefits</i>	<ul style="list-style-type: none"> <li>• SSO disclosure databases will become more complete;</li> <li>• Benefits implementers by having better information on SEPs preventing non-availability or unexpected licence claims;</li> <li>• Benefits patent owners in preventing the risks of restricted (or even blocked) adoption of standards in which they have a financial interest (in terms of licensing fee or cross licenses).</li> </ul>
<i>Potential costs</i>	<p>Scenario 1 (<i>members or SSO participants have to disclose all their essential patents regardless of the knowledge of individuals participating in the process</i>):</p> <ul style="list-style-type: none"> <li>• Costs would be limited; merely related to members/participants ensuring they send the appropriate staff and/or ensure participating staff is well-informed and/or staff gets back to the patent department in order to ensure full disclosure.</li> </ul> <p>Scenario 2: (<i>members or SSO participants have to disclose all their essential patents regardless of actual participation in working groups</i>):</p> <ul style="list-style-type: none"> <li>• Costs would be considerable, especially for organizations participating in SSOs that have a wide scope of activities.</li> </ul>
<i>Expenditure directly related to implementation of measure</i>	<ul style="list-style-type: none"> <li>• None (only a policy change is required).</li> </ul>
<i>Disadvantages, possible risks or consequences</i>	<ul style="list-style-type: none"> <li>• It may create a barrier for companies to participate in standardisation;</li> <li>• It creates transparency about what the owner regards as being essential. This ‘view’ may still be challenged.</li> </ul>
<i>Necessary or desirable conditions / Relation to other proposals</i>	<ul style="list-style-type: none"> <li>• It is a desirable – or arguably even a necessary condition - that blanket disclosures are not allowed, as parties will probably move to such blanket disclosures if other rules on disclosure are tightened.</li> </ul>

Response by stakeholders to the suggested policy solution confirms the aforementioned “Disadvantages, possible risks or consequences”:

- This proposal would actually mean a full patent portfolio search for each and every standard of each and every SSO in which a company is participating. As a result, the cost and resources needed to conduct multiple patent searches vis-à-vis a developing standard spread across a significant number of standards engagements would be significant and may quickly become prohibitive;
- The assessment of the essentiality is always a subjective task. Any declaration reflects nothing but good faith of the patentee at the time the declaration is made that the patent is or will become essential. As such, exhaustive identification of essential patents would provide little, if

any, value for implementers as it would result in a process in which errors and omissions would be inevitable;

- The current ETSI rules are OK.

### 5.2.7 Notification of transfer of SEP ownership by recordation

#### Introduction and outline of the proposed solution

Patent transfers raise a number of relevant issues in the context of patents in standards. While further on in this report we will devote an extensive section to the broad topic of patent transfers (Section 5.6), this section will focus specifically on transparency about patent ownership after transfer.

Virtually any national or regional patent office requires that a patent application include information on the assignee, which is the party that has the right to exploit the patent. However, given the significant number of ownership changes of essential patents (see Section 5.6), it is not only important to know who originally applied for a patent, but also who the current patent owner is. Unfortunately, few patent offices require patent holders to inform them of such ownership changes. While there are some specific exceptions,<sup>260</sup> one can say, generally speaking, that information on ownership changes in patent office documentation and databases is sketchy at best.

This lack of information on current patent ownership is being regarded as more and more undesirable, not only in the context of patents and standards. In June 2013, US President Barack Obama expressed his concern about ‘patent trolls’ and recommended Congress to pursue legislative measures, including one that would require “any party sending demand letters, filing an infringement suit or seeking PTO review of a patent to file updated ownership information and enabling the PTO or district courts to impose sanctions for non-compliance.”<sup>261</sup>

Given the specific importance of standard essential patents, and their impact on the market, it has been suggested that it is important that there is good, up-to-date public information available on essential patent ownership. As explained above, patent offices do not (generally) provide such information and, while most SSOs currently allow parties to update patent ownership information (usually by the new owner sending in a new patent disclosure), it is not required. As long as standards implementers did not ‘coincidentally’ find out about a SEP transfer via the media (see Table 5.1), rumours or otherwise, they might not be aware that the discloser no longer owns disclosed SEPs.

SSOs could do so by requiring parties that disclosed SEPs to update the existing disclosure with new ownership information should the SEP ever be transferred. For the remainder of this section, the above idea is now phrased as follows: “SSOs mandate that SEP disclosures are updated when ownership changes take place”.

#### Benefits and costs

The clear benefits would be that any interested party has a better understanding of who actually owns SEPs. Amongst others, this is valuable when:

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<sup>260</sup> Some patent offices require that ownership changes during the patent prosecution process are reported. Some patent offices (notably that of France) do not require ownership changes to be recorded, but instead limit the rights of the new owner if such recordation was not done, creating a significant incentive to inform the patent office of ownership changes.

<sup>261</sup> White House. (2013). Fact sheet: White House task force on high-tech patent issues; Legislative priorities & executive actions, Issued June 04, 2013.

- Assessing the patent situation (fragmentation, possible costs, risks, profile of SEP owners, etc.) for a specific standard;
- When a party is receiving demand letters or is accused of patent infringement, it can with better precision determine to what degree the demanding party actually owns SEPs. This is important information not only with respect to possible infringement, but also in order to know the patent owner is bound to certain restrictions (such as encumbered patents because of FRAND commitments).

Implementers benefit from having better knowledge about which parties can have legitimate claims with regard to SEPs, the extent of the portfolios underlying such claims (assuming blanket disclosures do not hide this) and the nature of the claimants. Prospective implementers can also benefit from better being able to assess the patent implications of a standard they consider to adopt. At the time of entering into a license agreement, this information also helps them to understand which patents originally owned by a particular party may no longer be covered by that licensing agreement (helping them to negotiate a fairer price and estimate the costs and risks of transferred patents).

Patent owners benefit from having a better understanding of fragmentation in the market and the risks of fragmentation of patents within standards in which they have vested interests.

Clearly, the costs would be for SEP owners that choose to transfer their patents. If those parties made regular, specific patent disclosures, these costs should not be very high. Although, if these parties originally made blanket disclosures, then the costs to comply with the suggested rule would depend on the exact implementation of the rule, and whether they are keeping internal records of which patents they believe to be essential or not. In the worst case, at the time of any patent sale, they would need to perform an essentiality review for all the standards for which they submitted blanket disclosures in order to identify which essential patents were actually transferred.

### Implementation

This idea requires changes to the patent policies of SSOs. Organisations that already consider changes in their transfer policies (see Section 5.6) might also include this recordation issue. Unfortunately, several SSOs that have recently updated their patent transfer rules did not include a notification or recordation obligation.

The implementation costs for SSOs are probably not going to be very significant; most of the IPR databases and front ends will require little, if any modification in order to record modified ownership information. However, it would be desirable if records also include a history of ownership, including dates at which changes were recorded so that ownership issues can be traced.

An important implementation element is that a recordation obligation should also work when cascaded transfers take place. In other words, every time an essential patent is transferred, the new owner must also have an obligation to notify the SSO of a new owner if it decides to sell the patent again at some point in the future.

While the recordation of ownership changes (of all patents, not only SEPs) could possibly also be taken up by patent offices, this has some disadvantages in the context of patents in standards: as long as SEP owners can make blanket disclosures, then such records at patent offices have limited value. There is no public information regarding which patents owned by certain organisations (and possibly transferred) is essential to a specific standard.

## Summary

The table below summarises the idea.

**Table 5.11 Summary of “notification of transfer of SEP ownership by recordation”**

<i>Potential benefits</i>	<ul style="list-style-type: none"> <li>• Better public understanding of SEPs ownership;</li> <li>• Implementers benefit from having better knowledge about which parties can have legitimate claims with regard to SEPs, about the extent of the portfolios and about the remaining extent of the portfolio of the previous owner;               <ul style="list-style-type: none"> <li>• Patent owners benefit from having a better understanding of fragmentation in the market and the risks of fragmentation of a patents within standards in which they have vested interests.</li> </ul> </li> </ul>
<i>Potential costs</i>	<ul style="list-style-type: none"> <li>• Relatively little for parties that have already made specific disclosures;</li> <li>• Potentially very significant for those that made blanket disclosures and, depending on their situation, might need to make efforts they had previously circumvented by making a blanket disclosure.</li> </ul>
<i>Expenditure directly related to implementation of measure</i>	<ul style="list-style-type: none"> <li>• For SSOs: not significant; most of the IPR databases and front ends will require little, if any modification in order to record modified ownership information.</li> </ul>
<i>Disadvantages, possible risks or consequences</i>	<ul style="list-style-type: none"> <li>• It may contribute to transparency, but it does not address the transfer of ownership problem in relation to the transfer of FRAND commitments.</li> </ul>
<i>Necessary or desirable conditions / Relation to other proposals</i>	<ul style="list-style-type: none"> <li>• If blanket disclosures are (no longer) allowed (idea in Section 5.2.4) then compliance with this idea will be considerably easier.</li> </ul>

Response by stakeholders to the suggested policy solution confirms the aforementioned “Disadvantages, possible risks or consequences”:

- Commitments to license standard essential patents need to be understood to follow a patent and to bind any subsequent acquirer of the patent. If the holder of an essential patent could evade its licensing commitment by simply transferring the patent, any such licensing commitment would become absolutely meaningless. Mandating that SEP disclosures are to be updated when ownership changes take place will, however, not properly address the issue;
- SSOs can mandate their members to update their disclosure when selling or buying SEPs, and it is a good idea [for keeping the database up to date]. {But} SSOs cannot mandate buyers who are not members to do anything;
- Blanket FRAND declarations are needed to reduce the cost and time spent for identifying SEPs. The same is true for ownership recordation. In a SEP transfer not all individual SEPs might be listed and so it is not reasonable to notify the SSO or PTO about the transfer to a new assignee for each and every SEP.

### 5.2.8 Increased collaboration between SSOs and patent offices

#### Introduction and outline of the proposed solution

While SSOs and patent offices are quite different organisations, serving different goals and having different responsibilities, there are a few areas in which both can benefit from working together. As

we will discuss below, some collaborations have already started and are regarded as very successful.<sup>262</sup>

In patent offices, non-patent documents are becoming more and more important for prior art search. Over time, patent examiners in the area of telecommunications and information technology realized that it would become increasingly important to also consider standardisation documents when determining the prior art of new patent applications. The standardisation arena was the first venue where new ideas were disclosed and shared. The most important documents are often early drafts and minutes of Working Group meetings and not actually final, public standards (which would typically appear at a much later stage). In the past, the problem was that patent offices did not consider such standardisation documents as prior art. A key question was whether such documents would meet the prior art criterion of being 'public'. In Europe, two events took place that helped a lot in that respect. Firstly, there were two cases brought before the EPO Boards of Appeal,<sup>263</sup> which resulted in jurisprudence and guidance on the matter. Secondly, EPO entered into collaborations with three SSOs (ETSI, IEEE, and ITU).<sup>264</sup> As a part of these collaborations, the SSOs clarified their policy with regard to the status of Working Group documents (early drafts, minutes, etc.). In general, these clarifications state that any document brought into the Working Group is assumed to be non-confidential, unless clearly indicated otherwise (and in such a case, the SSO can consider whether or not it is willing to accept that contribution). These two events opened the door to the use of standards-related documents for prior art.

While the collaboration between EPO and ETSI and between IEEE and ITU is generally considered to be very successful (more on that below), there are many more patent offices, and many more SSOs, that do not have similar collaborations. Setting up such collaboration invokes costs (see below). These costs could be effectively brought down if more parties collaborate. The idea for this section is now phrased as follows: *"A wide and harmonized collaboration between all important patent offices and all important SSOs in terms of using standardisation documents for prior art search in patent examination"*.

Apart from the above activities, EPO and ETSI have also worked together on improving the quality of the ETSI IPR database by linking ETSI patent disclosures to the EPO Espacenet database. It has increased data quality and therefore also transparency.

Furthermore, this section will focus only on the collaboration for prior art that is the most prominent topic in patent office: SSO collaboration.

### Benefits and costs

The main benefit from considering standardisation documents at the patent examination stage is that it improves the quality of patents: applications that are not meeting the novelty standard will be granted less frequently. This not only increases patent quality and results in a fairer market for knowledge, but also moderates the total number of patents in standardisation-intensive areas, thus moderating various problems and risks related to patents in standards (stacking, hold-up, fragmentation of rights, etc.). Moreover, it prevents participants from employing opportunistic strategies (like filing a patent for an invention that was actually disclosed by a competitor during a standardisation meeting).

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<sup>262</sup> This section builds on the experiences of the EPO, reflected by the following presentation: Goudelis, M. (2012). EPO cooperation with Standards Developing Organisations. Presentation delivered at the National Academies of Science, Washington DC, October 3-4, 2012. Retrieved from [http://sites.nationalacademies.org/PGA/step/IPManagement/PGA\\_072825](http://sites.nationalacademies.org/PGA/step/IPManagement/PGA_072825).

<sup>263</sup> These are EPO appeal decisions T 273/02 and T 738/04.

<sup>264</sup> With ETSI and IEEE, an MoU was signed, while with ITU a Cooperation Agreement was reached.

We learned from discussions with the EPO that in specific areas, such as telecommunications, these standards-related documents are now used with high frequency when new patent applications are examined and, that in this respect, the collaboration can be seen as a significant success.

Implementers benefit from the reduced costs and burden posed by patents that should never have been granted in the first place, as they do not meet the conditions for patenting.

Benevolent patent owners, and owners of high-quality patents in particular, benefit from this proposal by being able to get a fairer reward for their technical contributions and R&D, instead of the licensing fees going to parties that did not contribute significantly.

Additionally, there are various costs associated with this proposal. EPO has indicated that its expenses to get access to the standards-related documents, and the internal costs to make them available in the proper manner to examiners, is around 0.5 million Euro annually. The SSOs need to spend resources to ensure that all relevant documents are properly collected and that they meet a number of essential requirements to be used in this way, including clear identification of the date this information was disclosed, indication of the technical field/working group, etc. Although we have no information on the amount of these expenses, we expect these to be considerably lower than those of the patent offices.

### Implementation

While such collaboration is already effectively set up between EPO on the one hand and ETSI, IEEE and ITU on the other, it would be desirable to scale this up to other organisations. Firstly to other patent offices: as long as other major patent offices such as the US Patent and Trademark Office (USPTO) and the Japan Patent Office do not consider standardisation documents, they can still grant patents that do not truly meet the novelty requirement. Since patent portfolios are of a global nature, these patents still very much affect business in Europe, for instance. Second, scaling up is also desirable to other SSOs. In fact, the EPO indicated that it would find it valuable if such collaborations would be extended to new areas, such as energy and new automotive technologies.<sup>265</sup> In fact, the Global Standards Collaboration Conference (GSC) adopted a resolution encouraging SDOs "to cooperate with the relevant Patent and Trademark Offices to provide access to technical information for use by such Agencies that should help them improve the quality of patents being granted".<sup>266</sup>

Scaling this collaboration up, however, depends on the willingness of other SSOs and patent offices to collaborate. For patent offices, one of the issues may be that they do not have the jurisprudence that facilitated this process at the EPO – as explained, at the EPO two specific cases at the Boards of Appeal helped to clarify that standardisation documents are indeed to be considered for prior art, but similar cases might not exist at the other patent offices. This concern might be mitigated, however, if SSOs adopted very clear principles about the documentation at WG meetings being public information and if SSOs would put this documentation, with proper identification such as dating and so on, in the public domain. If they do so, it would be hard for anyone to maintain that this is not to be considered prior art.

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<sup>265</sup> See Goudelis (2012), op cit.

<sup>266</sup> GSC 12 reaffirmed until GSC 16. See Goudelis (2012), op cit.

At the same time, considerable potential costs savings ensue both on the side of the SSO and the patent office if: (i) a harmonized approach was reached, (ii) all organisations were to agree on a similar status of standardisation documents and (iii) a standardized format becomes available in which the documents are distributed. Cost-saving could be even higher if a single, common database for all SSOs and all patent offices could be agreed upon.

### Summary

The table below summarises the idea.

**Table 5.12 Summary of “increased collaboration between SSOs and patent offices”**

<i>Potential benefits</i>	<ul style="list-style-type: none"> <li>• Improves the quality of patents relevant for standards;</li> <li>• Results in a fairer market for knowledge, where real innovators are rewarded;</li> <li>• Reduces the number of patents in standardisation-intensive areas, thereby moderating other problems in the field of patents in standards;</li> <li>• Implementers benefit from the reduced costs and burden posed by patents that should never have been granted in the first place, as they do not meet the conditions for patenting;</li> <li>• Benevolent patent owners, and owners of high-quality patents in particular, benefit from this proposal by being able to get a fairer reward for their technical contributions and R&amp;D, instead of the licensing fees going to parties that did not contribute significantly.</li> </ul>
<i>Potential costs</i>	<ul style="list-style-type: none"> <li>• Opportunistic companies have less room to apply for low-quality patents, also reducing the options to disclose these as SEPs.</li> </ul>
<i>Expenditure directly related to implementation of measure</i>	<ul style="list-style-type: none"> <li>• Costs at the patent office to get access to the standardisation documents and to process them internally (currently approx. 0.5 million Euro at EPO);</li> <li>• Costs at the SSOs to adopt changes and clarify the status of documents, and to collect the relevant documents and adding the necessary information;</li> <li>• Considerable potential costs savings at the side of both the SSO and the patent office if a harmonized approach was reached.</li> </ul>
<i>Disadvantages, possible risks or consequences</i>	<ul style="list-style-type: none"> <li>• Scaling up depends on the willingness of other SSOs and patent offices to collaborate. For patent offices, one of the issues may be that they do not have the jurisprudence that facilitated this process at the EPO.</li> </ul>
<i>Necessary or desirable conditions / Relation to other proposals</i>	<ul style="list-style-type: none"> <li>• None.</li> </ul>

Response by stakeholders to the suggested policy solution confirms that most of them see advantages and little costs:

- I think this is good idea in principle;
- I would assume that the cost for the SSOs is actually quite small. Also the cost for the patent offices should not be very high, as “only” one more database needs to be set up and maintained;

- PTOs are the appropriate organizations as evaluator of essentiality and validity. As for example ISO, IEC and ITU specifications are public, the PTOs can use those specifications as prior art or reference. But in some SSOs the specifications are licensed under a confidentiality obligation (for example if it comes to encryption standards). In those cases other arrangements (or no arrangement at all) must be possible;
- The co-operation of Patent Offices and SSOs is a typical win-win situation.

### 5.3 Promoting patent pools

#### Introduction and outline of the proposed solution

Patent pools provide a one-stop solution for licensing a bundle of standard essential patents owned by different entities, thereby aiming to mitigate transaction costs and royalty stacking. Competition law concerns have limited the practice of pooling patents in the second half of the 20th century. However, since the late 1990s, a new type of patent pool has emerged that is closely linked to technological standards and providing several safeguards against anticompetitive effects. Two pools for DVD patents and one pool for MPEG video coding patents were the pioneers of this new type of pool. By requesting the US Department of Justice (DoJ) to issue a Business Review Letter with regard to their intended activities as pools, this government agency performed an in-depth analysis of pro- and anticompetitive effects of these proposals. It eventually issued positive reviews that indicate which elements are, in their view, necessary to ensure such pools do not breach competition/antitrust rules.<sup>267</sup> Important elements are that the pools should only include complementary patents, not substitutes (a condition that can be met by including only essential patents because these are complementary by definition), that pools have good mechanisms to test essentiality and that all patent owners are also free to license out their patents directly, not via the pool. Virtually all pools established after the three pools in question have adopted these basic principles.

Pioneered by the two DVD and the MPEG pools, it is now clear under what conditions US competition/antitrust authorities allow such pools to operate.

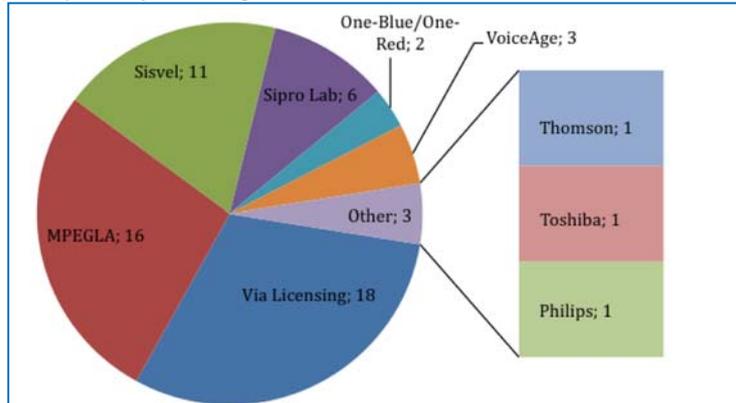
In the last few decades, over forty patent pools have been created, which have granted more than 8,000 licensing contracts. Nevertheless, patent pooling is still not widely practiced in most areas where standard-essential patents play an important role. Furthermore, while some well-known patent pools have gathered a large number of members and patents, not all pools are successful in quickly attracting a large share of the relevant patent holders. Several attempts at pooling patents have not even resulted in a pool being created.

Pools are launched and administered by a licensing administrator. In some of the oldest pools (DVD6C, DAB, mp3), this administrator is a patent holding company picked from the pool members. However, more recent pools are usually administered by independent third parties. Currently, five companies specializing in the administration of patent pools indeed account for the large majority of pools and attempted pool launches: MPEGLA, ViaLicensing, Sisvel, SiproLab, and VoiceAge (for distribution see Figure 5.1). In other cases (e.g. One-Blue, One-Red), the pool members have created an ad hoc entity to administer a particular pool.

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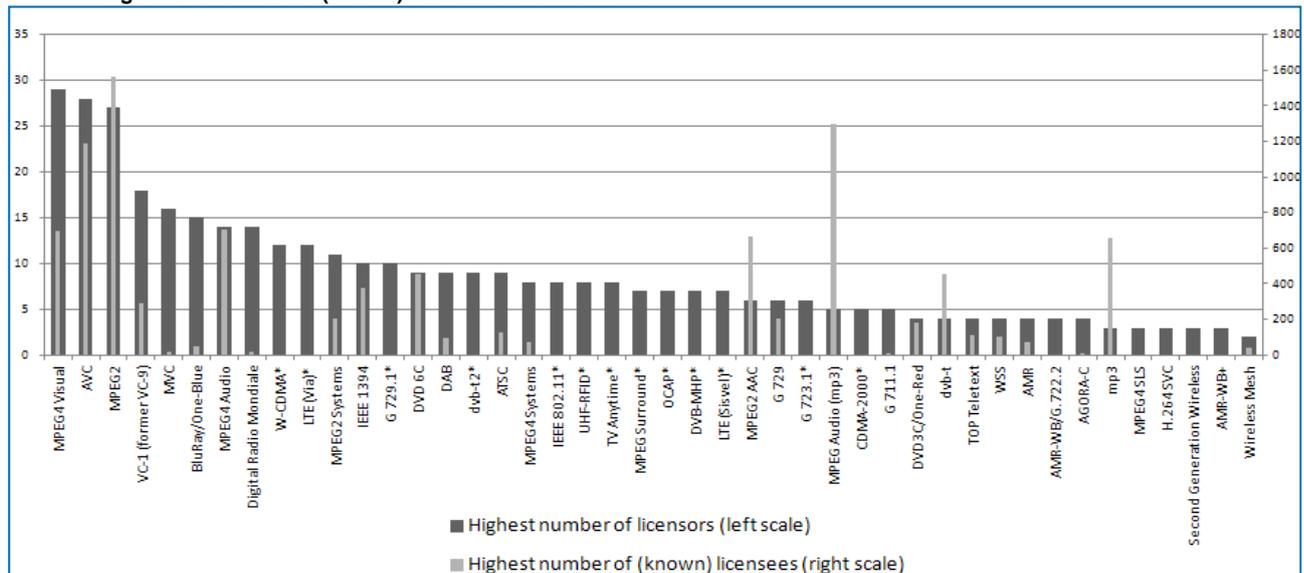
<sup>267</sup> For the three letters, see Department of Justice (DoJ), Antitrust Division. (1998). [Business Review Letter of proposed arrangements between Philips, Sony and Pioneer concerning DVD-ROM and DVD-Video], dated December 16, 1998; Department of Justice (DoJ), Antitrust Division. (1999). [Business Review Letter of proposed arrangements between Hitachi, Matsushita, Mitsubishi and others concerning DVD-ROM and DVD-Video], dated June 10, 1999; and Department of Justice (DoJ), Antitrust Division. (1997). [Business Review Letter of proposed arrangements concerning the MPEG 2 compression technology], dated June 26, 1997.

Figure 5.1 Number of pools by licensing administrator



The size of existing patent pools, in terms of licensors and licensees, varies considerably. Figure 5.2 provides the details of the number of licensors and known<sup>268</sup> licensees at the pool level. The various technological fields are characterized by significant differences in the average number of licensees (varying between 250 and almost 700),<sup>269</sup> but the number of licensees varies even more strongly between individual pools, with only seven pools disclosing more than 500 licensees and several pools having a very limited number of licensees. There is a similar, though less extreme skew in the number of licensors: three pools have more than 20 pool members, but most pools achieve only between four to ten members at the time of their greatest expansion.

Figure 5.2 Number of (known) licensees and licensors



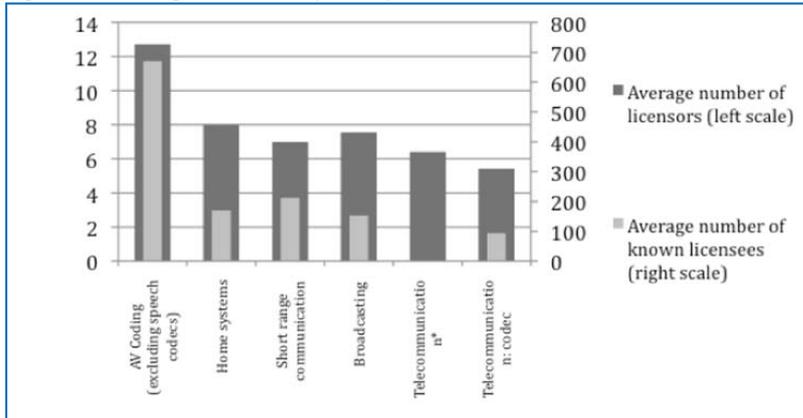
Size features of pools differ considerably across technology areas (Figure 5.3). Standards such as codecs or compression technologies are typically used in many different applications and pools on such standards often achieve high coverage and a very large number of licensees, especially in consumer electronics. In contrast, standards such as telecommunication standards (e.g. LTE), broadcasting technologies (DVB-T, ATSC) or home systems (Blu-Ray), incorporate and combine a large number of disaggregated technology standards for a particular technological purpose. Pools

<sup>268</sup> Most pools provide lists of licensees in good standing. These lists are, however, not available for all pools, and may not necessarily be complete. It is possible that a licensee in good standing asks not to disclose the existence of the licensing contract.

<sup>269</sup> Since several pools are already in a phase of substantial decline, all figures provided refer to the highest value observed.

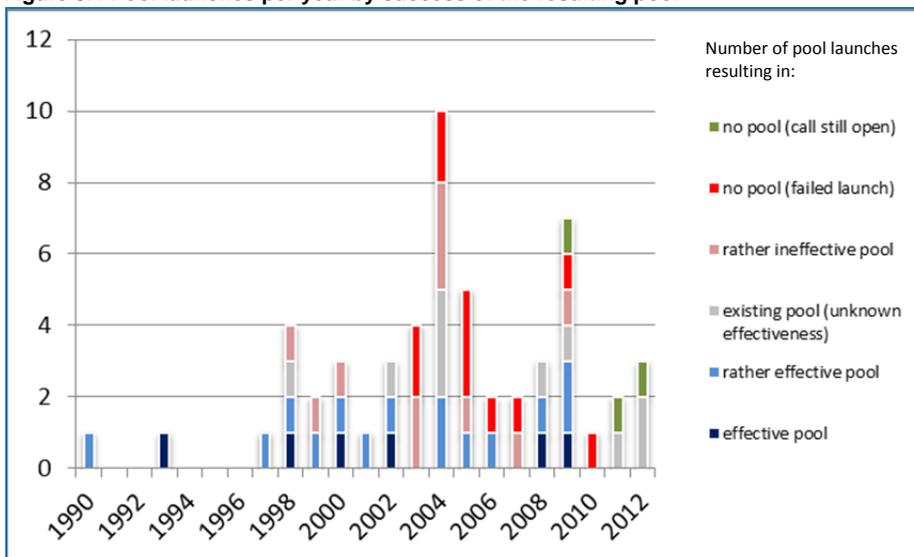
on these standards often achieve lower coverage of essential patent owners and have a limited number of licensees.

**Figure 5.3 Average number of (known) licensees and licensors**



The main topic in the public discussion on patent pools concerns a small number of clearly successful pools. However, over the past 15 years, there have also been several unsuccessful attempts to launch pools. Investigating 51 pool formation processes (Figure 5.4), we consider six of them to be ‘effective pools’ and another 14 “rather effective pools’ (for our definitions, see Footnote 271). While it goes beyond the scope of this study to investigate in detail the reason for success or failure for these 51 pool attempts,<sup>270</sup> doing so could generate useful insights into policies on how best to promote successful pools.

**Figure 5.4 Pool launches per year by success of the resulting pool<sup>271</sup>**



<sup>270</sup> Some first attempts in that direction can be found in Bekkers, R., Iversen, E., & Blind, K. (2012). Emerging ways to address the reemerging conflict between patenting and technological standardization. *Industrial and Corporate Change*, 21(4), 901-931.

<sup>271</sup> We identify a “failed launch” if there is evidence of a significant effort to create a pool (e.g. a call for patent), which is not followed by a pool being created. We label it “effective” if: (a) a pool has been created within 3 years after standard release, (b) there is a single pool, the pool achieves good or very good coverage, and (c) the pool remains stable or grows through inclusion of other members over time. A “rather effective” pool creation refers to a case where either there are multiple pools (failure to achieve a single pool for one standard, like in the case of DVD or LTE), the pool fails to achieve good coverage, or is created after a significant delay. If a pool is abandoned after a short time, or the pool includes only fringes of the relevant patents, we speak of a “rather ineffective” pool creation. For 10 pools, we could not determine the level of success (these are not shown in the figure).

While pools are still relatively rare (compared to the number of potential pools there could have been established on the basis of standards), and the pools that have been attempted have seen variable success, there are reasons to believe that pools might become more desirable and more important over time. These reasons are as follows:

1. Markets are dynamic and convergence is increasing fast. Early on in a technology lifecycle a standardized technology is often the single core of the devices in which it is implemented (a mobile phone, a Wi-Fi card). But later in the standard's life cycle, it typically gets implemented in devices that support many, sometimes dozens of other standards that are equally or even more important. The smart phone is the classic example. Also consider the number of standards built into a modern Blu-ray player, a television, a game console or a photo camera. Producers will find it increasingly difficult to handle all the different, complex, bilateral licensing regimes for each of the standards incorporated in the device and will have a strong preference to have the necessary patents bundled in pools;
2. Standards from the Telecommunications and IT area are increasingly used in other technology fields as 'enabling technologies'. These fields are very diverse and include smart grids, e-health, public transport, road safety and intelligent transport systems. In fact, nearly every sector introducing 'smart' systems relies heavily on ICT standards. As a result, the standards that were often characterized by a relatively small group of implementers that all were patent owners themselves (and often favoured bi-lateral licensing / cross-licensing) now move towards a situation in which there are many more potential licensees, often from other technology areas and often not owning relevant patents themselves. In this development, pools start to make more and more sense;
3. In many product areas, consumers expect that new generation devices also support earlier standards. A 4G mobile phone is expected to support 2G and 3G standards as well; a device with 802.11AC WiFi capabilities is expected to support the earlier 'N', 'G' and 'B' standards as well; and a Blu-ray player is expected to play also DVD and compact discs. As a result, a producer is faced with the need to gain licenses for all of these earlier technologies, Even if pools do exist, there will be a fragmentation in pools. A recently novel development, known as a 'pool of pools',<sup>272</sup> addresses this issue by creating a one-stop solution for multiple pools at once, often at a lower price than the aggregate of the individual pools (which is also partly the result of overlap between pools<sup>273</sup>). The best known pool-of-pools is the One-Blue pool.<sup>274</sup>

While pools are a voluntary mechanism, there is still a lot to be gained from a public perspective if pool creation and pool participation could be further promoted. One of the ways in which this might be done is collaboration between pools and SSOs (see also below, at the section 'Implementation').

For the remainder of this section, the above idea is now phrased as follows: "Investigate how pool creation and the participation in pools can be further promoted, for instance by strengthening the relations between SSOs and pools, by providing incentives to participate in pools or by increasing awareness among entities such as universities and SMEs regarding the advantages of becoming a licensor in a pool".

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<sup>272</sup> See Uijl, S. d., Bekkers, R., & de Vries, H. J. d. (2013). Managing Intellectual Property Using Patent Pools: Lessons from Three Generations of Pools in the Optical Disc Industry. *California Management Review*, 55(4), 31-50.

<sup>273</sup> A patent may be essential both to an older generation standard and a newer generation standard (even if a device only implements just the newer standard). Yet, if that patent is part of a pool, it is typically only licensed for use for the standard for which the particular pool is for, not for any other standard or implementation, such as a newer generation standard.

<sup>274</sup> For details, see Peters, R. (2011). One-Blue: a blueprint for patent pools in high-tech. *Intellectual Asset Management*, September/October 2011, 38-41.

## Benefits and costs

As the core idea for this section is to promote pools, we will now consider the benefits and costs associated with pools. This analysis will not focus on one specific proposal for how to promote pools.

There are multiple benefits of pools, since they achieve the following:

1. Reduce transaction costs for both licensees and licensors (for the latter once set-up costs are recovered);
2. Introduce a coordination mechanism that helps to prevent royalty stacking;
3. Reduce search costs at the side of licensees;
4. Reduce uncertainty in total patent landscape, patent availability and pricing, thus reducing barriers to new entrants to implement standards;
5. Reduce or moderate the phenomenon of over claiming essential patents (by virtue of good essentiality testing mechanisms in pools);
6. May reduce the total royalty fee for licensees compared to the aggregate fee of the same patents when licensed in via bilateral negotiations;
7. Offer a mechanism of coordination through which patent owners can collectively decide on how to change (lower) their fees in response to changing market circumstances;<sup>275</sup>
8. May increase the total royalty fee for licensors compared to the aggregate fee of the same patents when licensed out via bilateral negotiations;
9. More level playing field across implementers (more of them paying for the implemented patents, and paying the same level);
10. May allow relatively small SEP owners to effectively generate revenues from its patents;
11. Pools may be more effective to address wilful infringement of pooled SEPs;
12. Less discrimination between implementers in terms of who pays all patent owners, who pays some, and who pays none at all.

Implementers benefit from reduced transaction costs and search costs, less uncertainty, typically lower license fees and less discrimination between implementers that pay licenses and those that do not.

Patent owners benefit from reduced transaction costs, better possibilities to address wilful infringement of SEPs and a better functioning market for technology in general.

Benefit number 8 is often overlooked and, at first sight, might seem conflicting with benefit 7. Yet, both benefits are real and compatible. The explanation is that pools usually have a considerable larger reach towards potential licensees than that of an individual company. For instance, the AVC/H.264 pool, in which 29 other companies have united their essential patents, has attracted over 1,100 licensees.<sup>276</sup> The firm AT&T, that also holds essential patents for the same standard but opted not to join this pool, seems to have registered no more than 13 licensees for its own licensing programme for this standard.<sup>277</sup> This may be explained not only by greater resources of the pool to track and sign up implementers, but also by the bigger size of the pool. In a large pool, it makes sense to register a relatively small implementer, whereas for an individual company the costs of doing so are larger than the income it generates. As an effect, a pool may be more interesting in terms of revenue generation that is often assumed, which also might explain that quite a few pools attract patent holders whose dominant business model is to derive revenues from royalties (such as

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<sup>275</sup> The lowering of fees can be repeatedly observed in many pools.

<sup>276</sup> This number is derived from the AVC pool license administrator website, [www.mpegla.com/main/programs/AVC/Pages/Licensees.aspx](http://www.mpegla.com/main/programs/AVC/Pages/Licensees.aspx).

<sup>277</sup> This number is derived from the AT&T website, [www.att.com/gen/sites/ipsales?pid=19116](http://www.att.com/gen/sites/ipsales?pid=19116).

Dolby). As a side effect, pools may also result in a fairer playing field among implementers: with a pool, almost everybody pays - and pays the same amount - while in a world of bilateral licensing, some implementers pay (to a certain patent holder) and others don't, which results in discrimination.

Nevertheless, pools also have disadvantages:

1. Pools have substantial set-up costs (usually worn by the SEP owners that consider to join the pool, the pool initiator and/or the pool administrator);
2. It is difficult for pools to agree on revenue-sharing rules if there are significant (perceived) differences in the value of essential patents<sup>278</sup> or differences in the fees that the patent owners wish to receive (depending on their strategy and business model, among others);
3. Broad pools may create attractive positions for single firms to stay out of the pool but piggy-back on its success (such firms may succeed in appropriating larger royalty revenues than they might have been able absent the existence of a pool).

A concern that is heard often is that pools would not allow companies to benefit from their SEPs in the way they would be able to in bilateral negotiations. While there might be some truth in that, reality is a bit more nuanced. Many modern pools include grant-back clauses, which in fact bind licensees to license back their own SEPs – if they own any – at rates that are comparable to the pool rate. The effectiveness of such clauses was demonstrated in the recent US court case between Motorola and Microsoft. A part of that case was about patents essential to H.264. Google was a licensee of the H.264 pool, and after it acquired Motorola, the judge ruled that the grant-back rules in the pool obliged Google/Motorola to license their own SEPs for this standard at a rate similar to that of the pool, instead of the much higher rate they had been requesting.

## Implementation

Given the number of pools already in existence, this section will not focus on the implementation of pools, but rather on the implementation of ideas to further foster pool creation and pool participation. We will briefly discuss implementation of each of the three ideas in the proposal.

**Strengthening the relations between SSOs and pools.** The standardisation of the DVB standard by the DVB Forum was arguably one of the first ones where pool formation was integrated with the standardisation effort. In this context, several specific activities were developed within the SSO to spur and promote both the establishment of pools and the participation in pools. These include:<sup>279</sup>

- a) Specific incentives for SEP owners to create/join pools: if for a given standard<sup>280</sup> more than 70% of all known SEP owners joined a pool 2 years after the standards' adoption, then the adopters right of arbitration, as defined by the DVB Forum patent policy is lifted;
- b) The offering of a mechanism by which patent owners can confidentially submit one or more patents to an independent expert (named by the SSO). This expert will try to identify (at least) one patent claim that 'reads on' the standard (i.e. is essential). If the answer is positive, then

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<sup>278</sup> The owners of more valuable patents will want a higher per-patent share in the revenues, while the others may insist on a harmonized, one-fee-per-patent basis. An interesting solution was adopted in the One-Blue pool, where optical disc patents (a category of patents that was considered to be more fundamental and more valuable) receive twice as much as other patents.

<sup>279</sup> For details see Eltzroth, C. (2008). IPR Policy of the DVB Project: Negative Disclosure, FR&ND arbitration Unless Pool rules OK Part 1. J. of IT Standards & Standardization Research, 6(2), 18-39, and Eltzroth, C. (2009). IPR Policy of the DVB Project: Negative Disclosure, FR&ND arbitration Unless Pool rules OK Part 2. J. of IT Standards & Standardization Research, 7(2), 1-22.

<sup>280</sup> For the sake of completeness, it is noted that the DVB is formally not an SSO: it develops specifications, and subsequently offers these for formal SSOs (ETSI, CENELEC) in order to turn them into standards. For that reason, the DVB Forum creates 'specifications', not standards. Nevertheless, for the purpose of this study, we will treat them as if they are an SSO.

the patent owner knows it may join a pool. The process remains confidential; the expert's conclusions are not made public. This method is considered a low-cost method for launching a pool, especially for parties that are less experienced in the field and/or have limited resources. (Of course, the pool will later need to execute a full essentiality test in order to meet the requirements /of competition law.);

- c) The establishment of a “*Forum to review pool terms*”. Contrary to many other SSOs that stay as far as possible from any discussion on commercial licensing terms, this SSO has set up a specific body where stakeholders (patent owners, implementers, pool administrators) can meet and discuss proposed licensing conditions/structures in pools – usually during the pool formation stage, where these licensing conditions are not yet set. According to involved parties, this forum has had significant, positive impact on several important pools, including the AVC/H.264 pool.<sup>281</sup> To prevent this from being seen as an anticompetitive conduct, it is stressed that this is expressly not a negotiation session between rights holders and the licensee community, but rather an exchange of views.

Also IEEE has been taking the idea of standardisation/pool linkages seriously. In 2008, this SSO entered into a 2-year cooperation agreement with the patent pool administrator Via Licensing. Public sources reported that the aim was to set up pools ‘soon after standards were issued’ and that the participation in pools would be voluntary.<sup>282</sup> However, not much was heard of this cooperation. Yet, in August 2012, the IEEE 802.11 Patent Pool Exploratory Forum was created, an effort to streamline the process of pool formation.<sup>283</sup> We have been informed, however, that since then, two commercial licensing administrators (Via Licensing and Sisvel) finally set up activities to create a pool for (some) 802.11 standards as well, making the IEEE activity no more necessary. This work at IEEE has now been halted.

***Providing incentives to participate in pools.*** Interestingly, the DVB effort mentioned above also combined the second elements of our central idea: in this effort, SEP holders are bound to binding arbitration unless they join the pool (thereby creating incentives for pool participation).<sup>284</sup> This indeed indicates one of the ways in which incentives could be created: offering pool participation as an ‘escape’ from new measures that are to be introduced (such as many measures discussed in this chapter). Indeed, if such a deal could make companies join a pool instead, much of the desired benefits, if not more, would already have been achieved.

***Making entities such as universities and SMEs more aware of the advantages of becoming a licensor in a pool.*** Universities, research institutes, nation states and individual patent owners together form a significant share of all known owners of essential patents. Among the larger SEP owners, they account for at least 5%; among all SEP owners their share is much higher, perhaps as much as 25-50%.<sup>285</sup> As a consequence, this category creates a significant fragmentation of patent

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<sup>281</sup> Eltzroth, C. (2008), op cit. In this paper, the AVC/H.264/ pool is referred to as the MPEG 4 Part 10 licensing program.

<sup>282</sup> [www.eetimes.com/electronics-news/4080218/IEEE-joins-move-to-patent-pools](http://www.eetimes.com/electronics-news/4080218/IEEE-joins-move-to-patent-pools).

<sup>283</sup> IEEE Press Release, 6 August 2012. IEEE 802.11 Patent pool exploratory forum launched: IEEE 802.11 Patent Holders Encouraged to Discuss Licensing Issues and Consider Ways of Streamlining Pool Formation. Available at <http://standards.ieee.org/news/2012/802pat.html>.

<sup>284</sup> Eltzroth, C. (2008), op cit., page 36/37 in particular.

<sup>285</sup> We investigated all patent disclosures at ANSI, ATIS, BBF, CEN, CENELEC, ETSI, IEC (including JTC1), IEEE, IETF, ISO (including JTC1), ITU, OMA and TIA, and cleaned/harmonized the names of the organizations that made these disclosures, and found 1315 distinct organizations (or individual patent owners). We further examined the largest 25% of these (in terms of number of disclosures) to determine the type of organization. Some 5% of all the declarations in that group came from universities, public research institutes, national states, or individual inventors. It is expected that among the remaining 75% of ‘smaller’ patent owners, the percentage of this type of owners is much larger, but we could not verify this: Going further does not only take more resources, but also gets increasingly difficult: the ‘smaller’ the patent owner, the harder it is to determine its identity. For instance, many universities use assignee names created for legal reasons by their technology transfer office, and from these names, and often nothing in these names hints at this being related to a

rights. Not all these parties may actively require licenses from implementers (in fact, the large majority of them do not), but their ownership does create uncertainties and certain risks. Patent pools could reduce these uncertainties and risks. At the same time, patent pools would give such parties an attractive mechanism to generate revenues on their inventions in a way that is more efficient than they could ever have done themselves. Providing incentives to universities and SMEs to join pools (and benefit financially from that choice) might also prevent them from selling their patents to parties that have more undesirable plans with those patents (of which the category of patent trolls is on the extreme end of that scale). Apart from providing positive incentives (awareness, direct support, perhaps financial triggers), public entities could also leverage their position as a significant (co)financer of public research (on international, national or other scale). One possibility is a contract provision which states that any patent that results from co-financed research, and which is eventually found to be essential to a standard, must be brought into a patent pool, if existing. A more far reaching rule would be to mandate that *any* SEP from a university (or publicly financed or financed research institute) would need to meet that condition.

### Summary

The table below summarises the idea.

**Table 5.13 Summary of “promoting patent pools”**

Table 5.13 Summary of “promoting patent pools”	
<i>Potential benefits</i>	<ul style="list-style-type: none"> <li>• Reduce transaction costs for both licensees and licensors (for the latter once set-up costs are recovered);</li> <li>• Introduce a coordination mechanism that helps to prevent royalty stacking;</li> <li>• Reduce search costs at the side of licensees;</li> <li>• Reduce uncertainty in total patent landscape, patent availability and pricing, thus reducing barriers to new entrants to implement standards;</li> <li>• Reduce or moderate the phenomenon of over claiming essential patents (by virtue of good essentiality testing mechanisms in pools);</li> <li>• May reduce the total royalty fee for licensees compared to the aggregate fee of the same patents when licensed in via bilateral negotiations;</li> <li>• Offer a mechanism of coordination through which patent owners can collectively decide on how to change (lower) their fees in response to changing market circumstances;<sup>286</sup></li> <li>• May increase the total royalty fee for licensors compared to the aggregate fee of the same patents when licensed out via bilateral negotiations;</li> <li>• More level playing field across implementers (more of them paying for the implemented patents, and paying the same level);</li> <li>• May allow relatively small SEP owners to effectively generate revenues from its patents;</li> <li>• May allow effective addressing of wilful infringement;</li> <li>• Less discrimination between implementers.</li> </ul> <p>In terms of the principal stakeholders:</p> <ul style="list-style-type: none"> <li>• Implementers benefit from reduced transaction costs and search costs, less uncertainty, typically lower license fees, and less discrimination between</li> </ul>

university. Yet, judging just from the names, we see numerous names that look like individual inventors, and thus we estimate that the combined share of the before-mentioned categories of SEP owners is between 25-50%.

<sup>286</sup> The lowering of fees can be repeatedly observed in many pools.

	<p>implementers that pay licenses and those that do not;</p> <ul style="list-style-type: none"> <li>• Patent owners benefit from reduced transaction costs, better possibilities to address wilful infringement of SEPs and a better functioning market for technology in general.</li> </ul>
<i>Potential costs</i>	<ul style="list-style-type: none"> <li>• Pools have substantial set-up costs (usually worn by the SEP owners that consider to join the pool, the pool initiator and/or the pool administrator);</li> <li>• It is difficult for pools to agree on revenue-sharing rules if there are significant (perceived) differences in the value of essential patents<sup>287</sup> or differences in the fees that the patent owners wish to receive (depending on their strategy and business model, among others);</li> <li>• Broad pools may create attractive positions for single firms to stay out of the pool but piggy-back on its success (such firms may succeed in appropriating larger royalty revenues than they might have been able absent the existence of a pool).</li> </ul>
<i>Expenditure directly related to implementation of measure</i>	<ul style="list-style-type: none"> <li>• [Depends on the exact measure as discussed in the text above.].</li> </ul>
<i>Disadvantages, possible risks or consequences</i>	<ul style="list-style-type: none"> <li>• None.</li> </ul>
<i>Necessary or desirable conditions / Relation to other proposals</i>	<ul style="list-style-type: none"> <li>• Few. As explained above, market conditions are developing in such a way that we expect pools to become more interesting for SEP owners anyway.</li> </ul>

Response by stakeholders to the suggested policy solution highlights a problem that would advocate for more focus on super-pools. We summarise the responses below:

- For products that include a lot of different standards, an implementer might be better off to have bilateral (and cross-) licenses in place. Otherwise pools lead to more the royalties getting stacked. So a promotion of pools is good for the industry, not only for the potential licensees but also for the potential licensors.

## 5.4 Introducing dispute resolution mechanisms

### Introduction and outline of the proposed solution

Prompted by the numerous and visible litigation cases, insiders have been wondering whether there are ways to resolve disputes in a way that would be less costly, faster and less distracting than a regular, full-fledged case before court. In addition, a SEP owner threatening to engage in expensive litigation or pursuing an injunction or an exclusion order if the licensee does not pay the

<sup>287</sup> The owners of more valuable patents will want a higher per-patent share in the revenues, while the others may insist on a harmonized, one-fee-per-patent basis. An interesting solution was adopted in the One-Blue pool, where optical disc patents (a category of patents that was considered to be more fundamental and more valuable) receive twice as much as other patents.

requested royalties creates a powerful incentive for the licensee to settle, even on poor terms.<sup>288</sup> Since many of these cases essentially are about the level of the royalties, alternative dispute mechanisms could be an option. A suggestion to have such an alternative dispute mechanism located at SSOs themselves was made by the three key individuals at European and American competition authorities we referred to above.<sup>289</sup> More specifically, these authors advised that “A F/RAND commitment should include a process that is faster and lower cost for determining a F/RAND rate, or adjudicating disputes over F/RAND, than litigation. The expensive nature of litigation creates frictions in the market for ideas, is a high transaction cost for licensees and renders this market less accessible for smaller firms. Each SSO can consider alternatives (even if leaving litigation as one possible option) that it thinks will work well for its members and technologies. The types of solutions we have in mind, without meaning to suggest that any one is the right solution in any particular instance, include arbitration and alternative dispute resolution within the SSO. These procedures could be made more efficient by the SSO defining, for example, the specification of the base to which a royalty should apply or other factors that would simplify the assessment as to whether a particular licensing offer is F/RAND. The goal we have in mind is that a third party, such as a judge or arbitrator, should be able to quickly and cost-effectively determine whether an offer is F/RAND.”

Additionally, these authors believe that “The F/RAND dispute resolution process should require that the licensor specify a cash price for its SEPs as an alternative to other pricing arrangements to aid in evaluation of the proposed license terms by the third party. Determining if a complex package of cross-licenses satisfies F/RAND is difficult for a third party. If the licensee has the option to choose a F/RAND cash price, but instead chooses to cross-license, then clearly it is better off.” (Emphasis added).<sup>290</sup> This links the idea to the proposed solution numbered S7 (‘cash-only’), discussed in Section 5.1.

For the remainder of this section, the above idea is now phrased as follows: “In the context of SSOs, provide stakeholders with an alternate dispute resolution (ADR) mechanism that can prevent court trials”. We will also refer to this solution as “SSO dispute resolution”. As we will discuss later, there are various mechanisms that can be used here (arbitration, mediation, mini-trial and more), some which have binding outcomes, and some that do not.

### Costs and benefits

The potential benefits of SSO dispute resolution are manifold. Compared to court cases, they can offer the following: (i) faster resolution of conflicts; (ii) lower costs (see below); (iii) a lower threshold for parties to seek a solution when bilateral negotiations fail;<sup>291</sup> (iv) more consistent outcomes, as parties can no longer do forum shopping; (v) higher quality outcomes, as a result of applicable competences, specialism and cumulative knowledge by the arbiters; (vi) fairer outcomes, especially when licensing conditions are not discussed under the threat of injunction; (vii) more creative and more focused on problem solving than litigation, which has always been based on an adversarial model and (viii) once the dispute is over, the parties face no appeals, delays, continuing expenses, or unknown risks.

These benefits are to the advantage of implementers and patent owners alike.

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<sup>288</sup> Kühn, K.-U., Scott Morton, F., & Shelanski, H. (2013). Standard Setting Organizations Can Help Solve the Standard Essential Patents Licensing Problem. CPI Antitrust Chronicle, March 2013 (Special Issue).

<sup>289</sup> Kühn et al, op cit.

<sup>290</sup> Kühn et al, op cit.

<sup>291</sup> This can potentially be a costs raiser as well, if this mechanism proves to be very successful.

Moreover, this mechanism might have a preventive effect in that it lowers the risk that patent owners demand non-FRAND rates in the first place (knowing there is a low-threshold resolution mechanism open to the implementer). If so, the benefits would be very substantial, because the instrument would not only affect the 'tip of the iceberg' parties that would go to full-fledged litigation, but also many smaller implementers that would never go to court.

Finally, should outcomes also be made public (which would be possible with varying degrees of confidentiality about the actual case), this instrument may also generate valuable public benchmark data, benefitting the industry and implementers at large and helping to reduce the ambiguity of FRAND.

Note, however, that the above section uses the words 'can', 'might' and 'may'. Experts have pointed out to us that it should not be taken for granted that these benefits will actually materialize. This strongly depends on the implementation and on a number of other critical factors, including industry support.

Concerning the costs of such a venue, some experienced arbiters we interviewed have indicated that it should not be taken as a fact that the costs are lower than that of a court. Such a dispute resolution venue should have very competent staff; three persons at a rate of 6,000 to 8,000 Euro per day are a reasonable assumption. The set-up costs of such a venue, including the appointment of appropriate arbiters, will also be substantial and can easily take up to 6 months. The level of legal fees and advice sought by the parties themselves may be much lower for such SSO dispute resolutions than they are for court cases, especially when compared to full-fledged US court cases. However, this all depends strongly on the implementation of this resolution mechanism.

A significant disadvantage or possible risk is that the industry does not support this idea, or no broad agreement can be obtained on the underlying guiding principles. Then there is a risk that no consensus can be reached in the bodies that vote/decide on SSO IPR policies.

Also, too much success can increase costs again and a (perceived) unbalanced conflict resolution process may disadvantage SEP owners (and also the true innovators among them) and have a negative impact on the standard, the SSO and the willingness to contribute to the standard.

## Implementation

Firstly, it is important to point out that there are various forms of alternative dispute resolution. In the context of this study, the most important ones are:<sup>292</sup>

- **Arbitration.** Here, a neutral party hears the disputants' arguments and imposes a final and binding decision that is enforceable by courts. An important difference with court decisions is that arbitration typically offers no effective appeal process. Generally, the disputants agree to an arbitration procedure before an actual conflict arises, but this is an aspect that could be deviated from in the current SSO context (making its use a voluntary choice for both parties after the dispute arose; see also below);
- **Mediation.** This procedure depends on the willingness of the disputants to solve their problems, and the mediator (also known as facilitator) never imposes a decision upon the parties. It is usually a multi-stage process that includes caucusing and shuttle diplomacy; a mediator tries to get the parties to make offers and counter-offers until agreement is met. Evidence suggests that parties are more willing to comply with the outcomes of mediation than they are with adjudicated decisions imposed on them by a judge or another outside party;

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<sup>292</sup> The below explanations are based on West's Encyclopedia of American Law, Edition 2.

- **Mediation-Arbitration ('med-arb')**. Here, a mediator tries to bring the parties closer to each other. However, when he does not succeed, the procedure changes into an arbitration process;
- **Mini-trial**. These are used, among other things, to solving large-scale disputes involving complex questions of mixed law and fact, such as product liability and antitrust cases. The disputants present their case as in a regular trial, but with the notable difference that the case is "tried" by the parties themselves and the presentations are dramatically abbreviated. Lawyers and experts present a condensed version of the case to top management of both parties. Often, a neutral adviser—sometimes an expert in the subject area—sits with management and conducts the hearing. After these presentations, top management representatives—by now more aware of the strengths and weaknesses of each side—try to negotiate a resolution of the problem. If they are unable to do so, they often ask for the neutral adviser's best guess as to the probable outcome of the case. They then resume negotiations.

Now we turn to the possible use of ADR in the context of patent and standards. It is currently unusual for SSOs to have a dispute resolution mechanism aimed at disagreements on licensing terms. Yet, it is not completely new either: VITA's patent policy includes an arbitration procedure to resolve disputes over members' compliance with the patent policy.<sup>293</sup> Arguably, this includes FRAND-type disputes. Also the standardization activities of the successful DBV standards have build-in arbitrage. The policy in question states that *'Each Member hereby agrees... that... all disputes with any other Member... regarding solely the terms and conditions of licences... shall be finally settled under the Rules of Conciliation and Arbitration of the International Chamber of Commerce by three arbitrators appointed in accordance with such Rules. Arbitration shall take place in Frankfurt, Germany.'*<sup>294</sup> The word 'shall' indicates that arbitration is the exclusive means to resolve disputes between members ('mandatory') and precludes recourse to judicial proceedings.<sup>295</sup> Ads put by some of the parties involved: *"Arbitration is a right to be exercised by DVB members"*. Because arbitration can only be invoked by those that are a DVB member, membership is being made more attractive for the implementing community. Finally, but perhaps less known, is that the idea of having arbitration within an SSO was part of ETSI's draft IPR policy from the early 1990s, but this part of the draft was eventually not adopted.<sup>296</sup> Currently, the possible inclusion of rules on alternate dispute resolution (ADR) in the ETSI IPR policy are again being discussed by the IPR Special Committee (SC)<sup>297</sup> in a series of meetings that started in March 2012. We were informed by ETSI that currently, WIPO is developing a tailored offer for arbitration of SEP related licensing disputes with the help of ETSI and interested members and that results from WIPO are expected around the end of 2013. We were also informed that it is not expected that ETSI will exclusively recommend the use of one single organization for ADR.

An important element is also whether or not the use of an alternative dispute mechanism is mandatory for both parties that are in dispute. More specifically, we could think of the following scenarios:

<sup>293</sup> See Bekkers & Updegrave, op cit., page 20. Scott Morton, F. (2012). The Role of Standards in the Current Patent Wars. Talk at the Charles River Associates Annual Brussels Conference: Economic Developments in European Competition Policy, December 5, 2012. Department of Justice (DoJ).

<sup>294</sup> See Eltzroth, C. (2008). op cit, Eltzroth, C. (2009)., op cit.

<sup>295</sup> Ibid, at page 36.

<sup>296</sup> The draft policy is known as document ETSI/GA12(92)3. See Iversen, E. (1999). Standardisation and Intellectual Property Rights: ETSI's controversial search for new IPR-procedures. In K. K. Jakobs & R. R. Williams (Eds.), SIIT'99 - IEEE Conference on Standardisation and Innovation (pp. 15-17). Aachen, Germany: IEEE., and also Brooks, R. G., & Geradin, D. (2011). Interpreting and Enforcing the Voluntary FRAND Commitment. International Journal of IT Standards and Standardization Research, 9(1), 1-22. See page 8.

<sup>297</sup> Within ETSI, this body is an advisory committee and as such it has no decision power. However, it can advise the ETSI General Assembly (GA) on IPR matters and propose changes to the IPR policy and Guide. The GA possesses decision-making powers, usually voting on the basis of a 71% majority.

1. It is mandatory for all SSO members/participants, and it is retroactive, so regardless of when licensing commitments were made (e.g. if the ADR is added as a clarification to existing policies);
2. It is mandatory for all SSO members/participants for new licensing commitments (e.g. when ADR is part of a policy change);
3. It is voluntary and, at the time of making a licensing commitment, a patent owner chooses whether or not he is willing to be bound to such an ADR if a future conflict arises;
4. It is voluntary and, at the time of the conflict, a patent owner chooses whether or not he is willing to engage in an ADR.

(Note that the above scenarios are independent of the question whether or not the *outcome* of the ADR is binding to the parties and whether or not there are possibilities to appeal that outcome.).

We have understood that within ETSI, the current discussions focus on voluntary ADR mechanisms and it is not expected that this body will make dispute resolution mandatory.

We learned from interviewees with extensive experience in arbitration and dispute resolution that setting up such a mechanism is a non-trivial task. Firstly, the venue should combine the right competences (for instance a lawyer, a forensic accountant and an industry expert), not only to conduct the job properly, but also to gain respect from the industry. Second, the implementation of SSO dispute resolution will require considerations about a number of choices, including - but not limited to – the following: (i) the specification of the issues subject to arbitration; (ii) the process for selecting arbitrators; (iii) rules or procedures that the arbitrators will follow, including the availability of discovery; (iv) the remedies that the arbitrators can adopt; (v) mechanisms - if any - by which arbitral decisions can be appealed and (vi) criteria to be applied to such appeals.<sup>298</sup> In addition, there are questions on how the set-up costs and the operational costs are funded.

Another interesting implementation question is whether this is organized as an ‘internal’ unit in SSO or as an ‘external’ activity that has not only organizational and cost implications, but might also touch upon liability and confidence questions. If ADR is introduced as an external activity by an ADR service providers, then decision have to be made about the exact division of tasks between the SSO and this service provider. (As indicated above, ETSI is currently looking towards external ADR service providers.).

Also the scope of the questions to be addressed by this arbiter need to be considered. Does this only include a FRAND fee level (assuming that the patents claimed by the patent owner are indeed essential and valid, and infringed by a particular product<sup>299</sup>)? Or would the task of the arbiter also include patent validity and essentiality (and/or whether or not a particular product infringes the said patents). Including validity and essentiality makes the resolution mechanism considerably more complex, costly and time consuming, and might thus limit its attractiveness compared to a full-fledged court case. Secondly, judging on validity and infringement requires very specific knowledge and skills and might interfere with the role of the patent office and regular judges. Finally, the typical (underlying) dispute is usually related to the *overall* essential patent position of the two companies involved and the *overall* fees that are demanded, not only the fees for the patents that are being

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<sup>298</sup> Teece, D. J., Egan, E., Grindley, P., & Sherry, E. (Undated). Reasoning about Reasonable royalties: Evaluating Patent Licensing in Platform Based Industries. Retrieved from <http://businessinnovation.berkeley.edu/WilliamsonSeminar/teece012413.pdf>.

<sup>299</sup> en if a patent is essential and valid, a particular product may not necessarily need to implement all parts of the standard, and thus might not be infringing an essential and valid patent. Certain features may be optional, and certain parts of the standard are only relevant for particular product types (e.g. mobile station vs. infrastructure in case of a mobile telecommunications standard).

brought up for infringement only. Addressing validity and essentiality/infringement for all involved patents is much harder than in a typical infringement law case when usually only *selected* essential patents are brought forward.

Furthermore, any dispute resolution mechanism can only be as good as the information that it has at its disposal.<sup>300</sup> Is accurate knowledge concerning the SEP ownership of the parties as part of the dispute available? Is sufficient knowledge regarding the overall SEP ownership for the standards in question at hand? Are there benchmarks in terms of licensing payments or value? In this sense, the SSO dispute resolution mechanism cannot be seen in isolation from proposals to improve transparency (which we discuss in Section 5.2).

More of a principle nature is the question on whether or not agreement can be reached on (1) the underlying principles of 'reasonableness' and value determination and (2) whether these principles can be applied in real world cases. Should the principle be based on past R&D investments and the related risks? Or should it be based on the added value over the next available feasible technical alternative? Or the price that would have been reached in a hypothetical arms-length negotiation before the technology was included in the standard? In this sense, the SSO dispute resolution mechanism cannot be seen in isolation from proposals to clarify the meaning of FRAND (which we discuss in Section 5.5). In a way, these questions have also been at stake in various court cases on FRAND, but while some courts have chosen to embrace certain principles, this does not mean that everyone agrees or would agree for a dispute resolution mechanism to use the same principles. On the positive side, in the past, a lot of experience has been gained by determining reasonable royalty rates in other settings, including the pharmaceutical sector (where the UK case had compulsory licensing and, later, right-of-license cases where such rates had to be set), as well as in the copyright sector. Some of our interviewees have stressed that a lot can be learned from those people that have set up the SSO dispute resolution process.

Next, there is the important question of whether or not a SSO dispute resolution regime is to be used for future disclosed patents only (which constitutes a "policy change"). Or would it have a retrospective effect for patents that were already disclosed (which constitutes a "policy clarification")?<sup>301</sup> Without having performed a thorough analysis, we believe that only the first form is feasible: to introduce an SSO policy change, which makes dispute resolution a mandatory element of the new commitment made by SEP owners.

An interesting idea is to link arbitration with pooling. More specifically, the DVB Project specifies that its mandatory arbitration mechanism does *not* apply for situations in which the patents are pooled. This way, the 'burden' or 'unattractiveness' of an arbitration procedure (at least, from the perspective of the patent owner) is used as an incentive for patent owners to join pools. In this specific case, it is believed that this 'coupling' of arbitration and pooling has promoted and 'spurred' the creation of pools.<sup>302</sup>

Finally, an appealing proposal for further implementation of SSO dispute resolution was recently put forward by Lemley and Shapiro.<sup>303</sup> In short, they propose that the SSO policy protects implementers from an injunction or exclusion order, but only if they do agree to pay a reasonable

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<sup>300</sup> though this might be less so for the baseball-proposal; see below.

<sup>301</sup> See Bekkers & Updegrave (op cit.), page 110-112, for a more extensive discussion on policy changes versus policy clarifications.

<sup>302</sup> See Eitzroth, C. (2008), op cit., page 37 in particular.

<sup>303</sup> Lemley, M. A., & Shapiro, C. (2013). A Simple Approach to Setting Reasonable Royalties for Standard-Essential Patents. Stanford Public Law Working Paper No. 2243026. (forthcoming Berkeley Technology Law Journal). Retrieved from SSRN: <http://ssrn.com/abstract=2243026>.

royalty rate, as determined through binding arbitration if necessary. For this arbitration, the authors express their preference for a baseball-style (or “final offer”) arbitration, under which each party submits its final offer to the arbitrator, who then must pick one of these two offers. As this is a very simple procedure to implement, its attractiveness may be great. It creates incentives for both the licensor and the licensee to submit a proposal that is indeed as close to the ‘ideal’ FRAND rate as possible. Otherwise the alternative proposal will be selected. The proposal is designed to steer bilateral, ex post negotiations towards royalty rates that reflect the outcome of ex ante technology competition. As put by the authors: “there is no need for the SSO to be substantively involved in deciding what is reasonable, no need to decide whether one party or another breached a contract so long as they participated in the arbitration, no need to decide whether a patent holder’s offer was actually a FRAND offer, no need to worry about which jurisdiction is litigating the issue and no need for antitrust law to intervene so long as the parties are abiding by their FRAND commitments.” Although some of the people we interviewed considered this baseball-style arbitration to be a very crude solution, and commented that the arbiters should at least have performed an analysis to be able to see the submitted solutions are or are not indeed within any FRAND boundaries, the proposal does seem to have certain benefits.

## Summary

The table below summarises the idea.

**Table 5.14 Summary of “introducing dispute resolution mechanisms”**

Dimension	Comments
<p><i>Potential benefits</i> (compared to court cases)</p>	<ul style="list-style-type: none"> <li>• Faster resolution of conflicts;</li> <li>• Lower costs;</li> <li>• Lower threshold;</li> <li>• More consistent outcomes (no forum shopping);</li> <li>• Higher quality outcomes (more competences and specialism);</li> <li>• Fairer outcomes (when conditions are not discussed under threat of injunction);</li> <li>• More creative and more focused on problem solving van litigation;</li> <li>• Once the dispute is over, the parties face no appeals, delays, continuing expenses, or unknown risks.</li> </ul> <p>Indirectly, there are also the following benefits:</p> <ul style="list-style-type: none"> <li>• Preventing patent owners to demand non-FRAND rates in the first place (knowing there is a low-threshold resolution mechanism open to the implementer);</li> <li>• Knowledge build-up concerning value/reasonable rates, both in general as well as in specific cases;</li> <li>• (Possibly) public benchmark data.</li> </ul> <p>The above advantages benefit implementers and patent owners alike.</p>
<p><i>Implementation costs</i> (direct financial costs)</p>	<ul style="list-style-type: none"> <li>• Set-up costs of such a venue (6 months of work);</li> <li>• Operational costs (estimated 20K Euro per acting day).</li> </ul>
<p><i>Disadvantages, possible risks or consequences</i></p>	<ul style="list-style-type: none"> <li>• There is a risk that the industry does not support this idea or that no wide agreement can be reached on the underlying guiding principles. Then there is a risk that no consensus can be found in the bodies that vote/decide on SSO</li> </ul>

Dimension	Comments
	IPR policies; <ul style="list-style-type: none"> <li>• A (perceived) unbalanced conflict resolution process can disadvantage SEP owners (and also the innovators among them) and have a negative impact on the standard, the SSO and the willingness to contribute to the standard.</li> </ul>
<i>Necessary or desirable conditions / Relation to other proposals</i>	<ul style="list-style-type: none"> <li>• To make this mandatory for SEP owners as well as for implementers (as far as both are SSO members/participants), a change in SSO IPR policy will be required.</li> </ul>

Response by stakeholders confirms and adds to the disadvantages, possible risks or consequences identified above. We summarise the responses below:

- Alternative dispute resolution can make sense in some situations, but it is not a silver bullet to resolve commercial disputes between companies;
- Alternative dispute resolution is in many cases more expensive than normal court proceedings. Also, it is a misbelief that alternative dispute resolution is always quicker than judicial proceedings. Further, the quality of the arbitration award is not always as high as a judgment from a court in a recognized jurisdiction;
- The task of defining the dispute and framing what to put in front of the arbitrator is therefore the main obstacle to an effective use of alternative dispute resolution in the cases at hand. Experience made during controversial discussions at SSOs over the last 18 months indicates that it is unlikely that parties will be able to agree on this issue;
- In any case, it has to be clear that any dispute resolution mechanism can always only be on voluntary basis. SSOs cannot deprive individuals of their rights of petitioning. Access to justice is a universally recognized right and is one of the pillars of the European Union;
- The biggest challenge with ADR is to clearly define the scope of the dispute. Framing what is to be submitted to the arbitrator is a particular challenge in situations where the parties have no existing contractual relationships.<sup>304</sup>

## 5.5 Principles on FRAND definition/royalty principles

### Introduction and outline of the proposed solution

FRAND has large number of dimensions, inducing the following: (i) the allowed royalty rates and royalty bases; (ii) whether licensing can be made subject to reciprocity conditions - and which conditions exactly; (iii) whether licensing can be made subject to reciprocity bundling other SEPS or non-SEPs; (iv) whether the patent owner is entitled to seek injunction in case of infringement; (v) whether the initial offer of the SEP owner should be FRAND or whether this only applies to the outcome of the process, and several more. A number of these issues have already been addressed

<sup>304</sup> While ADR may typically be well suited to deal with contractual disputes (e.g. dispute between the parties of a license over the scope of such license), things get more complicated where ADR is to be applied on a situation where the parties have no existing relationship and where the dispute between those parties is exactly about the establishment of such a relationship. While one party may want to have the ADR process being limited to the adjudication of a FRAND royalty for a single standard essential patent. The other party may wish to adjudicate the monetary and non-monetary terms and conditions of a portfolio license or a cross-license arrangement that involves both the licensing of patents essential to a larger number of standards and non-essential patents. The task of defining the scope of the arbitration is further complicated by the fact that one party may wish to include any related defence in the adjudication process, such as non-infringement, validity, enforceability, etc., while that other party is of the view that this would unduly overburden the adjudication and insists on having those arguments being pleaded outside the ADR.

in Section 5.2. In this section we will focus entirely on the first two dimensions: principles related to the level and base of royalties.

This section deals with the development of general principles for the basis of the determination of FRAND licensing terms and conditions – most specifically those for the royalty base and the royalty fee. While most if not almost all SSO IPR policies have FRAND as their central element in the policy, almost none defines how this principle is to be interpreted. Practice demonstrates there are wide variations in how parties perceive what FRAND means in a particular setting, because of the lack of explicit principles in the IPR policies and in the licensing commitment made by SEP owners (which are made on the basis of these policies). One of the most visible demonstrations of such varying views is the law case between Motorola (and later Google) and Microsoft, where the FRAND rates defended by the two parties differed by as much as a factor 2000.<sup>305</sup>

In absence of such principles in IPR policies, the FTC and the European Commission have started to state some principles in policy documents. The starting point for competition/antitrust authorities seems to be the concept of ‘reasonably royalties’ as known from patent law, where courts have been asking this question already for a very long time, for instance in patent damage cases. Here, a reasonable royalty normally is based on a hypothetical, arms-length negotiation between a willing buyer and a willing seller taking place at the time the infringement begins. In such a case, we would assume both parties to be in a position to refrain from entering into an agreement if such an agreement is not considered to be sufficiently attractive. The prospective licensee would be in a position not to include the technology in question, either opting for an alternative, or just not implementing a particular feature. However, there are a few specificities about the standard-setting context here. Most importantly, when talking about SEPs, the prospective licensee is not in a position to decide not to license. By virtue of the definition of an SEP, the patent is indispensable for any party that wishes to compete in the product market served by that standard. In consequence, an appropriate definition would be to consider the outcome of a hypothetical, arms-length negotiation between a buyer and a seller at the point in time at which the technology was considered for inclusion in the standard. Once a particular patented technology is incorporated in a standard, its adoption eliminates alternatives. Or, as phrased by Shapiro and Varian: *“Reasonable should mean the royalties that the patent holder could obtain in open, up-front competition with other technologies, not the royalties that the patent holder can extract once other participants are effectively locked in to use technology covered by the patent”*.<sup>306</sup>

Lines of arguments similar to the above have led the FTC to adopt a recommendation “that in case of SEPs, Courts should cap the royalty at the incremental value of the patented technology over alternatives available at the time the standard was defined”.<sup>307 308</sup>

In the same vein, the European Commission, in its Guidelines on horizontal cooperation agreements, wrote that “in case of a dispute, the assessment of whether fees charged for access to IPR in the standard-setting context are unfair or unreasonable should be based on whether the fees

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<sup>305</sup> In this case, Motorola/Google’s licensing demand to Microsoft was USD 4 billion annually for using patents on the (ITU) H.264 video coding standard and the IEEE 802.11 ‘Wi-Fi’ standard’, while Microsoft claimed that a FRAND fee would be much, much lower. Eventually the judge ruled that Motorola/Google was not entitled to ask more than 1.8 million annually for these patents ([www.reuters.com/article/2013/04/26/us-microsoft-google-trial-idUSBRE93P0BA20130426](http://www.reuters.com/article/2013/04/26/us-microsoft-google-trial-idUSBRE93P0BA20130426)).

<sup>306</sup> Shapiro, C., & Varian, H. R. (1999). Information rules: A strategic guide to the network economy. Harvard Business Press.

<sup>307</sup> FTC. (2011). The Evolving IP Marketplace: Aligning Patent Notice And Remedies With Competition. Federal Trade Commission. See page 194 in particular.

<sup>308</sup> A difficulty with this ‘incremental value’ approach is that in a situation in which there are many cumulative inventions, as is the case in many SEP-intensive areas, it may be very hard to determine the incremental value of any individual patent or sets of patents. Yet, there are other approaches, such as the analysis of royalties for comparable patents or licenses, or royalties for the same patents when they are also licensed out for purposes outside the standard in question.

bear a reasonable relationship to the economic value of the IPR. [... A possible method would be to...] compare the licensing fees charged by the company in question for the relevant patents in a competitive environment before the industry has been locked into the standard (ex ante) with those charged after the industry has been locked in (ex post)".<sup>309</sup> It might be argued, however, that there is no such thing as an 'ex ante value' without the context of a product or product category in which the patented technology is going to be used and that the appropriate value could differ as a function of the devices in which a technology is being incorporated<sup>310</sup> (and that neither a unit price or a percentage would be appropriate).

While the views adopted by these competition/antitrust authorities are very valuable, their scope is limited in some sense. First of all, it is 'only' an interpretation by antitrust authorities and, absent of further clarification of the meaning of FRAND in SSO policies or commitments itself, it is not clear whether members of SSOs intend that FRAND royalty commitments should reflect incremental values (see below) or some other notion of fair and reasonable pricing. Depending on the specific features of the case, a US or European judge may or may not need to accept the views endorsed by competition authorities expressed above. As put by Lemley and Shapiro: "FRAND commitments have taken on increasing importance in recent years as courts have been called upon to decide upon their meaning and as the Federal Trade Commission has brought antitrust actions to enforce those commitments. This litigation is largely a function of ambiguities and omissions in the FRAND system used by most SSOs."<sup>311</sup>

A specific issue that has drawn increasing attention has been the licensing base. There is a wide variety of ways in which patent owners can specify payment for licenses (singular lump sum payment, yearly fixed fee, payment based on milestones achieved, per-unit fees, value-based fees and more). In the field of patents and standards, two fee structures are dominant. In the field of coding technologies, among others, we predominantly find unit-based fees: the licensee pays an agreed, fixed<sup>312</sup> price per product that implements the technology. In the field of telecommunications, among others, we mostly find value-based fees: the licensee pays an agreed percentage of the value of the product, for instance the ex-works selling price or the wholesale price. It is in the latter pricing structure that increasing concern is expressed: ever more, products incorporate many different standards (convergence). In such a product, a single standard may no longer be so central to the overall product value as in the event that a product is entirely built around a single technology. An example: in a USB WiFi key, this wireless communications capability represents the full functionality of that device. However, if we consider a Tablet, a laptop, a game console, a photo camera or even a car with WiFi capabilities, this is no longer the case. This challenges the appropriateness of value-based ('percentage') royalty bases. In the case of single functionality devices adopting only one standard, a royalty fee for that standard of, say, 3% of turnover might be appropriate.<sup>313</sup> In case a device is implementing many functionalities (and sometimes many standards), a royalty of 3% per standard might not be appropriate. In an extreme case, a WiFi SEP owner that would demand 3% of the selling value of a full car would appropriate much more value than its invention really contributes to the product. Hence, parties have been

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<sup>309</sup> European Commission (2011). Communication from the Commission (2011/C 11/01) on Guidelines on the Applicability of Article 101 of the Treaty on the Functioning of the EU to Horizontal Co-operation Agreements. See paragraph 289 in specific.

<sup>310</sup> For instance: when the laser was invented, in 1960, it would have been very hard to set any licensing fee for any patents on this invention because it was initially not clear what product categories it could be used in, and what the 'value' of these product categories were.

<sup>311</sup> Lemley, M. A., & Shapiro, C. (2013). A Simple Approach to Setting Reasonable Royalties for Standard-Essential Patents. Stanford Public Law Working Paper No. 2243026. (forthcoming Berkeley Technology Law Journal). Retrieved from SSRN: <http://ssrn.com/abstract=2243026>.

<sup>312</sup> Though specific rules may apply, such as thresholds, volume discounts, etc.

<sup>313</sup> This is purely a hypothetical number, for the sake of the argument.

calling for guidance regarding royalty demands that could be a disproportionate share of product value when it is necessary for patents to comply with a standard and when the product includes multiple technologies.

Some stakeholders have suggested that the licensing percentage should be based on the “smallest identifiable components” or the “smallest identifiable unit” making use of the patents. In contrast, others have criticized this suggestion, arguing that it would hollow out the licensing fee structure and that SEP owners would need to adopt a steep increase in percentages in order to receive a reasonable compensation. Moreover, this approach could encourage implementers to find ways to make the ‘smallest identifiable units’ increasingly smaller with the only reason being to reduce licensing fees. The discussion on an appropriate fee basis is far from closed. (Another related discussion is *where* along the value chain license agreements are conducted. In many standards-related markets, there is a mixture with parties obtaining licenses at different points of the value chain. Some patents will be exhausted when the patented technology is integrated into a component or sub-product and, if a party higher up in the value chain also pays for that patent, then there would be ‘double-dipping’. On the other hand, some patents are not yet infringed by the components themselves and infringement only occurs once components or sub-modules are put together or a device is assembled.<sup>314</sup> For both licensor and licensee, there may be desirable points along the value chain for making agreements. Some standards implementers, for example, may prefer to purchase components for which the licensing fees are already paid. Furthermore, component makers and patent owners may have different preferences. In addition, not all patent infringements occur at the component level, as explained above.

The central idea behind this section is to include further clarification of FRAND within SSOs. For the remainder of this section, the above idea is now phrased as follows: *“The further clarification, within SSO IPR policies and/or the related licensing commitment documents, of the general principles on how the FRAND concepts is meant to be interpreted, for instance including notions on the royalty fee level, appropriate bases for the royalty calculation, the consideration of other essential patents for the same standard and specific terms and conditions such as reciprocity”*.

### Benefits and costs

With the overall goal to reduce interpretation differences, and therefore uncertainty, the clarification of FRAND would:

- Enable market parties (both implementers and patent owners) to propose and evaluate licensing proposals at lower costs and in shorter time;
- Enable judges, juries (if applicable) and competition authorities to evaluate whether a licensing proposal or licensing agreement is compatible with FRAND;
- Prevent (severe) overpricing of licenses, which is especially a risk for small and medium-sized parties that do not have the information or resources to evaluate offered licensing rates;
- Prevent (severe) under-pricing of licenses, especially in the case of SME patent owners that have a lower bargaining power and/or negotiation skills than larger implementers; and
- Reduce the number of later conflicts, including court cases and competition/antitrust cases.

As a result, a fairer playing field would be created; reducing transaction costs (shorted and less contentious negotiations, smoothing the licensing process and reducing costly, lengthy and risky litigation.

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<sup>314</sup> An example would be if a device maker would work purely from general-purpose components, such as transistors. Putting them together in a certain way might be considered infringement of a patent.

While the realized effects will depend on the specificity of the clarification, there is a trade-off in terms of the number of specific cases where the clarification would be inappropriate or unfair, a trade-off in dealing with differences between markets and sectors and a trade-off in being able to cope with unforeseen future developments (robustness).

### Implementation

In terms of implementation costs, the most significant elements would be the efforts that stakeholders and SSO staff would need to make to come to an agreement and change the SSO IPR policy. In several SSOs, this idea is being discussed. In ETSI, clarification of FRAND is one of the four main topics discussed by the IPR Special Committee (SC)<sup>315</sup> in a series of meetings that started in March 2012. Among other things, it was proposed at these meetings that ETSI should provide guidelines/principles for compensation elements under the FRAND commitment. In August 2013 ETSI informed us that so far no consensus views had been found, however the proposal to close the discussion has not been accepted.

### Summary

The table below summarises the idea.

**Table 5.15 Summary of “developing principles on FRAND definition/royalty”**

Table 5.15 Summary of “developing principles on FRAND definition/royalty”	
Potential benefits	<ul style="list-style-type: none"> <li>• Facilitates market parties (both licensors and licensees) to propose and evaluate licensing proposals;</li> <li>• Facilitates judges, juries (if applicable) and competition authorities to evaluate whether a licensing proposal or licensing agreement is compatible with FRAND;</li> <li>• Prevents (severe) overpricing of licenses, which is especially a risk for small and medium sized parties that do not have the information or resources to evaluate offered licensing rates;</li> <li>• Prevent (severe) under-pricing of licenses, especially in the case of SME patent owners that have a lower bargaining power and/or negotiation skills than larger implementers;</li> <li>• Reduces the number of later conflicts, including court cases and competition/antitrust cases;</li> <li>• As a result, a fairer playing field would be created, reducing transaction costs (shorter and less contentious negotiations, smoothing the licensing process, and reducing costly, lengthy and risky litigation.</li> </ul>
Potential costs	<ul style="list-style-type: none"> <li>• Patent owners may be restricted to execute what they themselves consider to be a FRAND compatible licensing programme.</li> </ul>
Expenditure directly related to implementation of measure	<ul style="list-style-type: none"> <li>• The most significant direct financial costs would be the efforts that stakeholders and SSO staff would need to make to come to an agreement and change the SSO IPR policy.</li> </ul>

<sup>315</sup> Within ETSI, this body is an advisory committee and as such it has no decision power. However, it can advise the ETSI General Assembly (GA) on IPR matters and propose changes to the IPR policy and Guide. The GA possesses decision-making powers, usually voting on the basis of a 71% majority base.

Disadvantages, possible risks or consequences	<ul style="list-style-type: none"> <li>• This might trigger complex discussion about which underlying principles would be appropriate and to what degree it can be used in a practical context (is the required data available?);</li> <li>• While the realized effects will depend on the specificity of the clarification, there is a trade-off in terms of the number of specific cases where the clarification would be inappropriate or unfair, a trade-off in dealing with differences between markets and sectors and a trade-off in being able to cope with unforeseen future developments (robustness).</li> </ul>
Necessary or desirable conditions / Relation to other proposals	<ul style="list-style-type: none"> <li>• [None identified].</li> </ul>

Response by stakeholders confirms the disadvantages, possible risks or consequences identified above. We summarise the responses below:

- Defining basic principles might be possible, but any detail must be avoided to prevent a negative impact on specific cases. A “one-size-fits-all” is just not possible! A definition that is too strict risks ignoring fully unpredictable future markets, product structures, product chains, product prices and competing technologies;
- FRAND determinations are inherently fact and case-specific.<sup>316</sup> The essential patent holder and prospective licensee are the primary mechanism to establish terms consistent with FRAND undertakings. If negotiations fail, courts are able to enforce FRAND undertakings. It is neither necessary nor appropriate for an SSO to define any “one size fits all” set of principles or guidelines for determining fair, reasonable and non-discriminatory terms and conditions.

## 5.6 Transfer issues

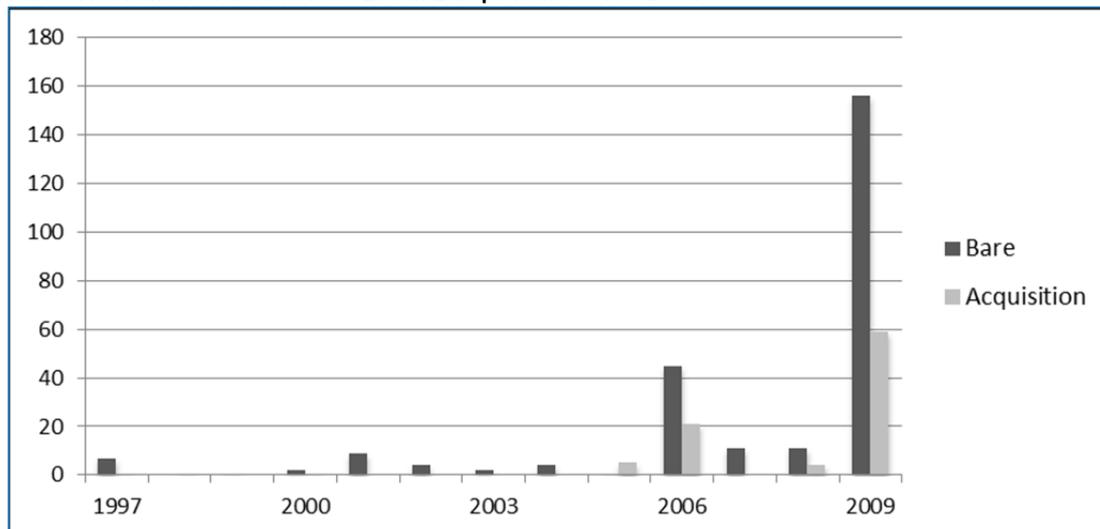
This section focuses on measures to address the increased risk of hold-up when declared SEPs are transferred to new owners. The problem originates in the fact that the FRAND commitments made by initial SEP owners are usually too vague to effectively bind subsequent owners upon the sale of a patent and may therefore be dismissed by subsequent owners. Solving it requires solutions that ensure that all successive owners of a SEP are similarly and effectively bound by the initial FRAND commitment.

More generally, SEP transfers contribute to the lack of transparency about SEP ownership, because their occurrence and the identity of new owners are not public information. A possible means to address this problem is the notification of SEP transfers by recordation. Since recordation is already presented in Section 5.2.7 (above) as one of the measures to enhance transparency on SEP ownership, it is not discussed further in this section.

<sup>316</sup> FRAND is not limited to a specific type of licenses formula. Implementation of the FRAND undertaking has intentionally been left flexible in SSO Patent Policies[...] Like other reasonableness standards, it does not dictate specific licensing terms, but instead provides flexibility across a diverse range of situations that allows market participants to negotiate customized solutions that takes into consideration all of their particular business needs.

SEP transfers and related concerns are a recent but growing phenomenon. As reported in Figure 3<sup>317</sup>, transfers of European SEPs declared at ETSI, ISO, ITUT, IEEE and JTC1<sup>318</sup> started increasing after 2005 and reached a peak in 2009. These transfers consist of numerous transactions of 2 to 10 patents and a few transactions involving large SEPs portfolios (both of which significantly contribute to the 2009 peak). A large majority of the transfers (83.5%) took place after standard release. While for ETSI more than 50% of transfers followed the SEP declaration, this is only the case for less than 10% of the transferred SEPs declared to other SSOs.

**Table 5.16 Number of transferred SEPs in Europe from 1997 to 2009.**



Anecdotal evidence suggests that the take-off of SEPs transfers observed in 2009 has persisted afterwards. A review of large patent transactions involving SEP transfers (Table 5.17) indicates that most of them took place after 2010, including massive ones such as the sale of Nortel's portfolio to a consortium of other companies or the acquisition of Motorola Mobility by Google in 2011.

<sup>317</sup> These statistics are based on reassignments of European SEPs declared from 1997 to 2009, and their matching with SEP declarations at ETSI, ISO, ITUT, IEEE and JTC1 during the same period. SEP transfers are defined as reassignments that are due either to a "bare" patent sale or to the acquisition of the patent owner by another entity.

<sup>318</sup> Although about 75% of transferred SEPs were declared at ETSI, this is due to the much higher number of declarations at this SSO during the period rather than a higher frequency of transfers. The share of SEPs that are subject to a transfer is indeed relatively uniform across SSOs, from 1% of all SEPs declared at IEEE to 3% at ETSI and 7% at JTC1.

**Table 5.17 Anecdotal overview of recent patents transfers in the field of technical standards, most likely including SEPs**

- 2013: Ericsson sells “2,185 U.S. and international patents and patents pending” to Unwired Planet (formerly Openwave);<sup>319</sup>
- 2012: Eastman Kodak sells its imaging patents portfolio to a consortium led by Intellectual Ventures and RPX Corp for US\$ 525 million;<sup>320</sup>
- 2012: Adaptix was sold to Acacia, along with its portfolio of believed LTE “essential” patents;<sup>321</sup>
- 2012 Interdigital sells 1,700 patents specifically related to 3G, LTE, and 802.11 technologies to Intel for \$375 million;<sup>322</sup>
- 2012: IPWireless sells “500 patents including essential concepts in LTE, LTE-Advanced and 3G/4G technologies” to Intellectual Ventures and NVIDIA;<sup>323</sup>
- 2012: Nokia sells “450 patents including 300 SEPs” to Sisvel;<sup>324</sup>
- 2012: Nokia sells “500 patents” to Vringo;<sup>325</sup>
- 2011: Nokia sells “2000+ patents” MOSAID;<sup>326</sup>
- 2011: Nortel Networks sells “6,000 patents and patent applications” to a consortium including Apple, EMC, Ericsson, Microsoft, Research In Motion and Sony, for a total of US\$ 4.5 Billion;
- 2011: Google sells patents to HTC;<sup>327</sup>
- 2011: Motorola sells its Motorola Mobility division to Google including a large patent portfolio valued at approx. US\$ 5.5 Billion;<sup>328</sup>
- 2010 A “set of ‘882 patents formerly owned by Novell” were sold to a consortium including Apple;<sup>329</sup>
- 2011 Hewlett Packard sells patents to HTC;<sup>330</sup>
- 2008: Avaya sells SEPs (which originate from AT&T) to High Point;<sup>331</sup>
- 2008: Ericsson sells 66 patents to Research in Motion (now: Blackberry), for an estimated US\$ 172 million;<sup>332</sup>
- 2007: Robert Bosch sells “>100 patents, 160 patent families, including SEPs” to IPcom.<sup>333</sup>

There can be various motives for SEPs transfers, with different implications. On one hand, the data suggest that large SEPs owners may purchase SEPs from smaller owners in order to reduce the fragmentation of SEPs ownership around a standard, thereby mitigating transaction costs and royalty stacking. In particular, SEP concentration increases significantly after a trade for some small standards where ownership was initially concentrated. On the other hand, there is consistent anecdotal evidence<sup>334</sup> that large incumbent companies monetize part of their portfolio by selling away patents to NPEs or new entrants that seek to strengthen their IP position (e.g. for cross-licensing). With an absence of clear boundaries of definitions of what FRAND means, these new owners may demand fees significantly above what was asked by the former owner and still argue

<sup>319</sup> <http://www.techdirt.com/blog/wireless/articles/20130114/18214821670/ericsson-sells-2185-mobile-tech-patents-to-newly-minted-troll-unwired-planet.shtml>.

<sup>320</sup> <http://www.reuters.com/article/2012/12/19/us-kodak-patent-sale-idUSBRE8BI0R520121219>.

<sup>321</sup> <http://gametimeip.com/2012/01/17/return-of-the-bubble-patent-sellers-put-acacia-back-on-their-christmas-card-list/>.

<sup>322</sup> <http://www.theverge.com/2012/6/18/3095233/intel-purchase-1700-mobile-patents-interdigital>.

<sup>323</sup> [http://pressroom.nvidia.com/easyir/customrel.do?easyirid=A0D622CE9F579F09&version=live&prid=886630&releasejsp=release\\_157&xhtml=true](http://pressroom.nvidia.com/easyir/customrel.do?easyirid=A0D622CE9F579F09&version=live&prid=886630&releasejsp=release_157&xhtml=true).

<sup>324</sup> <http://www.sisvel.com/index.php/sisvel-news/257-sisvel-acquires-over-450-nokia-patents-including-over-350-patents-essential-to-wireless-standards2>.

<sup>325</sup> <http://thenextweb.com/insider/2012/08/09/mobile-tech-firm-vringo-to-sell-31-2m-worth-of-stock-to-buy-ip-from-nokia-and-more/>.

<sup>326</sup> <http://techcrunch.com/2011/09/01/mosaid-acquires-2000-nokia-patents-will-handle-licensing-litigation-for-a-cut/>.

<sup>327</sup> <http://www.fosspatents.com/2011/09/these-are-patents-google-gave-to-htc-to.html>.

<sup>328</sup> [http://news.cnet.com/8301-1023\\_3-57479646-93/google-motorolas-patents-tech-are-worth-\\$5.5-billion/](http://news.cnet.com/8301-1023_3-57479646-93/google-motorolas-patents-tech-are-worth-$5.5-billion/).

<sup>329</sup> [http://appleinsider.com/articles/12/02/13/justice\\_department\\_approves\\_apple\\_patent\\_purchases\\_from\\_nortel\\_novell](http://appleinsider.com/articles/12/02/13/justice_department_approves_apple_patent_purchases_from_nortel_novell).

<sup>330</sup> <http://www.fosspatents.com/2012/07/htc-countersues-apple-over-two-us.html>.

<sup>331</sup> [http://www.gpo.gov/fdsys/pkg/USCOURTS-ksd-2\\_09-cv-02269/pdf/USCOURTS-ksd-2\\_09-cv-02269-13.pdf](http://www.gpo.gov/fdsys/pkg/USCOURTS-ksd-2_09-cv-02269/pdf/USCOURTS-ksd-2_09-cv-02269-13.pdf).

<sup>332</sup> Stasik (2010), op cit.

<sup>333</sup> [http://www.ipcom-munich.com/IPCom\\_Frand\\_Declaration.pdf](http://www.ipcom-munich.com/IPCom_Frand_Declaration.pdf).

<sup>334</sup> See Table 11 above and reports from interviews.

that their offer is FRAND. As pointed out in interviews: “Suppose a large company that owns 400 patents sells four batches of 50 patents each to new owners. What situation do we face when these new owners approach us for licenses? What can we do if these five parties together demand a fee that is far above the original fee of the first owner?” Such SEP buyers may also be tempted to dismiss FRAND so as to more easily wield the threat of injunction or exclusionary relief, thereby maximizing the power conferred by their new assets.

So far, competition law has been the main safeguard against abusive exploitation of transferred SEPs<sup>335</sup>. In several cases (including the transfer from Robert Bosch to IP com or more recently the transfer of the SEPs portfolios of Motorola and Nortel), competition authorities in the U.S. and/or Europe have required that the new SEPs owner explicitly endorsed past FRAND commitments. However, competition authorities can only enforce ex post remedies in a small number of landmark cases, with imperfect knowledge of the field and after potentially long and costly procedures. Given the actual variety of potential cases, their ability to effectively and correctly orient behaviours towards FRAND principles is thus limited.

### Benefits and costs

The main benefit of making FRAND commitments effectively binding for subsequent SEP owners is that it reduces the threat of hold-ups for adopters. It thereby smoothens the licensing process and reduces the risk of litigation. In light of recent trends, this may be warranted to prevent the development of a market for FRAND-unencumbered SEPs with possibly harmful consequences on the balance of the whole standardization system. Preventing NPEs from unduly extracting above-FRAND royalties is for instance necessary for regulation of their impact on standards.

Stronger FRAND commitments mainly entail private costs for parties in the SEP transfers. Subsequent owners are prevented from dismissing FRAND, which in turn reduces the price at which initial owners can monetize their SEPs. This is not a direct concern from a policy perspective. However, a possible indirect effect is that some patent owners that have no stakes in the standard seek to avoid commitments by delaying declarations or keeping out of the standard setting process.

### Implementation

Two alternative measures are considered to effectively pass on FRAND commitments to subsequent SEP owners:

- Define or strengthen SSO rules that bind subsequent owners of SEPs to the initial FRAND commitments;
- Promote use of a License-of-Right system to ensure that commitments to licence SEPs on a reasonable and non-exclusive basis are tied to the patent itself, whoever its owner may be.

Both solutions work only insofar as the first owners accept that they must declare their SEPs and make FRAND commitments from the outset.

***Define or strengthen SSO rules that bind subsequent owners of SEPs to the initial FRAND commitments.*** A few months ago, the three key individuals at European and American competition authorities called for a revision of SSOs IPR policies<sup>336</sup>. In their words: *“IPR policies should create as strong a commitment as possible to bind future owners of the IPR to any F/RAND commitments*

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<sup>335</sup> The EU guidelines on the applicability of Art. 101 TFEU to horizontal cooperation agreements (paragraph 288) state that: *“to ensure the effectiveness of the FRAND commitment, there would also need to be a requirement on all participating IPR holders who provide such a commitment to ensure that any company to which the IPR owner transfers its IPR (including the right to license that IPR) is bound by that commitment, for example through a contractual clause between buyer and seller”.*

<sup>336</sup> Kuhn et al, op cit.

*made to the SSO. Clearly a F/RAND commitment that becomes weaker or more vague upon the sale of a patent (or undermines a commitment to effective dispute resolution) will not be as effective in protecting consumers as one in which all F/RAND obligations must be transferred in a sale”.*

SSOs such as ISO, IEC, ITU and ETSI are currently in the process of adopting such revisions. Several complementary provisions are being considered to make FRAND commitments more binding for subsequent owners:

1. Remove ambiguity as to the transferability of FRAND commitments. For instance, the revised clause 6.1bis<sup>337</sup> of ETSI IPR Policy now makes it clear that FRAND commitments to ETSI “shall be interpreted as encumbrances that bind all successors-in-interest”;
2. Request that SEP owners making FRAND commitments also commit to “include appropriate provisions in the relevant transfer documents to ensure that the [FRAND commitment] is binding on the transferee” and that the new owner will proceed accordingly to bind subsequent owners<sup>338</sup>;
3. Make it clear that the interpretation (1) of FRAND as binding for subsequent owners is not conditional on the inclusion of provisions (2) in the transfer documents;
4. Invite non-members of the SSOs, including courts, to interpret FRAND commitments according to (1);
5. Invite prospective SEPs acquirers to check for existing declarations.

**Use of License-of-Right system.** The license-of-right system enables the owner of a patent or patent application to voluntarily file a statement at the patent office in which he indicates to be prepared to license his patent to any interested party at reasonable rates, in return for a reduction of renewal fees. The commitment is inseparably linked to the patent in question for the whole of its lifetime, regardless of ownership changes or bankruptcy of the patent owner. It is this specific feature of the license-of-right provision that attracted the attention of people that were looking for a solid way to ensure a (FRAND) commitment would be inseparably linked to a SEP.

License-of-right (LOR) is a model where the patent owner has the option to commit to making licenses available to all interested parties in return for lower patenting and maintenance costs.

This option is already part of several national patent systems (including those in Germany, the UK and France) and is part of the new Community Patent: Article 8 of Regulation 1257/2012 organises the regime to be applied for license of right in the context of the European patent with unitary effect. However, it does not exist in all patent systems, which is a limitation to its use for SEPs. Moreover, the settlement of disputes on licensing terms is usually devoted to national jurisdictions, which may complicate international dispute resolutions and generate legal uncertainty. Finally the commitment under the license-of-right is less flexible than usual FRAND terms. It is usually at the time of the patent grant that the owner decides whether or not to commit to license-of-right, yet it might not be clear at that moment whether or not the patent will eventually be essential to one or more standards. However, license or right may also commit itself to license-of-right later on, for instance when it is clear that the patent is essential to a standard. The LOR commitment, however, encompasses all implementations of the patents, also those not related to a standard. More generally, there is no guarantee that all SEP owners (especially those that might benefit from sale of unencumbered patents) would use it on a voluntary basis. In the event that they use it, the expected reduction in renewal fees may lead then to an increase in filing of patent applications around standards.

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<sup>337</sup> Approved in the General Assembly in March 2013.

<sup>338</sup> ETSI IPR Policy, Clause 6.1bis.

## Summary

The table below summarises the idea.

**Table 5.18 Summary of “solve transfer issues”**

Table 5.18 Summary of “solve transfer issues”	
Potential benefits	<ul style="list-style-type: none"> <li>• Reduce the threat of hold-up following SEP transfers for standard users;</li> <li>• Reduce the risk of litigation;</li> <li>• Smoothen the licensing process.</li> </ul> <p>The above advantages benefit implementers and patent owners alike.</p>
Potential costs	<ul style="list-style-type: none"> <li>• Only private costs related to the dissipation of undue rent for parties in the SEP transfers.</li> </ul>
Expenditure directly related to implementation of measure	<ul style="list-style-type: none"> <li>• SSO IPR Policies: the cost and delay of revising SSO IPR Policies have already been incurred for major SSOs. Revised policies now provide a template for other SSOs wishing to do the same.</li> </ul>
Disadvantages, possible risks or consequences	<ul style="list-style-type: none"> <li>• (Limited) risk of encouraging entities that are not core SSO participants to delay commitments or stay out of the standard setting process;</li> <li>• License-of-right: incomplete geographic coverage, fragmented dispute resolution.</li> </ul>
Necessary or desirable conditions / Relation to other proposals	<ul style="list-style-type: none"> <li>• SSO IPR Policies: Agreement among members of relevant SSOs;</li> <li>• License-of-right: implementation of the License-of-rights in more patent systems and improvement of the dispute resolution mechanism are desirable conditions.</li> </ul>

Response by stakeholders confirms the benefits of this proposal. We summarise the responses below.

- Clear rules in SSOs would be very beneficial;
- Good idea. We strongly support the changes to ensure that the FRAND commitment follows the patent when transferred;
- See also comments made in relation to 5.2.7 Notification of transfer of SEP ownership by recordation.

## 5.7 Technology inclusion in the standardisation process

### Introduction and outline of the proposed solution

The above sections started from the current reality where there are a number of standards with a very high number of SEPs. This reality is reflected in Table 5.17.

Moreover, for quite a few standards in that list, the SSO allows blanket disclosures; the actual number of SEPs might be much higher than shown in that table. For instance, while the specific disclosures for the IEEE 802.11 family of standards (‘WiFi’) allowed us to identify a total of 136 patent families, a recent testimony accepted at a US court claimed that there were *possibly*

thousands of patents essential to this family of standards.<sup>339</sup> While the problems associated with blanket disclosures are already addressed elsewhere in this report (see Section 5.2), the point we want to make here is that for a number of very successful standards (and standards play a great role in society), we are flooded with essential patents.

While it can be well understood that for a complex standard such as the ones we are considering, there may be quite a few key patented technologies needed to realize the design requirements or to make an attractive standard, it may be hard to believe that achieving this in fact requires the use of hundreds or even thousands patented technologies.<sup>340</sup>

**Table 5.17 The 24 standards that have 100 or more patent statements**

Standard	Description	Total disclosure events	Total statements	Identified unique DOCDB families
ETSI grouping 3G	Standard for 3G mobile telecommunications, a.k.a. UMTS, W-CDMA and 3GPP <sup>341</sup> .	343	16007	2784
ETSI grouping 2G	Standard for 2G mobile telecommunications, a.k.a. GSM and DCS-1800 <sup>342</sup> .	170	7458	1114
ETSI project LTE	Standard for 4G mobile telecommunications.	125	3876	1588
JTC1 ISO/IEC 14496 incl. ITU H.264	Standard for video compression, aka MPEG-4 Part 10, Advanced Video Coding. Developed as collaboration between ISO/IEC JTC1 and ITU. Used in many devices including Blu-ray players, game consoles, computer software, etc.	265	1682 (*)	146 (*)
JTC1 ISO/IEC 18000	Standard for RFID technologies.	104	1107 (*)	161 (*)
IEEE 802.11	Standard for wireless Local Area Networks, popularly known as 'Wi-Fi'.	167	449 (*)	136 (*)
JTC1 ISO/IEC 13818 and H.222 and H.626	Standard for video compression, aka MPEG-2. Parts 1 and 2 of MPEG-2 were developed in collaboration with ITU-T. Used in many devices including DVD players, computer software, etc.	121	381 (*)	46 (*)
IEEE 802.16	Standard for wireless Metropolitan Area Networks., popularly known as 'WiMax'.	90	335 (*)	196 (*)
ETSI grouping DVB	Standard for digital television broadcast <sup>343</sup> .	40	270	106
ITU G.992	Standard for ADSL, for delivering internet services to residential homes via telephone cables.	65	229 (*)	38 (*)

<sup>339</sup> Microsoft Corp. v. Motorola, Inc., Findings of Fact and Conclusions of Law, 2013 U.S. Dist. LEXIS 60233 at paragraph 335 (W.D. Wash., Apr. 25, 2013).

<sup>340</sup> In this respect, one could also embrace the principle that standards define the minimum common denominator necessary to make interoperability possible. Additional features and performance may be built upon that standard in a competitive environment.

<sup>341</sup> This group includes the following ETSI projects: 3GPP, 3GPP / AMR-WB, 3GPP / AMR-WB+, 3GPP / EMS, 3GPP Release 7, 3GPP Release 99, HSPA+, HSUPA, UMTS, UMTS / CDMA, UMTS FDD, UMTS Release 4, UMTS Release 5, UMTS Release 6, UMTS Release 7, UMTS Release 8, UMTS Release 9, UMTS Release 99, WCDMA, SAE.

<sup>342</sup> This group includes the following ETSI projects: DCS 1800, GPRS, GSM, GSM / AMR-NB, GSM / TDMA, GSM Release 6, GSM Release 7, GSM Release 98, GSM Release 99, GERAN, GERAN Release 6, GERAN Release 7, GERAN Release 8, GERAN Release 98, GERAN Release 99.

<sup>343</sup> This group includes the following ETSI projects: DVB, DVB-C2, DVB-H, DVB-S2, DVB-SH, DVB-T2.

Standard	Description	Total disclosure events	Total statements	Identified unique DOCDB families
ITU M.1225	Not a product standard in itself, but guidelines for the various 3G mobile technologies were going to be evaluated by ITU (the so-called process for IMT-2000).	43	204 (*)	64 (*)
ISO 25239	Standard for friction stir welding, a technique that is applied in shipbuilding, aerospace, automotive and railway sectors, among others.	35	191 (*)	0 (*)
ETSI group BRAN HIPERLAN/2 HIPERMAN	ETSI activities for Broadband Radio Access Networks (BRAN), including HiperLan/2, HiperAccess, HiperMan.	17	169	74
JTC1 ISO/IEC 15938	Standard for multimedia content description, also known as MPEG-7.	42	167 (*)	1 (*)
IEEE 802.3	Wired LAN standard known as Ethernet.	99	149 (*)	53 (*)
ETSI project TETRA	Standard for professional mobile radio applications for police, ambulance and fire brigade applications, as well as commercial use.	21	144	42
ITU G.729	Voice compression technology used in Voice over Internet Protocol (VoIP) application, among others.	57	132 (*)	37 (*)
TIA 136	Second generation (2G) mobile telecommunication standard developed in the US, known as D-AMPS. Now considered end-of-life and replaced by GSM or 3G technologies.	31	124 (*)	0 (*)
ITU G.993	Standard for VDSL, for delivering internet services to residential homes via telephone cables. Faster than ADSL.	43	117 (*)	35 (*)
OMA WAP	Wireless Application Protocol (WAP), for interactive data services on mobile phones. Now considered end-of-life.	17	117	34
ITU M.1457	Again not a product standard in itself, but detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-2000 (IMT-2000).	14	113 (*)	22 (*)
JTC1 ISO/IEC 14888	Techniques for digital signatures.	8	111 (*)	7 (*)
IEEE 802.1	Standard for architecture, interworking, overall network management and several other general elements of LAN and MAN networks.	9	105 (*)	36 (*)
JTC1 ISO/IEC 11172	MPEG-1 is a standard for compression of video and audio. Used for digital radio and video CD, but best known for the MP3 audio format it introduced (which is officially called MPEG-1 Part 3).	41	100 (*)	0 (*)

(\*) Blanket disclosures are allowed in these bodies. As a result, the number of identified unique DOCDB families may be a gross undercount of actual SEP ownership.

In this section, we take a step back and consider the question of whether it is really necessary for standards to include so many patented technologies in the first place. Including patented technology in standards is certainly not a bad thing as such. When drafting a standard, the Technical Committee – or other entity entrusted with this work – is often given a set of design requirements.<sup>344</sup> There are often a number of trade-offs between these requirements and some technologies might be better than others at dealing with these trade-offs.

Given the high propensity for patents in many ‘high tech’ sectors, it is likely that many attractive technological solutions are already patented (or that companies developing these patent them immediately in order to address certain challenges in the standard). Patented technologies may then be chosen to be included in a standard because of their attractiveness. In some cases, a patented technology may even be the *only* feasible means of realizing the functional requirements of the standard in question. In other cases, the patented technology may not be the only solution but still the best way to achieve the standard requirements, e.g. by offering a higher performance, making the implementations more cost-effective or by improving their environmental friendliness. In such cases, the cost of essential patents (not only licensing costs, but also the resource-consuming licensing negotiation processes) may be worth the additional value of the standard.

However, if (numerous) patented technologies are included without contributing substantially to the standards’ value, it could be considered suboptimal from the public perspective (yet perhaps optimal from the individual patent owner’s perspective). Such patents, which we will coin as ‘trivial’ patents in this report,<sup>345</sup> can unnecessarily raise the cost of implementing the standard (costs that may or may not be passed on to the consumer) and have consequences for competition, market entry and more. It may reduce the incentive for ‘real’ innovators, as it is easier and cheaper to benefit from opportunistic strategies to get trivial patents included in the standards, than to invest in R&D and aim to make significant contributions to the technical state of the art. There are strong incentives for firms to engage in opportunistic strategies in order to get the technology covered by trivial patents into a standard, since it is most beneficial to obtain ownership of essential patents.<sup>346</sup> In telecommunications, as well as in a number of other areas with a high SEP intensity, standards are set by working groups whose participants are also patent owners. In such a setting, firms may bargain for the inclusion of their own trivial patents and may offer favours to others that support this inclusion, such as support to include patents of those other companies as well. As such, a relatively small group of participants facilitates each in generating large SEP portfolios, while patented technologies of ‘outsiders’ might be avoided as much as possible.

In recent years, leaders in the field of standards development have raised concerns with over-inclusion of IPR. For example, at a recent European Commission meeting attended by over a hundred specialists in the field of patents and standards, the chairman of ETSI’s IPR Special Committee (and current chairman of the ETSI General Assembly)<sup>347</sup> spoke of the “*increasing*

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<sup>344</sup> As an example, let us consider a standard for mobile telecommunications. Here, the design requirements will typically aim to achieve: (1) a high data rate (‘speed’) for data services, (2) a large, continuous coverage area, (3) allowing the user to move at high speeds, perhaps as fast as a high-speed train, (4) consuming little power in order to optimize battery life, (5) requiring a minimum number of cell sites or antenna towers, (6) being robust to noise and other types of interference, and (7) low costs for both base stations and terminals.

<sup>345</sup> Note that whether a patent is ‘trivial’ (i.e. a patent that does not contribute substantially to the standards’ value) is totally unrelated to whether it is ‘essential’. To illustrate this we will give this imaginary example: suppose there is a patent that claims a block of information with a header of 57 bits, and this patent is granted and non-disputed. Then suppose a standard that specifies a block of information with a header of 57 bits. Then there would be little doubt that this patent would be essential to the standard. Regardless of the question whether a 56 or 58 bits header would have been equally suitable to the standard, specifying a 57 bit header makes the patent in question essential.

<sup>346</sup> Companies owning SEPS have a range of benefits, see page 156.

<sup>347</sup> Dirk Weiler, Standards related patent quality, *A view from a standardisation organization*, EC/EPO Workshop on “Tensions between intellectual property rights and standardisation: reasons and remedies,” Brussels, November 22, 2010.

*number of marginal patents*", as well as the "risk of complicating the solutions just for getting patented, technology into the standard rather than to improve the standard". He also noted "no mechanism exists to determine whether a patent claim brings a standard forward (real innovation) or just tries to get a patent into the standard in order to make money". One such strategy was recently outlined at a conference by the former director of the research lab of a large multinational. He explained how he would send staff to a standardization meeting and, right after the meeting in the hotel room, they would brainstorm how to combine elements mentioned by other participants and then immediately prepare patent applications on these.<sup>348</sup>

Recently, academics have turned to questions of technology inclusion and questions on what aspects and strategies impact the likelihood to obtain essential patents. This includes the following studies:

- In a study on the standardization of the 3G W-CDMA standard, Leiponen (2008)<sup>349</sup> focuses on the role of private alliances, highlighting industry consortia. By being part of such alliances and consortia, firms increase their chances of having their own (patented) technical contributions accepted in the standard;
- Bekkers et al. (2011)<sup>350</sup> studied the determinants of patents being (claimed) essential. They found that patents with a high value ('technical merit') have an increased likelihood of becoming (claimed) essential, but the patent owner being an active participant was a much better determinant;
- One possible strategy is that firms use continuation patents in order to obtain patents that are essential to technical standards, as argued by Omachi (2004)<sup>351</sup>;
- Along the same line of thought, Berger et al. (2012)<sup>352</sup> find that patent applications that are eventually disclosed as being essential to a standard are amended more often than other, otherwise comparable patents. Arguably, firms amend these patents to add claims to the patents that will eventually create this essentiality, while being able to retain the original priority date of the patent.

Focussing specifically on the standards creation process and trying to gain a better insight into the way companies at meetings actually bargain to have technologies included, we turned to a study by Kang and Bekkers (2012)<sup>353</sup>. They investigated technology inclusion in relation to 77 meetings of the 3GPP on the W-CDMA and LTE standards, covering a period of over 12 years, and identified the patenting behaviour of each of the 939 individual participants attending these meetings, as well as the patenting behaviour by non-participants; altogether resulting in over 14,000 patents for this technology. The study observes a considerable peak of (preliminary) patent filings in the few days before such meetings, as well as during these meetings. It also finds that many of the inventors listed on these patents are also participants of these meetings and that these patents have a high likelihood to become essential to the standard (presumably because their inventors are present so they can bargain them into the standard). While the above should not be seen as a problem in

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<sup>348</sup> To prevent naming and shaming, we will not disclose the name of the particular firm here, but if desired this information and audio recordings of that meeting can be made available to the EC, if desired.

<sup>349</sup> Leiponen, A. E. (2008). Competing Through Cooperation: The Organization of Standard Setting in Wireless Telecommunications. *Manage Science*, 54(11), 1904-1919.

<sup>350</sup> Bekkers, R., Bongard, R., & Nuvolari, A. (2011). An empirical study on the determinants of essential patent claims in compatibility standards. *Research Policy*, 40, 1001-1015.

<sup>351</sup> Omachi, M. (2004). Emergence of Essential Patents in Technical Standards: Implications of the Continuation and Divisional Application Systems and the Written Description Requirement. IIR Working Paper WP#05-02. Retrieved from <http://hermes-ir.lib.hit-u.ac.jp/rs/bitstream/10086/15993/1/070iirWP05-02.pdf>.

<sup>352</sup> Berger, F., Blind, K., & Thumm, N. (2012). Filing behaviour regarding essential patents in industry standards. *Research Policy* 41, 216-225.

<sup>353</sup> Kang, B., & Bekkers, R. (2013). Just-in-time inventions and the development of standards: How firms use opportunistic strategies to obtain standard-essential patents (SEPs). ECIS working paper 13.1. Electronic copy available at [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2284024](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2284024).

itself, a valid concern is the finding that the patents in question – ‘just-in-time patents’ - are found to be, technologically speaking, of considerable lower merit than the other, ‘normal’ essential patents (i.e. not applied for just before or during these meetings). The observed strategy is especially found among (i) vertically integrated firms, (ii) the incumbent champions of the previous technology standard and (iii) smaller companies that nevertheless have large SEP portfolios for the standard.

In essence, all of the above suggests that in terms of patents, SSOs may have created an open-ended process, without any feedback or assessment of the patented technology being included. In combination with strong incentives for participants to push their IPR into the standard, this has led to unprecedented numbers of essential IPR, of which it is absolutely not clear to which degree they contribute to the performance or any other dimension of the standard.

The central idea for this section is now phrased as follows: “SSOs introducing guidance and promoting a new culture in order to arrive at a more conscious process for including patented technologies, with more consideration of the appropriateness of doing so”. This idea is actually addressing what could be considered as the source of many of the current problems, instead of trying to fight the symptoms. Yet, admittedly, the above proposal is still relatively crude and leaves a number of open questions. For instance, if the sought consideration is on a cost/benefit basis, how are costs and benefits to be estimated? Does it require (or interact with) ex-ante disclosure of licensing fees? Or is a strict cost/benefit analysis not necessary and does a more critical process suffice such as the one used by IETF, where patented technologies are only included if they clearly offer a substantial benefit over all other available alternatives, without assessing the costs? In this sense, this idea is primarily geared towards starting the discussion.

### Benefits and costs

Based on the analysis above, a number of benefits and costs associated with the implementation of the idea can be identified, even if it is still at a conceptual stage. The benefits would be as follows:

- Lower number of SEPs, higher quality of remaining SEPs, fewer SEP owners, less fragmentation;
- Provide stronger incentives for real innovators to engage in R&D and contribute to/participate in standardisation processes;
- Reduce unnecessary costs (both royalties and otherwise) associated with over-inclusion of technologies - costs that might otherwise be passed on to the purchaser or otherwise impact the market and competition;
- Reduce the costs associated with oligopolistic competition in the upstream market for necessary technologies that are a result of over-inclusion, including reduction of competition and market entry problems;
- Promote adoption/uptake of the standard as a result of having less SEPs and less distinct SEP owners;<sup>354</sup>
- Prevent unnecessary increase of complexity or complication of the standard by the inclusion of patented technologies just for the sake of being patented (and thus create benefits for their owners) and not selected because they improve the standard.

Possible costs of the proposal include that some parties that may not be willing to bring valuable technologies to the table, may feel less incentives to actively participate in the standard. This might include the implementers or intermediate users of the standards. On the other hand, participation in standard setting has (and should have) already a significant number of other benefits (creating the ‘right’ standard, reducing implementation costs, benefiting from early, insight knowledge etc.) that

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<sup>354</sup> Note that this does not necessarily imply that the aggregate royalty fees should be *lower*. It might also mean they stay at the same level but go to fewer parties and are paid to compensate inventions that really add value.

should be strong enough to secure their participation. If parties decide to stay away merely because they 'cannot drive their patents in', one should wonder whether or not he would like to have such parties there at all.

### Implementation

Although most SSO IPR policies discuss what should be done *if* standards include patented technology, few policies discuss *when* that is desirable. In fact, there is hardly any guidance on when it is or is not appropriate to include patented technology in standards. At best, the SDO provides some snippets of information. For example, OASIS explicitly encourages<sup>355</sup> the submission of existing, patented technical work, while ANSI, in contrast, notes that including patented technology *may* be justified if 'technical reasons justify this approach'. In IETF, there is a culture of avoiding the inclusion of patented technologies.<sup>356</sup>

While the IETF practice is encouraging, it also points us to the fact that this change is not only about adopting rules that go into SSO IPR policies. Such practice is at least as much about changing a culture that has developed over the years and achieving among participants a common understanding and a joint responsibility in order to create standards that only include patented technology for the benefits that outweigh the costs of the inclusion. While specific responsibilities and specific rules might help to implement this idea, it will not succeed if there is no joint responsibility and culture change.

We will now shortly consider some ideas for implementation. One possibility would be to introduce the responsibility for a joint (working) group to perform a conscious assessment before the decision is made whether or not to include a patented technology. The group would then be accountable for that responsibility and the chairman would have the task of ensuring that the group has made a proper assessment and followed the right procedures in their considerations. Another implementation idea would be to have any technology contributor justify its proposal for inclusion and have this contributor provide evidence of how the proposed technology provides benefits over all other alternatives. After that justification, the working group considers the arguments and only incorporates the proposed technology if it really provides a very significant contribution, as opposed to a smaller or trivial one. A third idea would be to introduce an 'opposition' procedure, in which any participant may challenge the view that an incorporated (patented) technology offers significant benefits compared to its alternatives. (Should the SSO in question have a limited degree of participation of the industry, then it could be considered to make such opposition also open to any interested party).

Competition authorities will also need to think about implementation options and consider how pro-competitive effects of particular solutions (including some in which commercial information is being provided and perhaps even discussed) compare to the anticompetitive effects. It may no longer be the proper approach to assume that *any* such activity tips the scale by definition to the anticompetitive side.

### Summary

The table below summarises the idea.

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<sup>355</sup> It is significant to note, however, that under several of the licensing modes available under the OASIS IPR policy, any included technology would be required to be licensed on FRAND-RF terms, while under the ANSI policy historical assumption would be that including technology would result in the need for implementers to pay royalties or other license fees.

<sup>356</sup> For the examples in the above paragraph, see Bekkers & Updegrave (2012), op cit., page 104-105 in particular.

**Table 5.19 Summary of “critical review of technology inclusion in the standardisation process”**

Potential benefits	<ul style="list-style-type: none"> <li>• Lower number of SEPs, higher quality of remaining SEPs, fewer SEP owners, less fragmentation;</li> <li>• Provide incentives for real innovators to engage in R&amp;D;</li> <li>• Reduce unnecessary costs (both royalties and otherwise) associated with over-inclusion of technologies;</li> <li>• Reduce the costs associated with oligopolistic competition in the upstream market for necessary technologies;</li> <li>• Promote adoption/uptake of the standard;</li> <li>• Prevent unnecessary increase of complexity or complication of the standard by the inclusion of patented technologies just for the sake they are patented.</li> </ul> <p>The above advantages benefit implementers and patent owners alike.</p>
Potential costs	<ul style="list-style-type: none"> <li>• Might discourage the ‘not real innovators’ from the standardisation process.</li> </ul>
Expenditure directly related to implementation of measure	<ul style="list-style-type: none"> <li>• [Depends on exact proposal, but implementation is less about money than about changes in culture and attitude].</li> </ul>
Disadvantages, possible risks or consequences	<ul style="list-style-type: none"> <li>• [Depends on exact proposal].</li> </ul>
Necessary or desirable conditions / Relation to other proposals	<ul style="list-style-type: none"> <li>• This proposal is complementary to most of the earlier ideas discussed in this chapter.</li> </ul>

Response by stakeholders elaborated on the disadvantages, possible risks or consequences identified above. We summarise the responses below:

- Such guidance/rules must ensure that the best technical solution is selected into the standard. Otherwise a standard will not be commercially successful, i.e. not broadly adopted;
- The inquiry should start with the assumption that patented technology incorporated in standards has been driving innovation.



## 6 Other potential policy routes stemming from non-standard dependent industries

The previous sections elaborated on problems and solutions specifically in the context of standard dependent industries. However, some of the problems that we identified are also experienced by industries that are not dependent on standards. Notably industries that are characterised by high levels of R&D and a large number of complementary (patented) technologies experience transparency-related problems and problems of royalty stacking. In this section we explore how companies and/or institutions in these non-standard dependent industries are facing their patent-related concerns. Some solutions may also be appropriate for alleviating the problems in the standard-dependent industries.

The section starts with a description of four non-standard dependent industries (chemicals, diagnostics, mechanical engineering and nanotechnologies) that are known for being highly innovative, which translates into a large number of yearly patent applications. The analysis of the industries evaluates a quick scan of literature and websites, as well four interviews with industry experts. As such, the analysis of these four industries was done as “in “light”,” manner with the aim of getting a basic understanding of the industry structure and the strategic role of patents and licensing in each of the four industries. Furthermore, we are aware that these industries are sometimes very broadly defined, such that we should treat generalisations prudently.

We found that in the four industries there are areas where patents are complementary but held by different owners, so that a so-called patent thicket exists, giving rise to transparency problems and problems of royalty stacking (similar to the problems experienced by the standard dependent industries). In the section following the description of the industries we briefly summarise these problems.

Finally we describe a number of solutions that have not been observed in the standard dependent industries. This analysis is based on desk research and interviews with stakeholders having experience with these solutions. Following the brief description of the industries and their problems we subsequently present these solutions in a separate section.

### 6.1 A brief introduction to a selection of non-standard dependent industries<sup>357</sup>

#### 6.1.1 Chemicals

##### A description of the industry

The chemical industry is central to the modern world economy. By simplifying, the industry converts raw materials (oil, natural gas, air, water, metals and minerals) into more than 70,000 different products. In total, the chemical industry generates nearly 2.5 trillion euros in annual turnover. Chemical companies in the EU and in the US are among the largest producers in the world.

The chemical industry can be divided into mainly two sectors:

- Commodity/basic chemicals, which are manufactured by many different companies;
- Specialty chemicals that are primarily manufactured to meet the needs of a specific customer.

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<sup>357</sup> This section is based on desk research and interviews with IP experts working in the industry.

The end product of commodity/basic chemicals shows a low level of variety. The end products of specialty chemicals are in most cases dedicated to a few suppliers and patents often offer protection for such chemicals. Furthermore, the boundaries of the “specialty chemicals” category are not very clear due to a convergence with other industries (e.g. nutrigenomics<sup>358</sup>) and the adoption of other technologies (e.g. biotechnology and nanotechnology).

### Actors

Worldwide, there are a number of large producers of chemicals, each with plants in several countries. Examples of these large producers are:

- BASF
- Ferro
- Solvay
- Braskem
- Celanese/Ticona
- Arkema
- Degussa
- Dow
- DuPont
- Eastman
- Chemical Company
- ExxonMobil
- Givaudan
- INEOS
- LyondellBasell
- Mitsubishi
- Monsanto
- PPG Industries
- SABIC
- Shell
- Wanhua

From an IP perspective, research institutions and universities play an increasingly important role in the chemical industry, in particular for new technologies such as nanotechnology and green technology. When assuming this applying a more dynamic perspective, the IP environment is much more complex compared to considering only pure chemistry.

The chemical industry provides inputs to almost every economic sector. Users typically buy products in which IP is already embedded. and no separate licence is necessary.

### The strategic role of patents and the most common transfer arrangements

Because of the convergence with other industries and technologies, it is difficult to give a clear overview of all the patents and their respective patent owners. Looking at pure chemical technologies, we observe that IP is mainly owned by the large chemical corporations themselves. From interviews with industry experts we have learned that the number of IP owners easily adds up to over 500 worldwide, but that the bulk of IP is owned by a group of 50 to 100 IP holders. The number of patents is very large. According to the OECD (2010)<sup>359</sup>, the industry accounts for 14% of world patent applications and individual firms may hold thousands of patents.<sup>360</sup> To give an indication, in 2010 the number of patent applications in basic materials alone was approximately 37,500 (according to WIPO IP facts & figures Report 2012). Of course, these applications were not all granted.

From interviews we learned that the strategic purpose of the development and control over IP is mainly ‘a freedom to operate’ as well as a ‘means to differentiate’ from competitors. Additionally, firms consider their patent portfolios having a strategic value in the sense that they form an entry barrier for potential competitors. Hence, those companies with relatively low R&D budgets are

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<sup>358</sup> “Nutrigenomics is a branch of nutritional genomics and is the study of the effects of foods and food constituents on gene expression” – see <http://en.wikipedia.org/wiki/Nutrigenomics>.

<sup>359</sup> Kiriyama (2010) “Trade & innovation: report on the chemicals sector”, OECD Trade Policy Working Paper No. 103.

<sup>360</sup> Kiriyama (2010) states “in 2008 DuPont alone filed over 1 900 US patent applications and was granted 495 patents; it currently holds more than 6 000 active U.S. patents (ACC). Overall, the majority of patent applications in chemistry (2007) take place in such areas as organic chemistry (4.7%), organic macromolecular compounds (2.4%) and biochemistry (3.0%).”

looking to form joint ventures.<sup>361</sup> Furthermore, the chemicals industry is a mature market with many competitors and many customers. Additionally, there are also many different technologies and solutions. So in case a company is not able to license-in IP from a specific company, then it is able to license alternatives or designs around patents, which is possible in a sector strongly typified by process innovations.

Large companies conduct patent landscapes with a purpose of monitoring the competition. Because the market is mature and the main competitors are well known, transparency problems (in terms of knowing who owns which IP) are not perceived as being large. In this respect, the services of databases and brokers are not considered of great value to large companies because of the in-house professional knowledge. Smaller companies may perceive transparency problems differently as they don't have the means to do large-scale patent landscapes themselves. For them, services by databases and brokers can be considered as adding value. However, some companies consider it more efficient for a small company not to take a license at all (i.e. infringe) and to try to remain undetected. As such, the transparency problem for the large firms exists in terms of not knowing who uses their IP. The Kiriya (2010) reports that intellectual property infringements have been a major problem for the industry for decades. A more recent problem is counterfeiting of chemical products.

#### *Most common transfer arrangements*

Cross-licensing does occur in the chemicals industry. The vast majority (70 to 80%) of IP is however mainly developed and used in-house rather than considered valuable as a source of revenue. As mentioned before, smaller companies tend to form joint ventures and co-invest in new IP.

In many areas the complementarity between patents of several companies is limited and hence patent pools are not regarded as a proper channel for licensing out. There has been some interest expressed and attempts have been made for setting up a clearinghouse, for example, by DSM. The clearinghouse initiative did not really focus on the "chemical patents" but on nutrigenomics. It did not succeed due to the reluctance among players (licensors and licensees) to participate. Interviewees have indicated that this reluctance was caused by 'doubts about the unknown' and not so much by players having structural objections to the clearinghouse concept. There are a lot of interdisciplinary developments in the chemical sector; nutrigenomics is one of them.

### 6.1.2 *Diagnostics*

#### **A description of the industry**

The diagnostics industry is testing patients to detect diseases. Patients who present symptoms of a particular disease can be diagnosed and asymptomatic patients can be screened as a matter of routine. These diagnoses are also used to allow testing of patients with diseases to establish prognosis or check the progress of a certain therapy.

Our analysis concentrated on the segment that is occupied with *in vitro* diagnostics.<sup>362</sup> Examples of these diagnostics are:

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<sup>361</sup> Kiriya (2010) states: "In general, countries with larger number of patents are lower in their ratio of co-invention. Countries that tend to be relatively low in their tendency to co-invention include for example Japan, India and Korea; China is a contrasting example, with a large volume of patent applications, whereby almost half resulted from co-invention."

<sup>362</sup> The whole industry can be broadly divided into:

1. In vitro diagnostics (IVD), which refers to testing samples of blood, tissue, etc.;
2. In vivo diagnostics, which refers to the testing of organ function and tissue, for example electrocardiography; and

1. Laboratory testing for use in the clinical-chemical or clinical microbiological laboratories;
2. 'Point-of-care' testing for use by health care providers at the bedside of a patient or for example in general practice;
3. Self-tests for consumer use.

This description is very broad and includes diabetes diagnosis, which falls under a different field of technology than molecular diagnostics (genetic testing), the latter being a technique used to analyse biological markers in genes (genomes) and proteins (proteome). The development of professional diagnostic devices is yet another speciality that could be singled out as a sub-sector. In 2012 the global market for IVD is valued at an estimated 48 billion US dollars in annual sales<sup>363</sup>.

### Actors

The following companies are active in the diagnostics industry<sup>364</sup>:

- Almac Group Ltd.
- BioGenex
- Covance, Inc.
- Dako Denmark A/S
- Epistem Plc
- F. Hoffmann-La Roche Ltd.
- Genomic Health, Inc.
- MDxHEALTH, Inc.
- Myriad Genetics, Inc.
- Precision Therapeutics, Inc.
- Prometheus Laboratories
- QIAGEN N.V.

In the area of professional diagnostic devices, Roche is (according to itself) a leading producer.<sup>365</sup> The C4 has just over 50% of the market share. Similarly the market for molecular diagnosis is highly concentrated (with a C4 of around 60%). Both market segments comprise a long tail of smaller suppliers (and IP owners).

The license with respect to a technology is often embedded in the purchase of a device. However, from what we have understood, the use of diagnostic devices alone does not always suffice. The diagnostic process may require IP related to molecular diagnostics (e.g. related to synthetic DNA), which depends on the type of diagnostic testing.<sup>366</sup> This IP may be available as part of a commercialised diagnostics testing product, but not always. In genetic testing, the licenses are more specialised. IP is generally regarded as complementary to other IP, but extent the extent to which these are considered complements differs from one test to another.

In total there are around 200 to 300 IP holders, of which many are (academic) research institutes. However, the ownership of the bulk of IP lies with the diagnostic device producers. The customers are diverse and large in number. They include hospital and commercial labs, Lab networks, Points of Care including emergency rooms, intensive-care units, patient's bedsides, physician's offices, pharmacies, homes, blood banks, Universities and Research centres. As stated, they not only purchase devices with embedded IP, but they also (need to) license-in complementary IP themselves.

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3. Medical imaging, such as x-rays, computerized axial tomography (CAT), mammograms and magnetic resonance imaging (MRI).

<sup>363</sup> Roche Diagnostics. Business Overview 2013.

<sup>364</sup> Predictive Diagnostics - Global Strategic Business Report (September 2013).

<sup>365</sup> Roche Diagnostics. Business Overview 2013.

<sup>366</sup> For example, genetic testing may encounter issues related to patents regarding DNA sequences (see the Myriad-case in the US versus EU Biotechnology Dir.).

## The strategic role of patents and the most common transfer arrangements

In the field of diagnostics the first and foremost observation is that IP is typically complementary<sup>367</sup>. For example, in order to develop a solution for a specific disease, the developer of a diagnostic tool needs the patents that are necessary for detecting a specific disease (genomes), as well as the patents for the instrument itself.

There are a lot of patents in the diagnostics industry and the business is predicted to annually grow with 14% until 2015. To give an indication, in 2010 there were around 66,000 patent applications in medical technology (according to WIPO) – this is almost twice the number of patent applications in chemistry, but one has to make a strong remark that not all of these applications have been granted and that, in the end, not all patented inventions will be commercially exploited.

For diagnostic devices, we have learned from interviews that a large fraction of IP is licensed out and licensed in (i.e. cross-licensed) by the ( $\pm 15$ ) companies that develop and market diagnostic testing devices. They regard the strategic role of IP as mainly contributing to a 'freedom to operate'. As IP is typically complementary, there is a lot of cross-licensing between these firms in devices. Hence IP is also seen as 'a currency in cross-licensing agreements'.

In molecular diagnostics (genetic testing), the remainder (also a large fraction) of the patents is owned by a large number of small commercial organisations and (academic) research institutes. For them IP typically is a 'source of revenue'. If the IP is regarded as highly complementary for the device manufacturers, such that they want to embed the IP in the device, they will likely purchase the IP and sometimes the company that owns it. If not, the end-user (diagnostics professionals) will need to purchase additional tests or license in additional IP, if they make the test themselves in-house. However, in practice, nobody is actually licensing in. There seems to be a culture of forbearance in the biomedical research community that reduces the need for a legal defence<sup>368</sup>. On the other hand, recent cases (e.g. Myriad) have shown that this culture might be changing (notably in the US).

In sum, there are up to 200 to 300 patent owners, of which the genome patent owners are to a large extent the (academic) research institutes.

### Most common transfer arrangements

From interviews we have learned that the most common transfer arrangements are:

- Portfolio-based cross-licensing with a cash payment to balance portfolios (typically among the device manufacturers);
- Cash only, for IP owned by parties that are not in the business of developing diagnostic testing devices. Patents related to DNA sequences are not major cash cows, but have only a few licenses.

In the relation between producers of diagnostic devices, cross-licensing on a broad portfolio basis is the most common arrangement for licensing.

In the relation between producers of diagnostic devices and the many (smaller) IP holders, the typical arrangement for obtaining the right to use IP is via Merger and Acquisition and sometimes via licensing in on a cash basis. But for many (complementary) IP, the need to obtain the right to

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<sup>367</sup> But it will depend on the actual testing method whether the patented DNA sequences actually have to be used. Complementarity is not so obvious in this area, especially, because there are no strong formal standards yet for genetic testing. There are practice and quality standards, but these are different depending on the country/region.

<sup>368</sup> Lee, C. (2012). Cease or Persist? Gene Patents and the Clinical Diagnostics Dilemma. Senior Essay.

use it can often be left as a problem of the diagnostics professionals themselves. In practice, hospitals are using the inventions, but not licensing and/or paying. In Europe these practices have largely been ignored; in the US IP owners have been sending cease and desist letters.

With respect to the relation between (smaller) IP holders and the diagnostics professionals, the right to use IP is either embedded in the test purchased or it is licensed in by the professionals on a cash-only basis. In the case of cash only, the fees are typically in the form of upfront, annual and milestone fees or royalties as a percentage of downstream product sales. For public hospitals, this is often not realistic, because they simply do not have the resources to pay such upfront fees. In addition to the demanding royalties, IP holders can also place limits on the patent for the in-house use, as well as (if it is the case) limits on publications and the sharing of materials, next to the future commercialisation.

Even though the industry is characterised by a few large IP owners/adopters the total number of IP owners is large as well as the total number of IP adopters. Based on the analysis of the Consumer Electronics industry, one would expect some patent pools. In diagnostics, there are no patent pools, but instead there are some initiatives in the clearinghouse, which is also a form of a collaborative licencing program (see section 6.3.2 below with regard to Librassay).

### 6.1.3 Mechanical engineering

#### A description of the industry

The mechanical engineering industry applies the principles of engineering, physics and material science for analysis, design, manufacturing and maintenance of mechanical systems. It is an important industry for the global economy in terms of value added and employment.

From an IP focus, the following subdivision of the mechanical engineering industry is made:

- Handling;
- Machine tools;
- Engines, pumps and turbines;
- Textile and paper machines;
- Other special machines;
- Thermal processes and apparatus;
- Mechanical elements;
- Transport.

The EU is the largest engineering industry market worldwide. It plays a key role for several other sectors. Within the mechanical engineering industry, high investments in research and development (R&D) are made. The United States, Japan and Germany are making the highest R&D investments in the mechanical industry of all countries worldwide<sup>369</sup>. China is catching up, though. The largest mechanical engineering company in China is Shanghai Electric Group Co. Ltd., with a turnover of 5.8 billion euro in 2009<sup>370</sup>.

In a previous research study by Ecorys for the European Commission, we already concluded that the mechanical engineering industry in the EU is a leading industry at the level of patent filings<sup>371</sup>. The total number of worldwide transnational patent applications is 45.202 in the period 2006-2008.

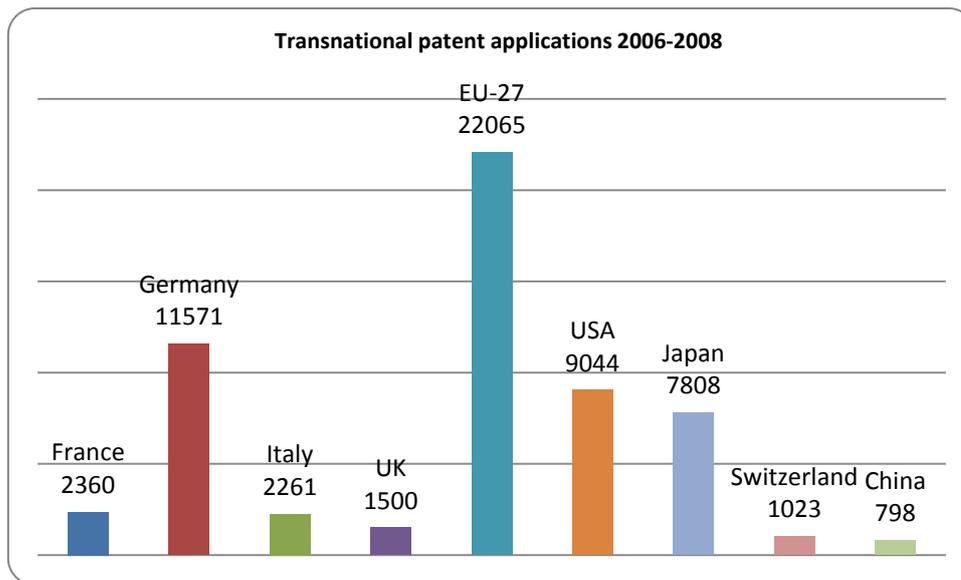
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<sup>369</sup> OECD STAN database.

<sup>370</sup> Mechanical engineering 2015 - Strategies for a changed world. Kautzsch and Sitte (2013).

<sup>371</sup> Ecorys a.o. An introduction to Mechanical Engineering: Study on the Competitiveness of the EU Mechanical Engineering Industry (February, 2012).

Below, a figure for the transnational patent applications for several countries between 2006 and 2008 is given.



### Actors

Within this large industry, there are a lot of key actors. In previous research, it is assumed that particularly larger companies with patenting activity on global mass markets and medium-sized companies specialized in R&D are the most patent-active (Neuhäusler and Frietsch, 2013). The 20 most important companies are<sup>372</sup>:

- Honda Motor
- General Electric
- Canon Kabushiki Kaisha
- Robert Bosch
- Toyota Jidosha
- Hon Hai Precision
- Seiko Epson
- Denso
- General Motors
- Hitachi
- Samsung
- Silverbrook Research
- Kogyo Kabushiki Kaisha
- Caterpillar
- Siemens
- IBM
- Boeing
- Eastman Kodak
- Delphi Technologies

In some sectors within mechanical engineering, there is vertical integration. In the past, most companies were specialised in a certain product. Nowadays, more and more companies try to decrease their end product costs by 'doing more on their own', which actually means that they are producing more of the end product themselves.

### The strategic role of patents and the most common transfer arrangements

As an indicator for the patent landscape within the *total* mechanical engineering sector the WIPO stated that the total amount of published patent applications accounts to approximately 323,000 for the year 2010<sup>373</sup>. In each specific niche sector there are not so many IP owners, i.e. more or less 5 to 10 firms. In relation to this, the number of IP adopters falls in the range of 10 to 50 firms per niche sector.

<sup>372</sup> Technology Assessment and Forecast Report Mechanical Classes (April 2013).

<sup>373</sup> The total amount of patents is the sum of the following sectors: 'Handling', 'Machine tools', Engines, pumps and turbines', 'Textile and paper machines', 'Other special machines', 'Thermal processes and apparatus', 'Mechanical elements', and 'Transport'. Data is according to WIPO IP facts & figures Report 2012.

The IP owners regard the strategic role of IP mainly to contribute as 'a freedom to operate', i.e. most of the patents are developed in-house and used for own purpose, as well as to 'differentiate from competitors'. It is also seen as to deter market entry. However, when a firm has the relevant knowledge it is often able to design around patents. As such, the main protection of IP in the mechanical engineering sector is based on keeping the tacit knowledge within the companies. Blind et al. (2003) showed that relative to the R&D expenses, the industry has a low patent intensity (as compared to the chemistry industry). The number of patent applications at the EPO filed in the field of mechanical engineering stems largely from Germany<sup>374</sup>.

#### *Most common transfer arrangements*

Licensing out of patents is not the most common arrangement for knowledge transfer, which also explains the fact that there is no patent pool present. IP is mainly developed in-house. Alternatively IP is acquired through M&A. Patent landscapes are done to identify potentially interesting IP to acquire and/or to monitor the competition. Databases are, however, not considered of great use because the knowledge on patents and future technologies is already within the companies themselves.

Furthermore, whereas you have the brokers that are mainly active in the US market and leading to decreased search and transaction costs, this is rarely the case in Europe. Their activities however would not be very valuable since the main players in the mechanical engineering are known to each other. This also leads to the fact that companies approach each other directly in case of any interest in patents.

### **6.1.4 Nanotechnologies**

#### **A description of the industry**

Nano is in fact not an industry. It is a key-enabling technology that mainly focuses on materials engineering. Some say that nanotechnology originates from mechanical engineering at the smallest scales. Broadly speaking, one can make a distinction between general nanotechnology and (industry) specific nanotechnologies. The latter typically builds upon the first.

From earlier research, it can be concluded that many of the top publication-producing countries are also the most prolific patent-producing countries<sup>375</sup>. In the EU, Germany filed 3,730 nanotechnology patents between 2000 and 2010, which is almost equal to the number of patents filed by the rest of the EU Member States (3,767).

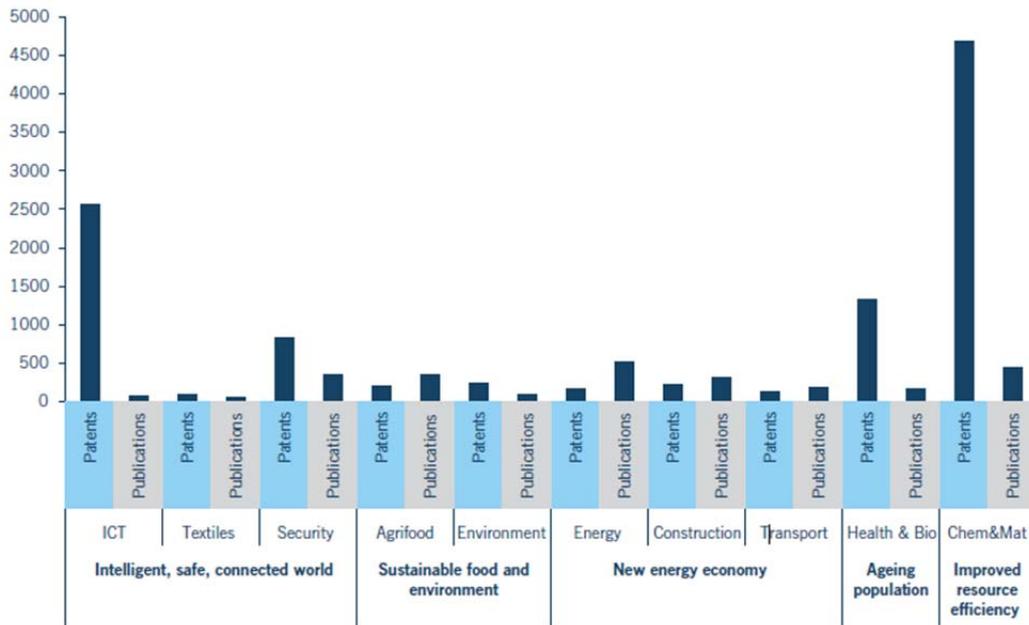
Nanotechnology is used and developed by various industries, notably: chemicals and materials, ICT, health, security, automotive, etc. The graph below gives an indication of how the numbers of patents and (academic) publications are spread over various industries.

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<sup>374</sup> When looking at the Transnational Patent Applications: Germany possesses more than half of the total EU-27 PCT applications, and approximately 25% of the world PCT applications in the period 2006 – 2008. (Mechanical Engineering Industry Competitiveness, 2012. Page 206.)

<sup>375</sup> European nanotechnology landscape report, ObservatoryNANO Work Package 3 (2011).

**Figure 6.1 patents and publications in nanotechnology**



Source: European Nanotechnology Landscape Report.

### Actors

In the nanotechnology industry, the top 20 assignees in nanotechnology patent literature in 2011 are<sup>376</sup>:

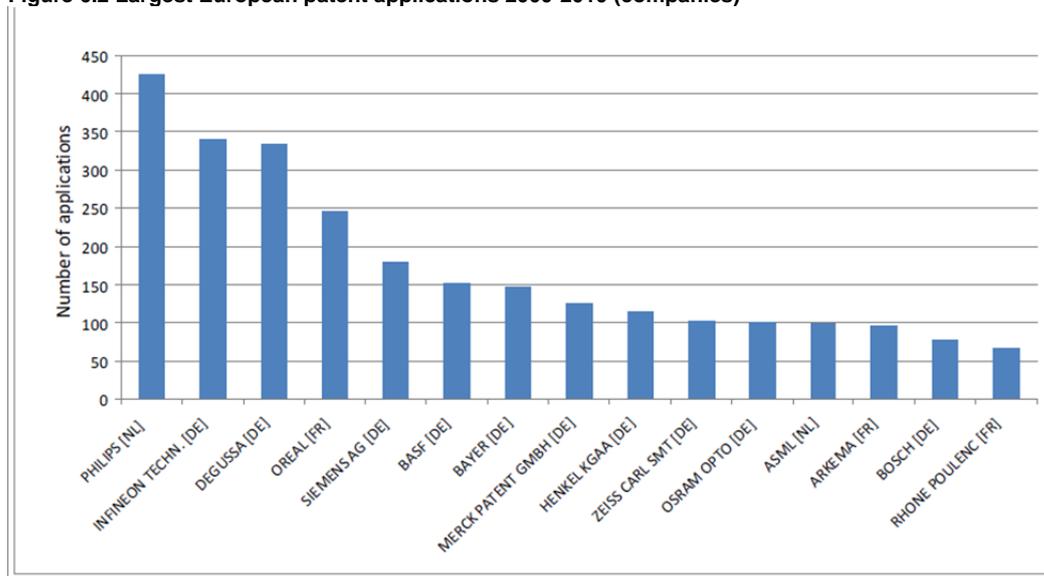
- Samsung
- IBM
- Hon Hai Precision Industry
- University of California
- Tsinghua University
- 3M
- MIT
- GeneASys
- Xerox
- DuPont
- Micron Technology Inc.
- Atomic Energy and Alternative Energies Commission
- BASF
- General Electric Company
- National Center for Scientific Research
- University of Texas
- Hewlett Packard
- Agency for Science, Technology and Research,
- Northwestern University
- Lockheed Martin Corporation & Applied NanoStructured Systems

From an interview with an industry expert, it became clear that in Korea and Japan IP is typically developed and owned by large (electronic) companies such as Samsung and Canon. In China, on the other hand, public universities play a much larger role. In the US, both universities and large companies have patents. In Europe, the picture of patent holders in nanotechnology is more fragmented and unclear. From the FP7 funded Observatory NANO European Nanotechnology Landscape Report it shows that European entities own 17% of the patents, which is low compared to the US, where that percentage is 40%. In terms of academic publications, the EU has a larger share: 33% compared to 13% in the US. One explanation could be that in the EU, nanotechnology research is typically carried out at universities that experience a barrier in filing patents by the fact that the patent office landscape is more fragmented.

<sup>376</sup> Nanotechnology Patent Survey: Who Will Be the Leaders in the Fifth Technology Revolution? Carey C. Jordan, Iona N. Kaiser and Valerie C. Moore (Fall 2012).

The top EU countries with the most Nano patent applications in the period 2000 - 2010 are Germany, France, UK and the Netherlands. For the same period the largest contributing European companies are shown in Figure 6.2.

**Figure 6.2 Largest European patent applications 2000-2010 (companies)**



Source: Observatory Nano factsheet March 2011.

There is a difference between general nanotechnology and (industry) specific nanotechnology. General technology refers to the basic ideas of nanotechnology, the so-called “building blocks”, many of which have already been patented.<sup>377</sup> This general technology is typically used for further development of (industry) specific technology. Whereas all nanotechnology may be used across industries, this obviously applies more to general nanotechnology<sup>378</sup>. It are typically universities that have ownership over these building blocks, or research tools, that are critical for developing further innovations. Many universities prefer to license these to the industry<sup>379</sup>.

### The strategic role of patents and the most common transfer arrangements

Nanotechnology is a recent upcoming technology, resulting in a patent scenario that contains of broad and overlapping patents. Additionally, patents have been granted on basic inventions, i.e. the so-called “building blocks”. This all happened due to the complexity of the technology in combination with the lack of industry-specific experience and knowledge at the patent offices who grant the broad patent claims. The situation is even considered as a ‘patent gold rush’ or ‘patent land grab’, referring to the early stage patent filing with the aim to get a share in high potential new inventions. It is characterized as a patent thicket, leading to difficulties for the researchers. Companies can use broad patents as a barrier against new entry into the market.

Another aspect of nanotechnology is the multidisciplinary character of the inventions and its patents, considering the different fields of research and science that it covers. Most of the nanotechnology can be filed under cross-sector applications. This is an issue that negatively influences the transparency for the industry. In the event that a company undertakes patent landscape, it does not know to which disciplines or applications it must turn. In addition, this scope

<sup>377</sup> Intellectual Property in the Nanotechnology Economy, Kshitiij Aditeya Singh (2007).

<sup>378</sup> Barpujari, I. (2010). The Patent Regime and Nanotechnology: Issues and Challenges. Journal of Intellectual Property Rights, Vol 15, May 2010, 206-213.

<sup>379</sup> Featherstone, DJ and Specht MD. (2004). Nanotechnology patents: A snapshot of nanotechnology patenting through an analysis of 10 top nanotech patents. Intellectual Property and Technology Law Journal 16(12), 19-24.

issue can cause problems with the interpretation of claims since competitors are not always fully aware of their freedom to operate.

#### *Most common transfer arrangements*

Currently there is no comprehensive overview on the different licensing techniques related to nanotechnology. One reason for this is the fact that it is a young and rapid-developing technology, not so clear as an industry in itself. This gives nanotechnology its multidisciplinary profile. Hence, the transfer arrangements differ per industry wherein the technology is used. This makes it difficult to make one clear overview of it. It all depends on the licensing customs of each specific industry.

As stated, Universities specifically own the Nano patents that are the “building bricks” and have the highest potential to become essential and needed for the development of specific nanotechnologies across industries. The universities seek to license these to the industry (most likely) on a cash basis. Cross-licensing is used when the patent is overlapping/complementary with another party's claims, which is not uncommon (Singh, 2007). It has been argued that, because of the patent thicket, it would be useful to work with patent pools. However, no patent pool yet exists. A reason for this could be the cross industry nature of the technology and the resulting heterogeneity among IP owners.

## 6.2 IP related problems in non-standard dependent industries

From the various interviews we learned that non-standard dependent industries experience similar problems with licensing, as do the standard-dependent industries. The foremost problems faced in non-standard dependent industries are caused by large numbers of patents, a large number of licensors and a large number of IP adopters. This results in transparency problems about ownership, scope and validity of patents. In some industries (from our examples above, notably the diagnostics industry) there is also a patent thicket.<sup>380</sup> The patent thicket adds to the aforementioned transparency problems. Furthermore, because of the complementarity of patents, the patent thicket gives rise to royalty stacking.

### 6.2.1 Large number of patents

Because of the large number of patents (and patent owners in some cases) both licensors and licensees often don't have access to the most essential information for a market to function well: what is the object (or which patent is relevant) and who owns it? Consequently, as a result of this lack of transparency, there is a risk for licensees of unknowingly infringing on a patent and thus a risk to ambushes, hold-ups and unanticipated litigations. This may form a barrier for adopting and commercially exploiting new technologies.

Alternatively, if there are a large number of users (as in chemicals as well as diagnostics) enforcement of patents is often hindered by large transaction costs related to identifying infringements. This again may induce deliberate infringements by adopters of technology and thereby reduce the return on investment for technology and IP developers (and thus the incentives to invest in the first place).

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<sup>380</sup> This is a phenomenon in which there are many overlapping/complementary patented technologies needed to produce a particular product (e.g. a machine for blood analysis). Those who try to use the technologies must contact and negotiate with multiple patent owners in order to get all licenses prior to commercialisation.

### 6.2.2 *Validity and scope*

Even if the basic information on relevance and ownership is available, and thus that licensors and licensees are able to at least enter into negotiations, there remain uncertainties about validity and scope of the patents. Such transparency problems may lead to frictions during bilateral licensing negotiations or frictions for the proper functioning (or take-up) of (potential) allocation mechanisms (such as pools, clearing houses or IP exchanges).

In some industries, this has resulted in an increased frequency in litigations. Notably in the diagnostics sector, licensors of gene patents have been actively enforcing their patents against providers of genetic tests by refusing to license or imposing restrictive terms. These litigations have resulted in disputes over validity and scope. The most prominent case is the Myriad case where the judge concluded that a (natural) gene cannot be patented (while a synthetic gene can be). Also in the field of Nanotechnology, Neill et al (2007) warn for an increased risk of litigations over validity and scope (see text below)

#### **O'Neill et al (2007)<sup>381</sup>**

Nanotechnology is expected to facilitate great advances in energy, materials and medicine. Inventors, corporations and governments are staking their claims to the rapidly growing body of nanotechnology intellectual property. Patents are issued with far-reaching rights, some leading to question the validity and scope of these patents. Concerns are arising on potentially overlapping patent claims in some sectors of nanotechnology. Contributing to the problem of patent overlap is the use of broad terms in the claims of nanotechnology patents.

### 6.2.3 *Royalty stacking*

Besides these risks related to transparency problems, the patent thicket also results in the risk of royalty stacking because of the high number of complementary patents. These concerns are especially in industries such as Diagnostics and Pharmaceuticals (the latter we did not discuss above).

A general remark (which also applies to standard dependent industries) is that problems described above may be perceived larger by smaller companies (compared to large companies). Notably with respect to transparency related problems, smaller companies lack the scale and the resources to set up their own professional IP department. Furthermore, large companies with large IP portfolios may be in a better position to escape royalty stacking by entering into cross-licensing agreements.

## 6.3 IP Solutions in non-standard dependent industries

Since the problems in the non-standard industries are to a certain extent similar to the problems in standard-dependent industries, the solutions also seem the same: cross-licensing, databases and collaborative licensing (such as patent pools). The details, such as how market participants that gather information on relevance, ownership, scope and validity turn out to be more experimental: making use of peer networks and/or data-aggregation techniques. We also noticed some innovative approaches to arranging collaborative licensing programmes (such as a clearing house and an IP exchange).

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<sup>381</sup> Sean O'Neill, Kirk Hermann, Marlene Klein, Jeff Landes and Raj Bawa (2007), "Broad Claiming in Nanotechnology Patents: Is Litigation Inevitable?", *Nanotechnology Law & Business*, Volume 4 No. 1, pp. 595-606.

Below we elaborate on these innovative approaches. We note that these solutions are modular and can thus often be used jointly. This modular approach is presented while discussing the concept of the clearinghouse. More specifically, the discussion of the concept of a clearing house is actually a description of how all previously discussed solutions can be merged and built upon each other.

In general (following the same logic as regards the problems), small and large firms may differently perceive the benefits of the solutions below.

### 6.3.1 *Creating transparency via web crawling, wikis and crowdsourcing*

Similar to standard-dependent industries, databases are used to improve transparency about patent ownership, scope and validity. Some of the databases are, however, very different from the databases operated by SSOs in the way in which the information is entered into the database and, subsequently, how the database is maintained and updated. Certain initiatives construct a "database of databases" on the basis of (web) crawling. Alternatively (or in addition to this technique) a database is constructed and updated by using a wiki approach that is based on activating the users of the database. Information can also be gathered by activating a network of experts via crowdsourcing. We elaborate on this below.

#### **Database of databases**

A first innovative approach is web and database crawling. In short, this is a database of databases. The content of a database is directly crawled and saved into a relational database. The database values, in this case information on patents, are indexed through a database crawler. Two examples of these crawling databases are Delphion and Google Patents.

Delphion is a commercial reporting and analysis tool, created by Thomson Reuters. It searches in 54 million patents worldwide. You must register to gain access to the database. An advanced search is possible. The database also provides several tools for analysing the data. Google also has a patent database with documents available from several databases such as the United States Patent and Trademark Office (USPTO), the European Patent Office (EPO) and the World Intellectual Property Organization (WIPO).<sup>382</sup> Google is free to use and you do not have to register. An advanced search for prior art is also possible. The Prior Art Finder identifies the main phrases from the documents that are acquired from EPO, WIPO and US patents. Subsequently these are compared to a query resulting from crawling documents in Google Patents, Google Scholar, Google Books and the rest of the worldwide web.

These databases provide a summarized overview allowing to quickly scan all of the patent's relevant information in a single document. Sometimes both the relevant attorney/agent as well as the examiner are shown. More specific information is also provided with respect to related applications and backward and forward citations.

A database can easily be extended with additional services such as tools for data analysis (as with Delphion which provides functionalities as: Alerts, Corporate Trees, Snapshots, Citation Links, Clustering, PatentLab-II, and more)<sup>383</sup> and/or services providing support during negotiations and business development. E.g. Pharamlicensing provided support as described below.

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<sup>382</sup> <https://www.google.com/?tbs=pts>.

<sup>383</sup> The website delphion.com states the following services:

**"Delphion Alerts** let you automatically run Saved Searches and email yourself the results — on a frequency you choose. With this innovative feature, you will be able to monitor competitor and industry patent activity, easily and efficiently."

**"Corporate Tree** helps you find US, European, and now WO records by Assignee name by helping end the confusion caused by mergers and acquisitions and the many different ways an Assignee's name can be represented on a patent

### Negotiation support by Pharmalicensing

Pharmalicensing support starts when a company has selected a partner by means of the first discussions and preparing the required material. When requested, it can even attend meetings between the partners, set up the deal structure, lead the negotiations and provide a license/collaboration agreement. Each of these aspects can be demanded on a singular basis.

Pharmalicensing additionally provides pharmaceutical-specific reports on licensing processes as well as therapeutic overviews, which can be purchased at their online shop. Furthermore, the latest news from the entire pharmaceutical industry is shown on the website. Other specific expertise is the gathering of information and data to strengthen the deal, which can be used as a benchmark for future negotiations. Moreover, subscribers with business development aims are able to acquire information that is updated daily regarding new innovations in order to license<sup>384</sup>. These publications are peer reviewed by their scientific staff.

Below we assess the benefits and costs of using these databases and analyse how these solutions can be of relevance for the standard dependent industries. For this we notably look at the critical success (or failure) factors and to what extent they are present in the standard-dependent industries.

Pros (Benefits)	Cons (Costs)
<ul style="list-style-type: none"><li>• Relatively easy to set up;</li><li>• Easy global accessibility;</li><li>• Very useful if also offering additional services/tools;</li><li>• May provide information about scope (if the source data provides this).</li></ul>	<ul style="list-style-type: none"><li>• Only useful if comprehensive;</li><li>• Requires constant maintenance to be up-to-date, comprehensive, and user friendly (but this may be automated);</li><li>• Difficult to control the quality of updates because the system depends on the inputs from other databases;</li><li>• Because it is fairly easy to set up, there are many database services online and it becomes difficult to separate the good from the bad or to identify the right one for your industry;</li><li>• Does not provide information on validity;</li><li>• Does not provide data on complementarity of IP.</li></ul>

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document. The inclusion of WIPO PCT Publications (WO) applications is of particular significance because many companies use WO filing as a way to register a "first occurrence." This means that, very often, the WO application is the first publication to appear in the public domain — and so it is the very first indicator of patenting activity in a certain field or by a certain competitor. Basing your search on Corporate Tree hierarchy data from the WO collection can alert you to the early moves of your competitors."

"**Snapshot** helps you instantly see the meaningful information hidden in the patents in your search results. Snapshot works with both patent office data and DWPI enhanced data — your Snapshots can contain a mix of both patent office and DWPI data."

"**Citation Link** reveals all of a patent's citations — both backward and forward — in a graphical map, using multiple visualization techniques."

"**Delphion Text Clustering** transforms obscure, textual information into useful knowledge. The visible relationships quickly become clear when you display clusters of similar documents based on extracted keywords. Text Clustering lets you look at your patents in a whole new way."

"**PatentLab-II** can help you quickly create your own graphs based on your selected fields — or get the overall picture of your data through several ready-made reports".

<sup>384</sup> [www.pharmatransfer.com](http://www.pharmatransfer.com).

### Critical success factors for transposition

- There are little barriers for applying the systems to standard related patents, but to be of use for the standard-dependent industries, the platforms should also crawl SSO databases;
- SSOs would need to make all the data publicly available;
- It is a useful platform for combining SSO databases with databases from patent offices (see solution 5.2.8);
- The benefits of linking all databases increase if additional functionalities are added (ranging from analytical tools to a platform for trade – see also below).

### Wiki-based database

PatentLens is an independent and non-profit oriented search platform in the field of Biological Innovation, by means of Open Source. PatentLens performs publicly-funded landscapes<sup>385</sup> and provides free access to its database. As such it is rather similar as the previously mentioned databases. For example, it also provides some analytical tools (notably visual analysis). However, PatentLens adds an additional functionality allowing its user-community to exchange information by adding comments, annotations and tags, creating and sharing collections of patent documents, analysing collections and commenting on them. All updates by registered users are posted immediately so that any other user can evaluate them. The idea is that on the basis of this wiki approach the information in the database is updated.

Users can also initiate/perform their own landscapes. For this PatentLens provides tutorials for patent search and landscapes and it tries to actively involve community members with expertise in patent informatics, patent searching or claims analysis. PatentLens itself does not provide comments about validity of patents, but it invites its users to provide information about “prior art” in the forum via the provided annotation interface. A remark is that one does not know if the individual providing the information has a conflict of interest and deliberately provides false information. Efforts should be devoted to a quality check of the outputs of these approaches.

PatentLens is still in its early phases. Since February 2013, the advanced version of the information platform (i.e. the website ‘Lens’) is available in a beta-version. Its aim is to develop into a full worldwide patent search engine within 2 years. It is therefore very early to assess the initiative in terms of how many users it attracts and how much it is valued by the professional society. A similar project “wiki-patents” has been running since 2007.<sup>386</sup> Since early 2013 it seems to be offline and no longer operational. Lists of many more similar initiatives can, however, be found on IP-centre.org under the heading Patent Information User Groups.<sup>387</sup> This gives the impression that there is a broad faith among a wide group of IP experts that a wiki-based approach has potential.

Below we assess the benefits and costs of using these Information User Groups and analyse how these solutions can be of relevance for the standard-dependent industries. For this we notably look at the critical success (or failure) factors and to what extent they are present in the standard-dependent industries.

<sup>385</sup> By the Norwegian Ministry of Foreign Affairs in a collaboration with the International Rice Research Institute. Recent work on the Patent Sequence server, and landscapes in Health and Medicine are made possible by grants from the World Intellectual Property Organization (WIPO) and PATH Vaccine Solutions.

<sup>386</sup> It was initiated by IBM and New York Law School and sponsored by Hewlett-Packard, General Electric and Red Hat.

<sup>387</sup> AIIP (Association of Independent Information Professionals), Confederacy of European Patent Information User Groups, Danish Patent Information Forum, French Patent Group German Research Circle (Recherchezirkel), Intellectual Property Bar Association (UK), Intellectual Property Society of Australia and New Zealand, Italian Patent Information Users Group, Netherlands Patent Information User Group, Patent Information Users Group (PIUG), PIUG Wiki Space, Swedish Inventors' Association, United Kingdom Patent and Trademark Group PATMG.

Pros	Cons
<ul style="list-style-type: none"> <li>• Set up costs are relatively low;</li> <li>• Relatively low costs for maintenance (the system maintains itself at relatively low costs);</li> <li>• Easy global accessibility;</li> <li>• Allows for including information about scope and validity;</li> <li>• Very useful if also offering analytical services/tools;</li> <li>• Can also provide information on complementarity of IP.</li> </ul>	<ul style="list-style-type: none"> <li>• Risk of failure: it needs a critical mass of registered users;</li> <li>• While competing with other initiatives, it is difficult to reach that critical mass;</li> <li>• Only useful if comprehensive;</li> <li>• Needs some advanced quality mechanism.</li> </ul>

Critical success factors for transposition
<ul style="list-style-type: none"> <li>• There are little barriers for applying the systems to standard related patents, but amidst all the competing databases and user groups, a clear sponsorship from SSO's would give the initiative a boost to reach the necessary critical mass;</li> <li>• There is a problem that the most informed experts are employed by the industry and may therefore have a conflict of interest. Hence despite a potential high expertise of the users, there is still a need for an advanced/objective quality mechanism. This may require the involvement and sponsorship of PTOs;</li> <li>• Indeed, the approach is still experimental, but the costs of setting up seem low. The costs of failure are low whereas the potential benefits are high.</li> </ul>

### Crowdsourced validity checks

The wiki-based approach results in a potentially powerful tool that provides indications about validity. We will not claim here that it can substitute a professional analysis by experts. There are examples, however, of alternative approaches in which a large group (or crowd) of professionals is used to provide information about validity. A “crowd” of motivated professionals may be able to find more references than a relatively small team. The motivation may be in the form of a bounty.

Article One Partners is a firm that specializes in crowd-based invalidity searches by offering a bounty to thousands of searchers around the world for providing evidence of invalidity on patents that have been submitted for a check. The initiative was set up in 2008 and has since built a network of over a hundred researchers globally and according to its website it enjoys a considerable degree of trust from the industry<sup>388</sup>. Also IPXI (whose starting up business case is itself relying on building trust - see below) uses the services of Article One Partners.

Similarly, as before, one does not know if the individual providing the information has a conflict of interest and deliberately provides false information. However, one can overcome this by having researchers confirming that they are without a conflict of interest (which is legally binding).

<sup>388</sup> <https://www.articleonepartners.com/what-we-do/our-scorecard> and, of course, it helps that the CEO is a well-respected IP expert himself (i.e. Marshall Phelps).

Pros	Cons
<ul style="list-style-type: none"> <li>• Set-up and maintenance costs are relatively low;</li> <li>• Allows for a high quality analysis for a relatively low price;</li> <li>• May be combined with other arrangements.</li> </ul>	<ul style="list-style-type: none"> <li>• Risk of failure: needs a critical mass of registered experts;</li> <li>• Risk of failure: needs a regular stream of validity requests for experts to remain interested in participating – but this is no different from any other company.</li> </ul>

Assessment of transposition
<ul style="list-style-type: none"> <li>• There are little barriers for applying the systems to standard related patents;</li> <li>• A problem might be that the most informed experts are employed by the industry and may therefore have a conflict of interest – although the problem is not an insurmountable barrier, since Article One Partners itself also serves 13 of the Top 20 companies involved in mobile technology patent wars.</li> </ul>

### 6.3.2 Collaborative licensing programs

Having a good database with information on the relevant patents and who owns them, as well as the scope and validity of these patents already addresses a majority of problems. However, in case the number of patents and the number of licensee and/or licensors is large, there remain considerable transaction costs in the form of negotiation costs and/or in terms of setting up and operating a licensing programme. Furthermore, in case patents are complementary, there remains a risk of royalty stacking. To deal with these problems in non-standard dependent industries, one observes various initiatives that we refer to under the heading of “collaborative licensing programmes”. A familiar form that we also see in standard-dependent industries is the patent pool. Other (often more experimental) forms that one observes are IP exchanges and IP supermarkets.

#### Non-profit pools

We identified patent pools operating with a non-profit objective to reduce transactions costs and prevent royalty stacking and thereby increase the marketability of technologies in low-income countries. For example, in pharmaceuticals there is the “Medicine Patent pool” (MPP). The pool is publicly initiated and sponsored.<sup>389</sup> Its aim is to reduce transactions costs and thereby increase the marketability of HIV/AIDS treatments in low-income countries. In a way these ‘treatments’ are also standards since the WHO often prescribes which are the best combinations of patented medicines. A difference between MPP and the pools known in standard dependent industries is that licensors are not a member of the pool, but that the pool is set up as an independent entity with its own philanthropic objective (backed by public funds and by public pressure on licensors to cooperate). The pool as such operates as an intermediary between licensors and generic medicine producers (licensees). By playing the role of an intermediary (and not inviting licensors to become a member), it can best serve its primary objective that is a general public interest and not serving private profitability. De facto, these objectives are more in line with the objectives licensees (generic producers) than with the objectives of licensors (which is also clear from the fact that MPP has more problems with closing a deal with licensors than with licensees).

<sup>389</sup> The first suggestion for the pool was initiated at the International AIDS conference in 2002. From here on UNITAID kicked-off, with support in a later phase from respectively Médecins Sans Frontières and the World Health Organization. As of April 2013 the organisation signed five sub-licensing agreements, while still in active negotiations with big pharmaceutical companies. See [www.medicinespatentpool.org](http://www.medicinespatentpool.org).

Another example is the BIO Ventures of Global Health (BVGH) pool that was an initiative by GlaxoSmith-Kline in 2009<sup>390</sup>. BVGH is not only a pool; it tries to engage companies and universities to participate in partnerships and to contribute in this way to the pool. As such, the BVGH pool goes beyond the operation of a collaborative licensing programme and aims to facilitate collaboration in innovation as well. This makes sense. As became clear from section 2.1.3, there are benefits for companies to collaborate in innovation, but there are also costs in terms of moral hazard, free riding and less flexibility for individual partners to use IPR strategically. Furthermore, during our interviews (almost all of them) it became clear that these costs translate eventually into the major problem of how to distribute the royalties to jointly-owned IP. These costs of joint innovation can be dealt with by making proper ex ante agreements on the distribution of royalties.

Setting up a non-profit pool and closing negotiations with relevant parties may take a long time (see the example of MPP).<sup>389</sup> As with other pools, there are problems in dealing with issues on validity (which may differ from one jurisdiction to another) and on royalty sharing. The process may go faster if also the licensors are motivated by other reasons than profit. Licensors may have intrinsic philanthropic motives to collaborate with these pools (e.g. BVGH), but public pressure to cooperate also forms an incentive (e.g. MPP). Incentives to join may become even larger if collaboration in licensing is combined with collaboration in innovation, e.g. to get the industry at large to realise objectives that it would otherwise not attain (such as developing orphan drugs).

If objectives are mainly profit oriented, pools are typically interesting for licensors when IP is complementary *and* if there is a large number of users requiring access to a set of complementary IP. In that case, the benefits of pooling outweigh the disadvantage (in terms of less flexibility). In the area of chemicals and synthetic DNA the use of profit-oriented patent pools has been explored because there are indeed many licensors and many licensees. However, these attempts were not successful because the interdependence between IP is not sufficiently strong (as compared to IP belonging to a single standard). The reduction in flexibility related to patent pools is therefore often considered too high.<sup>391</sup>

In case non-profit motives are present, structural market features are of less relevance for the incentives to pool (unlike complementarities between IP). In the example of MPP for example it only concerns around 5 treatments, each combining 4 to 5 medicines (i.e. patents). These 20 patents are owned by around 5 licensors. The number of generic producers (i.e. licensees) is around 5 as well. As such MPP is more of an intermediate agent than a pool as we know it from the standardised industries.

Below we assess the benefits and costs of non-profit pools and analyse how this solutions can be of relevance for the standard dependent industries. For this we notably look at the critical success (or failure) factors and to what extent they are present in the standard dependent industries.

Pros	Cons
<ul style="list-style-type: none"> <li>• Prevents royalty stacking;</li> <li>• Reduces transaction costs;</li> <li>• Reduces risks on scope and validity;</li> <li>• Can be used to serve non-profit objectives;</li> <li>• Can be used to grow into an R&amp;D joint venture;</li> </ul>	<ul style="list-style-type: none"> <li>• Risk of failure: Low number of licensees;</li> <li>• Risk of failure: disagreements on how royalties are shared.</li> </ul>

<sup>390</sup> Actually its predecessor was initiated by GSK: 'Pool for Open Innovation against Neglected Tropical Diseases'. Since then, several universities have joined the pool as contributor.

<sup>391</sup> In these industries, however, more loose forms of collaborative licensing programmes are being explored and experimented with (these are clearing houses and IP-exchanges).

Pros	Cons
<ul style="list-style-type: none"> <li>• Independent pools can function as intermediary and negotiates with licensees and licensors;</li> <li>• The pool/intermediate may also add (non-profit) value if there are only a few licensors and licensees.</li> </ul>	

Critical success factors for transposition
<ul style="list-style-type: none"> <li>• The intermediate pool model could be useful to facilitate the adoption of a standard from another industry (e.g. smart grids or automotive adopting standards from telecom). In this case, the pool does not necessarily have to play an independent intermediate role. It might just as well be initiated by the licensees (smart grid industry) to create countervailing buying power;</li> <li>• By combining the pool with collaboration in R&amp;D, it could help an industry agreeing on and adopting standards (and move on). This might particularly be relevant for industries where the current efforts to agreeing on standards fall short (e.g. related to security standards for smart grids or related to cross industry standards such as standards used for charging electric vehicles);</li> <li>• A critical success factor in all of this is that there should be made arrangements that take away anti-trust related objections to collaboration on the side of buyers (reverse hold ups) and to combining pools with collaboration in R&amp;D and standard setting;</li> <li>• The threat to a reverse hold-up can be assessed on a case-by-case basis by requiring pools from licensees to DG Competition for ex-ante permission to cooperate collaboration.</li> </ul>

### IP exchange

Krattiger (2004) distinguishes between “online” and “managed” IP exchanges. The online systems are quite simple and merely list cross-referenced technologies and patents, allowing licensors and licensees to engage in negotiations. Sometimes they also organise an online auction service. Most of these were founded during the dot.com era of the 1990s and many (if not most) of them are no longer operational.<sup>392</sup>

One of the few examples of a “managed” IP exchange is IPXI that is organised by Ocean Tomo. IPXI is still in its early stages and about to open trade in a first set of patents related to OLED technology. The model of IPXI has, thus, not yet been tested in practice. Conceptually, however, IPXI is quite interesting and may provide some inspiration for dealing with problems in standard-dependent industries.

IPXI is developed after the model of a stock exchange. It allows companies to issue a number of IP licenses in the form of Unit License Rights (ULR) in a same way that companies issue stocks at the stock exchange. (A ULR gives the right to produce a predefined number of products - see text below). Similar to the introduction of a stock, the introduction price of ULRs is based on an underwriting process during which investors are approached to place a bid. After a successful introduction, ULRs can be traded at the exchange or holders “consume” the ULRs to produce a specific number of products/services.

<sup>392</sup> Krattiger (2004) gives several bottlenecks for these online services to succeed:

- Few of them are complete enough to allow a prospective licensee to assemble all the needed licenses to obtain freedom-to-operate (FTO);
- In addition, actually negotiating with a company often not only allows for cross-licensing but also for the transfer of know-how or trade secrets; and
- IP owners typically use their patent portfolios as a strategic tool, a practice not conducive to wide licensing. Merely clicking on a web, downloading a standard license, and wiring money is rarely sufficient for technology transfer to occur.

### Unit License Rights

Each purchaser of a ULR contract is granted the right to use the underlying technology for a pre-established number of instances (the technology unit); for example, the right to manufacture and/or sell a certain number of defined product units incorporating the patented technology. As soon as one instance of use occurs and is reported to IPXI, the ULR contract is consumed and retired from the purchaser's registry account. If a ULR contract is not consumed, a purchaser can alternatively trade the ULR contract on the electronic trading platform maintained by IPXI.

The exchange standardizes offerings and enables secondary market transactions thereby reducing transaction costs. If liquidity on the secondary market is high enough (i.e. large enough volumes are traded), it results in market-based price discovery. A precondition for high volumes is for the exchange to be relatively easily accessible to both buyers and suppliers of IP, but also that the platform enjoys a considerable degree of trust. For this latter purpose, IPXI has a clear rulebook. Every actor engaging in a trade via IPXI is required to become a member first and is thereby required to abide by the rules. Amongst others, licensors are required to provide adequate information about scope (and when applicable about essentiality) and each patent that is introduced at the exchange is first screened on validity by using Article One Partners (see above). The rules also prescribe that members keep 'consumption reports' on how many ULRs they have "consumed" (as such, the exchange also provides a wealth of information about technology adoption). If there is a dispute between members concerning IP that has been traded via IPXI, the members are to make use of IPXI's arbitration mechanism.

For licensors, the main benefit of using IPXI as a platform is that they don't need to develop their own licensing programme and save on transaction, enforcement and litigation costs. The benefits of participating increase with the number of licensors using the exchange.

A primary reason for licensees to use the platform is that they know that the price is market based (assuming a liquid market). It has also been argued that the secondary market allows for hedging exposure to new technologies and managing risks of patent infringement (Boger and Ziegler, 2012 and *IPWatchdog*). Furthermore, licensees enjoy more transparency on scope, validity and essentiality (if applicable).

A critical success factor for the IP-Exchange is whether it covers trade in complementary IPs. If complementary IP is traded in large enough volumes, the problem of royalty stacking is reduced because the market-based price mechanism accounts for the complementarities. If, however, complementary patents are traded outside the exchange against different conditions transparency problems and royalty stacking may remain and the value added of using the exchange as a platform reduces significantly for both licensors and licensees.

The critical success factors are thus: low barriers to join, trust, volume and coverage. Trust and barriers to join may have a regional dimension and (similar to stock exchanges) there may be a need to set up multiple exchanges in different regions. Similar to the regular stock exchanges, volume and coverage increase if these different exchanges are linked and allow for trade between the exchanges.

Below we assess the benefits and costs of the IP exchange and analyse how this solutions can be of relevance for the standard dependent industries. For this we notably look at the critical success (or failure) factors and to what extent they are present in the standard-dependent industries.

Pros	Cons
<ul style="list-style-type: none"> <li>• Prevents royalty stacking;</li> <li>• Reduces enforcement and litigation costs;</li> <li>• Reduces risks on scope and validity;</li> <li>• Reduces negotiation costs.</li> </ul>	<ul style="list-style-type: none"> <li>• Complex to set up;</li> <li>• It has not yet been tested for real and investors as well as licensors and licensees may have cold feet;</li> <li>• Licensors are less flexible in their IP strategy;</li> <li>• Risk of failure: needs a critical mass of registered licensors and licensees;</li> <li>• Risk of failure: complements are traded outside the exchange.</li> </ul>

Critical success factors for transposition
<ul style="list-style-type: none"> <li>• Is difficult to implement in markets with only a few licensors and licensees (in particular if they are vertically integrated and there is a lot of cross-licensing going on). From that perspective, the telecommunications industry is likely not to be the first to embrace the concept;</li> <li>• The IP has a higher chance of success in consumer electronics where we also observe a higher intensity of patent pools. Notably in those situations where licensors perceive the costs of joining a pool (in terms of giving up flexibility in negotiations) as being too high but the benefits still considerable, the IP exchange might be a more attractive model (not surprisingly we see have observed that IPXI's first launch concerns the CE technology OLED);</li> <li>• The model seems particularly useful to facilitate the adoption of a standard from another industry (i.e. where cross licensing makes little sense). We can, for example, think of a situation where consumer electronics producers need to adopt standards from both smart grids as well as telecommunications as we move toward automated homes;</li> <li>• A critical success factor is to have all participants accepting the ULR as a unit for negotiations. Notably the telecommunications industry (being the most cross industry in nature) has to embrace the concept (at least for licensing-out to other industries).</li> </ul>

### The IP supermarket (or royalty-collecting clearinghouse)

The IP supermarket is a term that we encountered while studying the literature on clearinghouses (see below). To clarify exactly what is meant with an IP supermarket, it is useful to compare it to patent pools. A patent pool is a set of arrangements among patent owners that is often based on a multiparty agreement. The pool subsequently markets a package of complementary IP. In the case of the IP supermarket, the patent owner enters into agreement with the supermarket only (by means of a standard form licence). The supermarket subsequently brings together the licensors and the potential licensees. Here, instead of one package, the licensee can make a deliberate choice between each patent, depending on its needs. Consequently, the risk for the technology adopter of (unknowingly) infringing a patent remains larger (as compared to a pool). In an ideal situation, however, the supermarket offers all relevant IP and presents them next to each other 'on the same shelf'. The risk of unknowingly infringing on a patent is thereby reduced. The main difference between a pool and a supermarket is that in a pool it is the patent owner who decides which patents will be licensed, whereas with the supermarket it is the licensee who determines which patents are licensed. The supermarket serves one or several patents on an *individual* basis as an agent between licensees and owners.

It is also possible to combine the concepts of the supermarket and the pool. The IP owners set up a pool by entering into a multiparty agreement; the pool then enters into agreement with the supermarket. The supermarket can subsequently offer the bundle of IP for a single price. As required by anti-trust authorities, the members of a pool must offer licensees the opportunity to unbundle the bundle. For this, IP owners can individually enter into agreement with the supermarket that subsequently 'displays' the individual IP next to the package. At all times, the IP owner is free

to bypass the supermarket and enter into a bilateral agreement with a licensor. In an ideal situation, however, a producer of a smart phone could buy all necessary IP at a one-stop-shop.

A first attempt to set up such a supermarket is the ‘*Librassay® – Molecular Diagnostic Patent Supermarket*’ (related to the molecular diagnostics industry), which is established by MPEG LA at the end of December 2012<sup>393</sup>. Furthermore, we know of one multinational chemical firm having showed interest offering standard licenses via such a supermarket within the niche field of nutrigenomics. However, other market players within this industry seem hesitant because of the uncertainty with respect to its success.<sup>394</sup>

Similarly to the IP exchange (and for similar reasons) the supermarket’s success factors are: low barriers to join, trust, volume and coverage.

Below we assess the benefits and costs of the IP Supermarket and analyse how these solutions can be of relevance for the standard dependent industries. For this we notably look at the critical success (or failure) factors and to what extent they are present in the standard-dependent industries.

Pros	Cons
<ul style="list-style-type: none"> <li>• Reduces the risk to royalty stacking;</li> <li>• Reduces enforcement and litigation costs;</li> <li>• Reduces risks on scope and validity;</li> <li>• Reduces negotiation costs;</li> <li>• Licensors are more flexible in their IP strategy as compared to a Pool;</li> <li>• Licensees are can more easily unbundle the bundle from a pool (without the need to enter into bilateral negotiations).</li> </ul>	<ul style="list-style-type: none"> <li>• Complex to set up;</li> <li>• It has not yet been tested extensively and licensors and licensees may have cold feet;</li> <li>• Risk of failure: needs a critical mass of registered licensors and licensees;</li> <li>• Risk of failure: complements are traded outside platform.</li> </ul>

Transposition
<ul style="list-style-type: none"> <li>• Same as the IP exchange.</li> </ul>

### 6.3.3 Clearinghouse

Above we already introduced the concept of a clearinghouse while discussing the IP supermarket. However, we might just as well have introduced the terms while discussing databases. The clearinghouse is namely a multi-functional modular concept that integrates the previously described solutions. The literature by Van Zimmeren, Van Overwalle and other<sup>395</sup> elaborates extensively on this concept.

<sup>393</sup> Contributors to Librassay® include:

- Johns Hopkins University;
- Ludwig Institute for Cancer Research;
- Memorial Sloan-Kettering Cancer Center;
- National Institutes of Health;
- Partners HealthCare;
- The Board of Trustees of the Leland Stanford Junior University;
- The Trustees of the University of Pennsylvania;
- University of California, San Francisco;
- Wisconsin Alumni research Foundation (WARF).

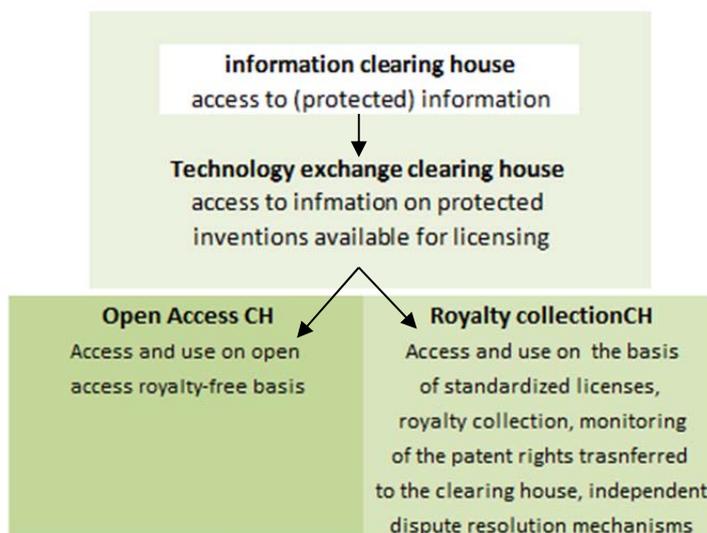
See also [www.librassay.com](http://www.librassay.com).

<sup>394</sup> The case is also elaborated on in the PhD thesis of Van Zimmeren, University of Leuven, 2011.

<sup>395</sup> See: Van Zimmeren, Vanneste, Matthijs, Vanhaverbeke, and Van Overwalle, 2011; Van Overwalle, Van Zimmeren, Verbeure, and Matthijs, 2007; Van Zimmeren, Verbeure, Matthijs, and Van Overwalle, 2006; and, Van Zimmeren, 2006.

According to Van Zimmeren et al. a clearinghouse can provide many services, thus several types of the clearinghouse can be distinguished by means of a gradual increase of tasks. From basically providing databases of information to the high-end level of royalty-collecting intermediaries that may also offer additional services like monitoring, enforcement and mediation or arbitration in case of disputes. Figure 6.3 below shows in this sense how the different types fit together. The first two types provide access to information on the patented inventions; these are in essence not different from the databases that we described above. These platforms address the concern of transparency, as already discussed in the former sections, but do not address the problem of royalty stacking. The latter two types instead do deal with this problem, whereas the *open-access clearinghouse* has the very specific feature of having a royalty-free profile and is much more focused on integration with R&D functionalities (similar to the BVGH pool mentioned above).

**Figure 6.3 The clearinghouse; a stylised representation**



Source: adapted from Van Zimmeren, et al., 2006.

- **Information clearinghouse:** This basic concept of a clearing house provides access to information related to the intellectual property status, thus it functions more or less like a database. Hereby, think of search sites for patents such as Delphion;
- **Technology exchange clearinghouse:** This model adds to the database the feature of a platform between licensors and licensees so to enhance bilateral negotiations. Hereby, think of Pharamlicensing, which also provides expert assistance through the entire chain of negotiations;
- **Open access clearinghouse:** This type of the clearinghouse aims at collaboration on an open and royalty-free basis. It is mostly used in cases when patents are fragmented or for exchanging unpatented inventions. It typically has the objective of “managing” the commercial exploitation of essential IP while having in mind the public benefits. Examples are the SNP consortium or the Wellcome Trust. Both focus on keeping essential IP (mainly in genomics) accessible for all. The Wellcome Trust invests in R&D and “[s]hould any Trust-funded IP arise from the Grant, then the Trust requires the Institution to consider whether the protection, management and exploitation of such Trust-funded IP is an appropriate means of achieving the public benefit.” The SNP consortium applies for patents to secure recognition as inventors and for defensive purposes, but it has not the objective of securing commercial patent rights. It also serves the wider objective of making technology accessible to all;
- **Royalty collection clearinghouse:** The next model tries to enhance the transparency by means of stimulating standardized simplified licences and to include a mechanism for the

reimbursement of the licenses. In addition it may even include its own independent dispute resolution mechanism for cases when a patent is infringed. An example of this concept is a copyright society but also Librassay can be regarded a royalty collecting clearinghouse. Also IPXI has many features of this type of clearinghouse.

The clearinghouse concept as described by Van Zimmeren et al. is thus not so much a new approach to dealing with transparency problems and royalty stacking. It is much more a description of how to develop from setting up a database to offering brokerage functionalities and even facilitate innovation.

It is important to mention that the concept is something different from what brokers are doing. Whereas brokers are active from an entrepreneurial spirit diving into those markets where they see a possibility to match demand and supply of patents, the clearinghouse should be seen on a more institutional level. Brokers, on the one hand, actively approach suppliers of patents in order to build up a competitive valuable database and then actively seek for the customers. A clearinghouse, on the other hand, should be built up from an already existing database / combination of databases, which attracts the potential licensees because of the completeness of the 'shop'. This in turn attracts licensors for it allows them to identify large numbers of potential licensees. This shows that the clearinghouse typically serves two markets (i.e. a two-sided market). For a clearinghouse to become a success it should thus either have a large number of patents for sale or a large number of adopters shopping there. Recent attempts such as Librassay and IPXI aim to set this wheel in motion by convincing a large number of patent owners to join. They thus follow the approach of brokers. Experience from the market for Operating Systems (another two-sided market) is that one can also start with establishing a large user base, e.g. by developing a search engine (as Google did). Mirroring this to the clearinghouse concept, it fits with the approach of starting with a database (e.g. a database of databases) and growing from there by adding new functionalities. This approach has the advantage of gradually becoming known in the industry/industries, steadily building up trust and getting the first licensors committed. Note that the first ones will likely be small and medium sized enterprises who do not have an advanced legal IP department running their own licensing programmes.

Moving from the first stage (database) to the next (technology exchange) is a matter of having built up the right user group (i.e. licensees), having gained enough trust from the licensors, and confirming that there is actual demand for additional services. From there on, expanding the clearinghouse with additional functionalities follows the same recipe: large enough user-group, trust and actual demand for the services.

Realizing and maintaining the large numbers (in terms of patents and licensees) is crucial, especially when taking into account that companies may fear losing control in the negotiation phase because this is now done by the clearing house. Notably in the case of non-standard dependent industries, firms can decide not to provide their key technologies, reducing the value added of the clearinghouse for adopters. This in turn makes other patent owners hesitant in joining the clearinghouse. It results in a vicious circle leading to an 'empty clearinghouse'. With SEPs this problem is less gradual since every patent is just as important: either a company joins with all its relevant SEPs or not. When not, there is a similar risk that other parties decide not to join as well. Clearinghouses, however, suffer less from this risk than do patent pools. The reason is that clearinghouses can allow for more flexibility and negotiation room for the licensor.

As stated the two 'basic' clearinghouses (i.e. the *information clearinghouse* and *technology exchange clearinghouse*) do not prevent royalty stacking. The royalty-collecting clearinghouse also does not prevent royalty stacking, but it can introduce some measures to contain the risk. It can, for

example, introduce a royalty-stacking clause by means of a ceiling. This can be implemented in the contracts with licensors as a fixed percentage (e.g. 10%) of the sales revenue as total royalty amount. As soon as the total royalty amount exceeds this percentage, then the licensors will be paid on a *pro rata* basis. Obviously, the other side of the coin is that licensors may be willing to agree with such a *pro rata* clause, but only with the guarantee that such reduction does not go below a specific percentage per unit sold (e.g. 2.5%).<sup>396</sup> This specific percentage in turn depends on the essentiality of the patent and the subsequent negotiation power.

#### 6.3.4 Applicability to standard dependent industries

The most basic form of the clearinghouse (a database) is well suited for all industries. However, the platform should be ‘crawling’ the databases of SSOs as well to provide full information about which IP is essential for a standard. This requires SSOs to participate in the project and invest in updating their databases regularly. Alternatively, patent owners are willing to provide the information and/or the database builds upon an active user-group providing the information via a wiki-approach. The user group can also provide indications about scope and validity of patents. However, the wiki-based initiatives have not yet proven to be a great success. On the other hand, the cost of failure is low. To get more guarantees for success one can better rely on a principle of crowdsourcing with monetary incentives (in particular for validity checks, but perhaps also for other types of consulting services).

The demand for additional technology exchange services differs from one actor to another and differs from one industry to another. Demand is likely low in telecommunications, where cross-licensing is the common mode for licensing between a few large enterprises all of which employ a large unit of highly skilled IP experts. In smart grids, technology exchange services can add value in terms of spurring standardisation and preventing duplication of innovative efforts. To bring the industry at large to a higher level, these technology exchange services can be complemented with agreements on royalty-free licensing (which is common already in smart grids) between participants. A same conclusion could be drawn for automotive where we already see similar kinds of models (e.g. the Holst model – see chapter 3).

The IP exchange or the IP supermarket (or in general terms, the concept of a royalty-collecting clearinghouse) have a chance of success in consumer electronics where we also observe a much higher intensity of patent pools. Notably in those situations where licensors perceive the costs of joining a pool (in terms of giving up flexibility in negotiations) too high, the clearinghouse might be a more attractive model.

Also for telecommunications, the IP supermarket or the IP exchange might add value after all in terms of facilitating the adoption of CT standards by other industries CE, smart grids and/or automotive (possibly all at once if we consider the future of smart cities). We note that the convergence of industries may make actors suspicious. The automotive industry as well as the smart grid industry might feel uncomfortable with adopting the telecommunications standards and becoming subjected to a considerable degree of market power. Not surprisingly we see companies like Mercedes and BMW becoming a member of ETSI and participating in PPP programmes for developing the 5G standard for mobile telecommunications. The question is why? Either to make sure that the future standards of mobile communication are compatible with the in-car

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<sup>396</sup> Krattiger A, RT Mahoney, L Nelsen, JA Thomson, AB Bennett, K Satyanarayana, GD Graff, C Fernandez and SP Kowalski. 2007. Editor’s Summary, Implications and Best Practices (Chapter 11.9). From the online version of *Intellectual Property Management in Health and Agricultural Innovation: A Handbook of Best Practices*. MIHR: Oxford, U.K., and PIPRA: Davis, U.S.A. Available online at [www.ipHandbook.org](http://www.ipHandbook.org).

communication systems or because they are investing in owning a bargaining chip in terms of SEP ownership when we want to adopt these standards. The first objective is (from an economic perspective) very good, the second, however, seems like a waste of resources because of the principle “every man to his own trade”. The clearinghouse could play an important role in this respect by providing trust; amongst others by initiating clear transparent standardised licensing agreements.

The table below summarises these conclusions.

	Relevance	Ownership	Scope	Validity and	Royalty stacking	CE		CT		SG		AUT	
						intra	inter	intra	inter	intra	inter	intra	inter
<b>Databases</b>													
Crawling	**	**	*			*	*		*	*	*	*	*
Wiki	*	*	**	*		*	*		*	*	*	*	*
Crowdsourcing				**		*	*		*	*	*	*	*
<b>Collaborative Licensing</b>													
Non-profit intermediary pools	*	*	*		**				*		*		*
Open access clearing house	*	*	*		**					*		*	
IP Exchange	*	*	*		*	*	*		*		*		*
IP Supermarket	*	*	*		*	*	*		*		*		*

The terms intra and inter refer (respectively) to licensing-out of IP to competitors (within the same industry) and to licensing-out of IP to non-competitors (from other industries).

## Annex I Interview plans

In order to gain feedback and insights from stakeholder we organised three rounds of interviews for this study.

The **first round** of interviews was with industry experts and focussed on obtaining information on:

- The structure and competitiveness of related sectors; and
- The strategic role of patents and standards.

In total we organised 9 interviews: 4 with stakeholders in communications technology; 1 with a stakeholder in consumer electronics, 2 with stakeholders in automotive; and 2 with stakeholders in smart grids.

The **second round** of interviews was with licensing experts in standard-dependent industries and focused on:

- establishing an in-depth understanding of the knowledge transfer practice in standard-dependent industries;
- identifying risks and transactions costs involved;
- finding facts and figures supporting these insights; and
- identifying/reviewing a range of policy options to address the risks/lower transaction costs.

When appropriate, (depending on the expertise of the interviewee) the second-round interview devoted special focus to the pros and cons of forming patent pools.

In total, we organised 18 interviews: 6 with stakeholders in communications technology; 5 with a stakeholder in consumer electronics; 3 with stakeholders in automotive and 2 with stakeholders in smart grids.

The **third round** of interviews was with industry and licensing experts in chemistry, mechanical engineering, diagnostics and nanotechnology. In total we organised 8 interviews (4 with industry experts and 4 with licensing experts – some of which were employed by existing clearinghouses or patent pools in non-standard dependent industries).

Below we present the questions that guided each round of interviews.

## Interview round 1 – industry analysis

### Purpose of the interviews

The purpose of the first round of interviews is to fill knowledge gaps that remain from the desk research aimed at describing the industry context and licensing practices for four standards based industries: communications technology, consumer electronics, automotive and smart electricity grid.

This first round of interviews is targeted at industry experts who have a broad perspective of the market for knowledge transfer in the respective industry. Depending on the particular knowledge gap, these experts may be connected to a university, research centre, firm or member of a technology licensing practice.

### Interview questions

Considering the interview objectives described above, we will apply a qualitative research approach using semi-structured in-depth interviews (Thietart *et. al.*, 2001). These interviews will typically be conducted by telephone.

Based on the knowledge needs, interview-specific interview questions will be formulated. The following protocol and list of questions provides an example of how the interview may be conducted and the type of questions that may be used:

Step	Activity
	<b>Introductions</b>
	<b>Role of IP in your industry</b>
1.	What is the typical attitude towards IP? Kept as a secret (know-how); codified in patents, protected and defended; patented, leveraged as revenue stream; shared under reciprocal conditions; shared freely? How patent intensive is your industry?
2.	How is Intellectual Property (IP) ownership distributed, who is the main IP (patent) owners? Where are these firms positioned in the value chain (knowledge firms, component/subassembly firms, OEM firms, systems firms, integrators, distributors or other)?
3.	How important is knowledge transfer through selling and buying IP? Through patents or otherwise? How important is IP (patent) enforcement?
4.	Are there major changes in patenting? Any trends? Major issues?
	<b>Role of IP licensing in your industry</b>
5.	How important is the role of IP licensing? What are the most important arrangements: Bi-lateral IP licensing contracts, multi-lateral IP licensing contracts, cross-licensing, through a patent pool, through a clearinghouse, otherwise?
6.	Which firms are the most important IP licensors? Which firms are the most important IP licensees?
7.	Are there major changes in licensing? Any trends? Major issues?
	<b>Role of standards in your industry</b>
8.	What is the most important role of standardization: achieving compatibility through standard interfaces, assuring minimum quality and safety, reducing costs through economies of scale and experience, as information and measurement standard?
9.	What are the major standards arrangements used: proprietary/de facto, consortium driven, through a Standards Developing/Setting Organisation (SDO/SSO), by government regulation, otherwise? What is/are the most important geographic scope for standardization (world, regional area, countries)?

Step	Activity
10.	What is the prevailing standardization strategy: enforcing proprietary standards, battle among different standards, purely cooperative standard setting or other? What are the drivers/motivations for the prevailing standardization strategy?
11.	Which firms are the major contributors to the standardization work? Where are these firms positioned in the value chain (knowledge firms, component/subassembly firms, OEM firms, systems firms, integrators, distributors or other)? What are the major drivers/motivations for these contributors in participating in standardization work? (drivers internal/external to the firm)
12.	Are there major changes in the role of standards? Any trends? Major issues?
	<b>Patents in relation to standards</b>
13.	What is the ratio of patents and standard essential patents?
14.	Are the patent disclosure rules satisfactory? Sufficiently transparent? What needs to change?
15.	Is the licensing process (post standardization) satisfactory? What needs to change?
16.	Is change in patent ownership (post standardization) affecting licensing? What needs to change?
17.	Are there major changes in the role of patents in standards? Any trends? Major issues?
	<b>Impact of technology convergence between industries (e.g. CE+CT)</b>
18.	How does the convergence affect patenting, licensing and standardization? Are there any barriers in obtaining licenses, participating in standardization work as an industry-outsider?
19.	Are there issues in terms of remuneration, e.g. a different base for calculating the licensing fee?
	<b>General</b>
20.	What are issues that you would like to bring to the attention of the European Commission that may improve the situation your industry is facing?
21.	What are experiences in your industry that you consider appropriate to share with other industries to foster economic development in the European Union.
22.	Which person(s) in which firm(s) should we interview to obtain a good insight in the knowledge-transfer practice, success and fail cases, in this industry from a licensor's perspective? Which persons in which firms should we interview to obtain a good insight in the knowledge transfer practice, success and fail cases, in this industry from a licensee's perspective?
	<b>In closing</b>
23.	Are there any topics related to knowledge transfer that we have not discussed, but that should have been addressed?
24.	Words of appreciation for granting the interview; next steps: transcript and review; reporting to DG Ent & Ind; results of Study via DG Ent & Ind.

## Interview round 2 – analysis of licensing experiences

### Purpose of the interviews

The purpose of these interviews is to establish an in-depth understanding of the knowledge transfer practice in standard-dependent industries. The interviews focus on identifying conditions and arrangements that explain the success/failure of knowledge transfer. The interviews are mainly a search for facts and figures.

### Interview questions

Step	Activity
	<b>Introduction</b>
1.	<p>1. Personal introduction of interviewer and introduction of the project, purpose and partners; reference to introductory letters/emails;</p> <p>2. Presenting an overview of the interview structure and process: solicited and unsolicited answered; ending with open question; time requirement/constraints by interviewee, flexibility;</p> <p>3. The findings of this interview will be anonymous and used in (public) reports to the European Commission. You will receive an interview transcript for review. If there is any information you wish to share with us but not to appear in the report, please state this explicitly;</p> <p>4. May your name and that of your organization name be listed in the list of interviews in the final report on this study? (Y/N);</p> <p>5. Do you agree that we record this interview for transcription purposes (audio recording will be deleted afterwards)? (Y/N).</p>
	<b>Setting the context, verifying base data for the interview</b>
2.	<p>6. Establishing/verifying the field of operation (industry) of the expert; the territory and markets in which he/she operates;</p> <p>7. Your name (specify);</p> <p>8. Your function/responsibilities/role within the organisation (specify):</p>
	<b>The role of knowledge, IP strategy and standards for your organization</b>
3.	<p>9. What is the strategic role of IP for your organization? (Multiple answers are possible)</p> <ul style="list-style-type: none"> <li>• Achieving freedom to operate;</li> <li>• A source of revenues;</li> <li>• Entry into markets;</li> <li>• A currency in IP negotiations (leverage in cross-licensing);</li> <li>• Differentiate products from those of competitors;</li> <li>• Other...</li> </ul> <p>10. How does the above role(s) affect your IP management strategies?</p> <ul style="list-style-type: none"> <li>• Do you develop IP in house or outsource?</li> <li>• Do you develop IP jointly or individually? <ul style="list-style-type: none"> <li>◦ (<i>jointly meaning in consortia, research collaboration and/or joint ventures</i>)</li> </ul> </li> <li>• Do you buy IP from other entities or license it in? <ul style="list-style-type: none"> <li>◦ (<i>buying can also be through merger &amp; acquisitions</i>)</li> </ul> </li> <li>• Do you sell IP to other entities or license it out?</li> <li>• Do you execute 'IP landscaping' prior to starting the product/service development?</li> <li>• Do you execute 'claim landscaping' to investigate your own IP position? At what stage?</li> </ul> <p>11. What are the major standardization arrangements in your business (please rank)? Can you list the most important organisations?</p> <ul style="list-style-type: none"> <li>• De facto: [ _____ ]</li> <li>• Via forums and consortia: [ _____ ]</li> <li>• Via Standards Setting Organisation (SSO): [ _____ ]</li> </ul>

Step	Activity
	<ul style="list-style-type: none"> <li>• Otherwise: [ _____ ]</li> </ul> <p>12. How actively are you involved in standardisation? What are your motives for this level of involvement?</p>
<b>Your organization's practices with licensing in/out SEPs</b>	
4.	<p>13. For which standards are you licensing in SEPs?</p> <p>Please take a standard-based product category in mind that is important for you (e.g. mobile terminal, Blu-Ray player): [ _____ ]. Then please answer the questions below for that product category:</p> <p>14. Who are the main IP owners and who are the main IP licensees?</p> <p>15. How many in-licensing agreements for SEPs do you have? How does that compare to the total number of (estimated) SEP owners of the standard?</p> <p>16. As an implementer of the standard, do you approach those that you believe to be SEP owners, or do you wait until you are approached?</p> <p>17. If you now consider all essential patents on that product category, can you please indicate which way these patents are licensed? (Note: total sum should be 100% = all SEPs):</p> <ul style="list-style-type: none"> <li>[ ___%] Licensed in on royalty free conditions</li> <li>[ ___%] Licensed in via a paid license, royalty based on units</li> <li>[ ___%] Licensed in via a paid license, royalty based on percentage of value of sold products</li> <li>[ ___%] Licensed in via cross license, no payment</li> <li>[ ___%] Licensed in via cross license, net payment to other licensor</li> <li>[ ___%] Licensed in via cross license, net payment to us</li> <li>[ ___%] Licensed in via patent pool license</li> <li>[ ___%] No formal license, still in negotiation</li> <li>[ ___%] No formal license, non-assert statement in place</li> <li>[ ___%] No formal license, there has been no contact with patent owner</li> </ul> <p>18. What percentage of your existing licensing agreements includes both SEPs and non-SEPs? (e.g. all patents in a defined technology area);</p> <p>19. What percentage of your existing licensing in agreements include grant backs or reciprocal conditions? [ ___%];</p> <p>20. What percentage of your existing licensing in agreements specifies a limited time period (as opposed to a non-expiring licensing agreement)? [ ___%] What is the average time period?</p> <p>21. What percentage of your existing licensing in agreements is on a broad portfolio basis (all patents in defined technology area) [ ___%];</p> <p>22. What percentage of your existing licensing in agreements has geographic use restrictions (opposed to global use) [ ___%];</p> <p>23. How do you determine which organizations to approach for offering licenses?</p> <p>24. How much time does a typical license negotiation take and how many Euros/FTE are involved?</p> <p>25. What are your principles when determining a license fee?</p>
<b>Problems your organization might be facing when licensing in SEPs</b>	
5.	<p>26. What problems do you experience in identifying SEP owners and their SEP portfolio?</p> <ul style="list-style-type: none"> <li>- Identifying relevant parties;</li> <li>- Identifying their portfolios;</li> <li>- Assessing the value of the IP;</li> <li>- Other: [ _____ ]</li> </ul>

Step	Activity
	<p>27. Do blanket disclosures in SSO IPR databases limit your ability to assess actual SEP portfolios and value?</p> <p>28. Does the quality of the information in SSO IPR databases limit your ability to assess actual SEP portfolios and value? (E.g. over- or under-disclosure, accuracy, level of detail, up-to-date, information on which standardized products infringe);</p> <p>29. How much effort or money would you save if transparency would be improved (especially the information contained in IPR databases)?</p> <p>30. As an implementer of standards, what types of risks do you experience yourself...</p> <ul style="list-style-type: none"> <li>a) of (unanticipated) litigation?</li> <li>b) of incidental or categorical discrimination because you don't own SEPs?</li> <li>c) of unsolicited bundling of SEPs with non-SEPs?</li> <li>d) that access to SEP is made conditional to the licensing of self-owned non-SEPs in return?</li> <li>e) that cumulative payable royalty for SEPs is above reasonable levels or even prohibitive for implementing products ('Royalty stacking')?</li> <li>f) substantial transaction costs because of the need to deal with numerous SEP owners (e.g. collecting information, negotiating, etc., but <i>not</i> royalty stacking)?</li> <li>g) that after a SEP transfer the new owner does not consider itself bound to earlier licensing commitments (including situations with cascading transfers and situations with blanket disclosures)?</li> <li>h) that SEP commitments are no longer in force after bankruptcy proceedings of the owner?</li> </ul> <p>31. Do you fear such risks in the future? Do you believe others suffer from these risks?</p> <p>32. What policy measures would alleviate these problems?</p> <p>33. What is your position towards patent pools? Would you welcome them as an implementer?</p>
	<p><b>Problems your organization might be facing when licensing out SEPs</b></p>
6.	<p>34. What problems do you experience in identifying standards implementers?</p> <p>35. What problems do you have with dealing with standards implementers?</p> <p>36. As an IP owner, would you benefit from increased quality of the information in SSO IPR databases (especially concerning information on the other SEP owners)? (E.g. over or under-disclosure, accuracy, level of detail, up to date, information on which standardized products infringe.);</p> <p>37. As an owner of SEPs, what types of risks or problems do you experience?</p> <p>38. Do you fear risks or problems in the future? Do you believe others suffer from these risks?</p> <p>39. What policy measures would alleviate these problems?</p> <p>40. What is your position towards patent pools? Would you welcome them as a SEP owner?</p>
	<p><b>In closing</b></p>
7.	<p>41. Are there any topics related to knowledge transfer that we have not discussed but should have been addressed?</p>

## Interview Round 2: The role of Patent Pools

In early 2013, the European Commission, DG Enterprise and Industry asked the ECSIP consortium to study the situation in industries dependent on patents and standards. In particular, they asked the consortium to investigate possible policy routes. As a part of their assignment, the ECSIP consortium conducts a number of interviews. This interview specifically focuses on the role of patent pools.

### Interview questions

1. Have you been involved in pools? If so, can you tell us in which pools and your role (founder/initiator, administrator, licensor and/or licensee)?
2. What were/are your motives for joining (or not joining) a pool?
3. What are, more generally, the benefits for patent holders of joining a pool? And do they concern some categories of patent holders more specifically? E.g. benefits can be in terms of:
  - a. SEP enforcement;
  - b. Faster adoption due to:
    - i. Market transparency (reducing search costs for adopters);
    - ii. Price (levels and transparency).
4. What, more generally, can deter patent holders from joining a pool? And do they concern some categories of patent holders more specifically?
5. What are, according to you, the main benefits of patent pools for licensees? And do they concern some categories of licensees more specifically?
6. Can you describe the process of forming a pool?

Pools are not always successful. We did some desk research in which we identified 52 pool launches in the last 15 years. Of these, 20 pools were considered effective or rather effective. Another 32 pools were found to be ineffective or rather ineffective or failed.<sup>397</sup>

7. Can you elaborate on the determinants of pool success? Among other things, these could include:
  - a) Number of prospective implementers vs. number of prospective SEP owners;
  - b) The importance of alternative licensing strategies, such as bilateral and cross-licensing;
  - c) Perceptions about the 'need' of a pool in order to achieve or promote market success;
  - d) Legal aspects (meeting competition law/antitrust law criteria);
  - e) Other ....
8. Are there some context elements (industry structure, nature of the technology or distribution of patent ownership) that make patent pools more suitable?

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<sup>397</sup> "effective" means:

- (a) a pool has been created within 3 years after standard release;
- (b) there is a single pool, the pool achieves good or very good coverage; and
- (c) the pool remains stable or grows through inclusion of other members over time.

"rather effective" means:

- (a) there are multiple pools (failure to achieve a single pool for one standard, like in the case of DVD or LTE); or
- (b) the pool fails to achieve good coverage, or is created after a significant delay.

"rather ineffective" means:

- (a) a pool is abandoned after a short time; or
- (b) the pool includes only fringes of the relevant patents.

"failed" means:

- (a) there is evidence of a significant effort to create a pool (e.g. a call for patent), which is not followed by a pool being created.

9. Are there developments that could increase the feasibility of pools in the future, or the 'need for pools'? Among other things, these could include:
  - a) Telecom and IT standards becoming enabling technology in many other markets (e-health, smart grids, etc.) and the number of implementers is quickly going up;
  - b) Increased convergence of functionalities in devices, challenging current bilateral licensing models;
  - c) Increasing need to support backward compatibility to earlier standards (e.g. OneBlue Pool of Pools);
  - d) Other ....
10. In several cases, licensing administrators or sponsors have been competing in order to launch pools (e.g. DVD, LTE). What is your view on this? Is this development positive or negative?
11. Do you have insights on the costs that patent pools have to comply with in relation to competition/antitrust rules (such as the self assessment)?
12. Is it desirable that the EC stimulates pool creation and adoption?
13. If so, what would be appropriate ways to do so?
  - a. More flexibility to organize joint enforcement of the pool patents;
  - b. Subsidising the assessment/screening of pooled essential patents;
  - c. Promote clearing house mechanisms based on SEP assessment with an optional choice for joint licensing for SEP holders that wish it;
  - d. Encourage public research organizations to join pools when they hold relevant SEPs;
  - e. Allowing/requiring different royalty rates for different categories of patents.
14. Are there innovative new ideas for pools? (In the recent past, we have seen developments like "Patent Platforms" and "Pools of Pools".);
15. Most current pools focus on interoperability standards. However, increasingly, pools and/or clearing houses are suggested for biotechnology, medicines/pharmaceuticals and genetics (USPTO, 2000; Duxbury 2008, 'Medicines Patent Pool'. Can you elaborate on such developments? Can pools in such sectors learn from current pools? Can current pools learn from such new developments?

## Interview Round 3: Non-standard dependent industry experts

### Purpose of the interviews

The purpose of these interviews is to establish an in-depth understanding of the knowledge transfer practice in non-standard dependent industries that are characterised by a patent thicket (with a neutral interpretation of the term). The interviews focus on identifying arrangements for efficient technology transfers and smooth licensing that could also be applied in standard-dependent industries:

- First it is important to establish the structure and the strategic role of patents in your industry:
  - It allows us to assess whether there is a resemblance with any of the four standard dependent industries that are subject of our study.
- Next it is important to establish what risks and problems related to licensing in/out IP (intellectual property) are present in your industry:
  - Again, it allows us to assess the resemblance with any of the four standard dependent industries that are subject of our study;
  - You find an overview of the typical risks and problems related to SEPs (standard essential patents) at the end of this document (after the questions).
- Finally, we are most interested in learning from practices in your industry for dealing with those risks and problems.

### Interview questions

Step	Activity
	<b>Introduction</b>
1.	1. Personal introduction of interviewer and introduction of the project, purpose and partners; reference to introductory letters/emails; 2. The findings of this interview will be anonymous and used in (public) reports to the European Commission. We prefer not to make an interview transcript (as this saves us a lot of time). If there is any information you wish to share with us but wish for it not to appear in the report, please state this explicitly; 3. Do you agree that we record this interview for transcription purposes (audio recording will be deleted afterwards)? (Y/N).
	<b>Setting the context, verifying base data for the interview</b>
2.	4. Your name (specify); 5. Your function/responsibilities/role within the organisation (specify); 6. Establishing/verifying the field of operation (industry) of the expert; the territory and markets in which he/she operates.
	<b>Industry background</b>
3.	7. If you want to adopt a technology, do you need to license in other (complementary) technology as well in order to make an end-product that works? 8. Are most IP owners also adopters? <ul style="list-style-type: none"> <li>a. How many IP owners are there in the industry: 10-50-100-500-1000?</li> <li>b. How many IP adopters are there in the industry: 10-50-100-500-1000?</li> </ul>
	<b>The role of knowledge, IP strategy and standards in your industry</b>
4.	9. What is the strategic role of IP for your organization? (Multiple answers are possible) <ul style="list-style-type: none"> <li>• Achieving freedom to operate;</li> <li>• A source of revenues;</li> <li>• Entry into markets;</li> <li>• A currency in IP negotiations (leverage in cross-licensing);</li> <li>• Differentiate products from those of competitors;</li> <li>• Other...</li> </ul>

Step	Activity
	<p>10. How do you (or most of your competitors) acquire IP?</p> <ul style="list-style-type: none"> <li>• Do you develop technology (IP) in-house?</li> <li>• Do you develop technology (IP) jointly? <ul style="list-style-type: none"> <li>○ <i>(jointly meaning in consortia, research collaboration, and/or joint ventures)</i></li> </ul> </li> <li>• Do you buy technology (IP) from other entities? <ul style="list-style-type: none"> <li>○ <i>(buying can also be through merger &amp; acquisition)</i></li> </ul> </li> <li>• Do you license technology (IP) in from other entities?</li> </ul> <p>11. What is the most common form of IP marketing?</p> <ul style="list-style-type: none"> <li>• Do you sell/buy technology (IP) to/from other entities?</li> <li>• Do you license in/out technology (IP) to other entities? <ul style="list-style-type: none"> <li>○ On a cash basis?</li> <li>○ Royalty free?</li> <li>○ Via cross-license with other entities?</li> <li>○ Via pools?</li> </ul> </li> </ul> <p>12. Is it common to approach those that you believe to be IP owners or do you wait until you are approached?</p> <p>13. Is it common for licensing agreements in to include grant backs or reciprocal conditions?</p> <p>14. How do you determine which organizations to approach for offering licenses?</p> <p>15. What are your principles when determining a license fee?</p>
<b>Problems your organization might be facing when licensing in/out IP</b>	
5.	<p>16. What problems do you experience in identifying IP owners and their IP portfolio?</p> <ul style="list-style-type: none"> <li>- Identifying relevant parties,</li> <li>- Identifying their portfolios,</li> <li>- Assessing the value of the IP,</li> <li>- Other: [ _____ ]</li> </ul> <p>17. Are there databases available that can support you in these matters?</p> <p>18. Who administers these?</p> <p>19. How is the quality of the information?</p> <ul style="list-style-type: none"> <li>• Is the data complete?</li> <li>• Is the data up to date (in terms of ownership, validity, etc.)?</li> <li>• Is the database easy to navigate?</li> <li>• Other...</li> </ul> <p>20. As an implementer of technology, what types of risks do you experience yourself...</p> <ul style="list-style-type: none"> <li>i) of (unanticipated) litigation? <ul style="list-style-type: none"> <li>○ What is the role of NPEs (non-producing entities) in your industry?</li> </ul> </li> <li>j) that access to IP is made conditional to licensing out self-owned IP in return?</li> <li>k) that cumulative payable royalty for IP is above reasonable levels or even prohibitive for implementing products ('Royalty stacking')?</li> <li>l) substantial transaction costs because of the need to deal with numerous IP owners? (e.g. collecting information, negotiating, etc. but <i>not</i> royalty stacking)</li> <li>m) that after an IP transfer the new owner does not consider itself bound to earlier licensing commitments?</li> <li>n) that IP commitments are no longer in force after bankruptcy proceedings of the owner?</li> </ul> <p>21. Do you fear such risks in the future? Do you believe others suffer from these risks?</p> <p>22. What (policy) measures would alleviate these problems?</p> <p>23. What risks do you fear as a licensor?</p> <p>24. What (policy) measures would alleviate these problems?</p>

Step	Activity
	25. What is your position towards patent pools? Would you welcome them as an implementer? And as an adopter?
	<b>In closing</b>
6.	26. Are there any topics related to knowledge transfer that we have not discussed but should have been addressed?

## Interview Round 3: collaborative licensing programmes in non-standard dependent industries

Amongst other things, the study is to take a first step in capturing and analysing the licencing practices in distinct standard-dependent industries. The purpose of this is twofold:

1. To identify barriers for engaging in knowledge transfer in relation to standards; and
2. To identify policy options to level these barriers.

In our search for solutions, we also seek mechanisms that seem to work in other (non-standard dependent) industries that experience similar problems with licensing as a result of the existence of a patent thicket (notably transparency about ownership, validity and scope of patents and the problem of royalty stacking).

A solution to these kinds of problems is to market IP via collaborative licensing programmes, such as a patent pool, an IP exchange or a clearinghouse.

In standard-dependent industries we notice that the formation of patent pools is often hindered by issues on patent valuation, costs of validity checks, issues on revenue sharing among the members of the pool and issues related to compliance with anti-trust rules.

We are interested in how you manage these issues. What makes your pool a success (or not) and what could pools in e.g. telecoms, smart grids or automotive learn from you?

### Questions for pools in non-standard dependent industries

1. What industries do you service?
2. What is at the core the reason that your business model works (what problems for IP owners and IP adopters do you solve)?
3. What services does your firm provide to the respective business communities?
4. Can you elaborate on the determinants of pool success? Among other things, these could include:
  - Number of prospective implementers vs. number of prospective IP owners;
  - The importance of alternative licensing strategies, such as bilateral and cross-licensing;
  - Perceptions about the 'need' of a pool in order to achieve or promote market success;
  - Legal aspects (meeting competition law/antitrust law criteria);
  - Context elements (industry structure, nature of the technology, distribution of patent ownership).
5. Most current pools focus on interoperability standards. But increasingly, pools and/or clearinghouses are suggested for biotechnology, medicines/pharmaceuticals and genetics (USPTO, 2000; Duxbury 2008, 'Medicines Patent Pool'. Can you elaborate on such developments? Can pools in such sectors learn from current pools? Can current pools learn from such new developments?
6. How do you deal with issues such as:
  - Patent valuation;
  - Validity checks;
  - Revenue sharing;
  - Anti-trust compliance.

Can you make an assessment of the costs involved?

7. If the EC wants to stimulate pool creation and adoption in standard-dependent industries, what would be appropriate ways to do so?

- More flexibility to organize joint enforcement of the pool patents;
  - Subsidising the assessment/screening of pooled essential patents;
  - Promote clearinghouse mechanisms based on SEP assessment with an optional choice for joint licensing for SEP holders that wish it;
  - Encourage public research organizations to join pools when they hold relevant SEPs;
  - Allowing/requiring different royalty rates for different categories of patents.
8. Are there developments that could increase the feasibility of pools in the future, or the 'need for pools'? Among other things, these could include:
    - Telecom and IT standards becoming enabling technology in many other markets (e-health, smart grids, etc.) and the number of implementers is rising;
    - Increased convergence of functionalities in devices, challenging current bilateral licensing models;
    - Increasing need to support backward compatibility to earlier standards (e.g. OneBlue Pool of Pools);
    - Other ....
  9. Are there any topics related to knowledge transfer that we have not discussed but should have been addressed?

### Questions for IP exchange in non-standard dependent industries

#### *Your business*

1. To what industries do you provide a service?
2. What is at the core the reason that your business model works (what problems for IP owners and IP adopters do you solve)?
3. What services does your firm provide to the respective business communities?
4. Why are most brokers located in the USA? What is different in the EU?

#### *IP Auctions*

5. How does IP auctioning work?
  - Is it typically related to a transfer of IP?
  - Can it also be used to determine a license fee? (How does that work?)
6. What (characteristics of the patent/IP market) might prevent an IP auction from being successful:
  - How does it deal with lack of transparency about scope and validity?
7. Would it be possible to organise an IP auction for Standard Essential Patents?

#### *IP Exchange*

8. How does IP exchange work?
9. What (characteristics of the patent/IP market) might prevent an IP exchange from being successful?
  - How does it deal with lack of transparency about scope and validity?
  - Which industries show flourishing after market?
10. Would it be possible to set up an IP Exchange for Standard Essential Patents?

### Questions for clearinghouses in non-standard dependent industries

#### *Your business:*

1. What industries do you service?
2. What is at the core the reason that your business model works (what problems for IP owners and IP adopters do you solve)?
3. What services does your firm provide to the respective business communities?

*The clearinghouse:*

4. How would you define the concept of a clearinghouse?
5. What factors are important for a clearinghouse to become successful?
6. Why is your clearinghouse currently focused on industry X?
  - a. What are the patent issues that directed a clearinghouse as their first step in that direction?
7. How do you collect the data? And how do you keep the database up-to-date (now and in the future)?
8. In what manner are patents licensed by the clearinghouse?
  - a. Is there one standard licensing contract? Or
  - b. Are licensors able to differentiate contracts for various parties/profiles/licensees?
9. Have you experienced issues with licensors that are not willing to participate because they want to keep more flexibility in the licensing process?

# Annex II Questionnaire on policy options

Dear \_\_\_\_\_,

A short while ago we interviewed you for a study on patents and standards that is commissioned by the European Commission. The study focuses on identifying the barriers for smooth licensing of SEPs and identifying potential solutions to level these barriers. At the end of the interview we asked you if you could save some time to fill out a brief questionnaire to assess these potential solutions. We kindly ask you for that time now.

We are currently in a final phase of the study and we have identified a number of concerns (problems) that typically occur in those industries in which standard essential patents play an important strategic role. Also we have learned about numerous solutions or measures that have been put forward by stakeholders, either in SSO meetings, in the public domain or otherwise.

The Commission asked us to analyse solution in the following dimensions: the costs and benefits and potential disadvantages or risk. For this exercise, we are particularly interested in how you assess the policy options from the perspective of your organisation. We therefore ask you to fill out a brief questionnaire in the attached word file.

The questionnaire first presents a brief description of the solution as well as the problems it could address. Next, we ask you to fill out a table providing us with information about the three dimensions for assessment.

We ask you to assess the impact of the following measures:

1. Increasing the level of transparency (several proposals);
2. Promoting patent pools;
3. Dispute resolution mechanism;
4. FRAND definition/royalty principles;
5. Transfer issues;
6. Technology in the standardisation process.

## 1. Increasing the level of transparency

One of the problems recognised by most of the stakeholders was a lack of transparency on ownership and essentiality. This problem has multiple causes (e.g. there are (too) many SEPs, databases of SSOs are not up-to-date, SEP transfers are not well documented, etc.). The problem results in increased search and transaction costs, more disputes (e.g. over the level of royalty fees), and a higher risk of litigation. Since the problem has these different dimensions, the suggested solution concerns a series of measures:

- (a) Defining update requirements and regular check of essentiality;
- (b) Entering licensing information in SSO database;
- (c) Limiting the use of blanket disclosures;
- (d) Adopting a stricter disclosure regime;
- (e) Notifying transfer of SEP ownership by recordation; and
- (f) Increasing collaboration between SSOs and patent offices.

*1. a. Defining update requirements for SEP disclosures and regular checks of essentiality*

There are various reasons why patents (or patent applications) are essential at one point in time, but may not be essential anymore at a later point in time: 1) because disclosed SEP is no longer essential; 2) because disclosed SEP does not represent a legal right and 3) because the disclosed SEP is not infringed in all implementations of the standard.

It results in a significant inaccuracy in the database. The limited quality of the SSOs databases hinders a market player from gaining access to the necessary information needed to enter into licensing negotiations (or only if it bears considerable costs of landscaping).

One proposal is to create update requirements for patent disclosures and regular checks of essentiality, resulting in more accurate and more useable information.

**Please indicate in the table below (by filling out the green cells) what would be the consequences of this measure in terms of costs and benefits. These questions are rather specific in what we mean with costs and benefits. We also ask for (dis)advantages and risk or (other) consequences. Here you can freely answer what comes to mind.**

Potential benefits & financial costs	* mark with X	+	0	-
	Search costs will*			
	The quality information will*			
	Time-to-market / time for adoption of a standard will*			
	Possibility for benchmarking in case of disputes will*			
		%	€ (per patent)	
	A single round of update will increase the firm's cost by:			
	Other costs and benefits are:	Open answer		
Disadvantages, possible risks or consequences	Open answer			

*1. b. Entering licensing information in SSO database*

The central idea is to add other types of licensing information to SSO databases that would empower prospective licensees to ensure they receive FRAND offerings. The right for licensees to be treated in a non-discriminatory way is already ensured in the “non-discriminatory” leg of FRAND, yet the insight a (prospective) licensee has into what others are paying (and other agreed conditions) is very limited.<sup>398</sup>

Below, we suggest three (conceptual) proposals that can add licensing information to SSO databases:

- (1) In a ‘licensee helps licensee’ approach, a party that has entered in a (non-cross) licensing agreement with a SEP owner can anonymously list the (cash) price it is paying for the license.

<sup>398</sup> In fact, the “non-discriminatory” leg of FRAND has some similarities with the Most Favourite Nation (MFN) concept as known from international economic relations and international politics, but with the difference that for the latter, information is available on the treatment of other countries, which arguable makes MFN work better than FRAND. In a FRAND law case, the judge might order the SEP owner to produce information on licensing contracts with other licensees. However, if done so, this information is generally treated as confidential within the case and will not become public.

This information could be added to the SSO IPR database, perhaps in a direct form or an aggregate form,<sup>399</sup>

- (2) In an approach that is derived from the ex-ante approach, yet inspired by the MFN principle, SEP owners could be required to post a public ‘most attractive awarded cash price’ in the SSO IPR database;<sup>400</sup>
- (3) Licensing revenue information is collected from secondary information sources (e.g. data received by tax authorities) and then processed in such a way that it becomes informative in terms of individual standards.<sup>401</sup>

**Please indicate in the table below (by filling out the green cells) what would be the consequences of this measure in terms of costs and benefits. These questions are rather specific in what we mean with costs and benefits. We also ask for (dis)advantages and risk or (other) consequences. Here you can freely answer what comes to mind.**

Potential benefits & financial costs	* mark with X	+	0	-
	Overall transparency on royalty rates*			
Ability to challenge discriminatory licensing proposals*				
Time-to-market / time for adoption of a standard will *				
Possibility for benchmarking in case of disputes will*				
Flexibility for SEP owners to use SEPs strategically*				
		%	€ (per patent)	
Providing all this additional information increases the costs of the firm by:				
		Open answer		
Other costs and benefits are:				
Disadvantages, possible risks or consequences	Open answer			

### 1. c. Limiting the use of blanket disclosures

Blanket disclosures have several positive and negative effects:

- Blanket disclosures also provide several advantages for holders of essential IPR. They prevent firms from incurring costs associated with specific disclosures and, it has been argued that, particularly for firms with large IPR portfolios, such costs would be both very high and recurring. Hence, such costs are the main reason not to make specific disclosures;

<sup>399</sup> Conditions for this to work are: (1) the SEP owner does not prevent the licensee from making public the high-level parameters of its licensing contract. A compromise here might be to have SEP owners agree that they will not oppose such claims as long as they are anonymous and (2) the information contains enough insight into other relevant key parameters (e.g. on SEP only or on broad technology area license) to ensure that apples can be compared with apples.

<sup>400</sup> In several aspects this proposal would differ from the ‘regular’ voluntary ex-ante approach: (i) this requirement would only come into force once the standard is finalized. (In other words, this proposal would give up the very early timing that is sought by ex-ante proposals that aim to inform decisions about technology inclusion, and thus address concerns of SEP owners that they are not able to quote a price before it is known how their own included IPR compares to the final standard, or before it is known how the final standard looks like in the first place); (ii) the SEP owner would need to update this posting if it awards a more attractive price to a later licensee; (iii) the posting should include relevant parameters such as whether the price also include non-SEPs or other SEPs and (iv) the posting of the price is a requirement.

<sup>401</sup> This processing is obviously the challenge – in the hypothetical case of a small company owning only one patent, which is also a SEP, this might be very easy; while in the case of multinational firms active in many product areas, this might be very hard.

- Blanket disclosures mask a very significant part of public knowledge on the existence and ownership of SEPs. Arguably, they are the largest single factor that prohibit a good overall understanding of SEP existence and ownership overall;
- Blanket disclosure can shift search costs to other parties and creates information asymmetry.

The proposal is that the use of blanket disclosures is limited (not allowed).

Please fill out the table below in a similar fashion as above.

Potential benefits & financial costs	* mark with X	+	0	-
	Search costs *			
	Quality information *			
	Time-to-market / time for adoption of a standard *			
	Benchmarks to be used in case of disputes *			
	Information asymmetry *			
	Discrimination on the cost side (between those that already make voluntary specific declarations and those that do not) *			
			%	€
Limiting the use of blanket disclosures increases the costs of the firm (per disclosure) by:				
	Open answer			
Other costs and benefits are:				
Disadvantages, possible risks or consequences	Open answer			

#### 1. d. Adopt a stricter disclosure regime

Most SSOs have an extensive regime governing the disclosure of patents essential to the standards they develop. Nevertheless, the exact obligations vary considerably across these organizations. As a result, the SSO disclosure databases are more incomplete than what is usually assumed by those that use such information. The information could be made more complete if disclosure rules are tightened and possibly harmonized. At the same time, the current rules are often the outcome of a bargaining process, where stakeholders felt that *absolute* disclosure rules would require too many resources and would thus be unjustified.

The idea is to *tighten SSO disclosure rules so that members or SSO participants have to disclose all their essential patents regardless of the knowledge of individuals participating in the process, and regardless of actual participation in working groups.*” At the same time, we suggest to drop mandatory rules for disclosure of patents of third parties; this does not seem to work and only creates false certainty.

Please fill out the table below in a similar fashion as above.

Potential benefits & financial costs	* mark with X	+	0	-
	Search costs *			
	Quality information *			
	Time-to-market / time for adoption of a standard will *			
	Information asymmetry *			
			%	€
The measure increases the costs of the firm (per disclosure) by:				
	Open answer			
Other costs and benefits are:				
Disadvantages, possible risks or consequences	Open answer			

### 1. e. Notification of transfer of SEP ownership by recordation

This specifically concerns transparency about patent ownership after transfer. Few patent offices require patent holders to inform them of such ownership changes. The idea is that SSOs mandate that SEP disclosures be updated when ownership changes take place.

**Please fill out the table below in a similar fashion as above.**

Potential benefits & financial costs	* mark with X	+	0	-
	Search costs for licensees *			
	Information about SEP ownership *			
	Time-to-market / time for adoption of a standard will *			
			%	€
	The measure increases the costs of the firm (per transfer) by:			
The measure increases the costs of the SSO by:				
	Open answer			
Other costs and benefits are:				
Disadvantages, possible risks or consequences	Open answer			

### 1. f. Increased collaboration between SSOs and patent offices

While SSOs and patent offices are quite different organisations, serving different goals and having different responsibilities, there are a few areas in which both can benefit from working together. The collaboration between EPO, on the one hand, and ETSI, IEEE and ITU, on the other, is generally considered to be very successful. There are many more patent offices, and many more SSOs, that do not have similar collaborations. Setting up such collaboration invokes costs (more on that below as well). These costs could be effectively brought down if more parties were to collaborate.

The idea is as follows: *“A wide and harmonized collaboration between all important patent offices and all important SSOs in terms of using standardisation documents for prior art search in patent examination”.*

**Please fill out the table below in a similar fashion as above.**

Potential benefits & financial costs	* mark with X	+	0	-
	Quality of patents *			
	Rewards for the innovator*			
	Number of patents in standard-intensive areas*			
	Disclosure of low quality patents as SEPs*			
	Number of patents in standard-intensive areas*			
	Costs for SSOs and Patent offices*			
		Open answer		
Other costs and benefits are:				
Disadvantages, possible risks or consequences	Open answer			

## 2. Promoting patent pools

Patent pools bundle the essential patents of all participating SEP owners, and make them available to any interested adopter of the standard in a simple, one-stop-shopping licensing process. Not only does it significantly reduce transaction costs compared to bilateral licensing with all the patent owners in questions, but it also increases transparency, reduces uncertainty and creates a level playing field.

While pools are a voluntary mechanism, there is still a lot to win from a public perspective if pool creation and pool participation could be further promoted. One of the ways in which this might be done is collaboration between pools and SSOs (see also below, at the section 'Implementation').

The idea is to *“investigate how pool creation and the participation in pools can be further promoted, for instance by strengthening the relations between SSOs and pools, by providing incentives to participate in pools or by making entities such as universities and SMEs better aware of the advantages of becoming a licensor in a pool”*.

### Please fill out the table below

Potential benefits & financial costs	* mark with X	+	0	-
	Transaction costs*			
	Royalty stacking*			
	Search costs*			
	Costs for enforcement*			
	Total royalty fee for licensees*			
	Total royalty fee for licensors*			
	Level playing field across implementers*			
	Relatively small SEP owners effectively generate revenues from its patents*			
		€		
Set up costs of pools				
	Open answer			
Other costs and benefits are:				
Disadvantages, possible risks or consequences	Open answer			

### 3. Dispute resolution mechanism

We observe an increased risk to litigation. One of the reasons is that (due to a changing strategic role of SEPs for some large portfolio holders) SEPs are being sold, which leads to fragmentation of SEP portfolios and increased ownership by NPEs that are more inclined to litigate.

The suggested solution entails the development of a dispute resolution or arbitration mechanism (e.g. in SSOs), which would be mandatory before parties are allowed to turn to courts. The dispute resolution mechanisms should or could address the FRAND rate, validity, essentiality and infringement.

**Please fill out the table below in a similar fashion as above.**

Potential benefits & financial costs	* mark with X	+	0	-
	Resolution of conflicts*			
Litigation costs*				
Threshold to seek solution when negotiations fail*				
Royalty rates being FRAND*				
Fairness of outcomes of negotiations*				
Fairness of outcomes of conflicts*				
		€ / or open answer		
Set up costs				
Your costs of litigation will go down by:				
		Open answer		
Other costs and benefits are:				
Disadvantages, possible risks or consequences	Open answer			

### 4. FRAND definition/royalty principles

FRAND has large number of dimensions, including (i) the allowed royalty rates and royalty bases, (ii) whether licensing can be made subject to reciprocity conditions - and which conditions exactly, (iii) whether licensing can be made subject to reciprocity bundling other SEPS or non-SEPs, (iv) whether the patent owner is entitled to seek injunction in case of infringement, (v) whether the initial offer of the SEP owner should be FRAND, or whether this only applies to the outcome of the process, and several more.

This proposed solution entails the further development of principles for determining royalty rates and royalty bases that are compatible with the FRAND concept. Such principles can assist parties – including third parties such as judges and arbitrators – to assess whether an offer made by a licensor is compatible with FRAND.

**Please fill out the table below in a similar fashion as above.**

Potential benefits & financial costs	* mark with X	+	0	-
	Resolution of conflicts*			
	Litigation costs*			
	Royalty rates being FRAND*			
	Smoothness of negotiations*			
	Fairness of outcomes of conflicts*			
		Open answer		
Set up costs				
	Open answer			
Other costs and benefits are:				
Disadvantages, possible risks or consequences	Open answer			

## 5. Transfer issues

This section focuses on measures to address the increased risk of hold-up when declared SEPs are transferred to new owners. The problem originates in the fact that the FRAND commitments made by initial SEP owners are usually too vague to effectively bind subsequent owners upon the sale of a patent, and may therefore be dismissed by subsequent owners. Solving it requires solutions that ensure that all successive owners of a SEP are similarly and effectively bound by the initial FRAND commitment.

This suggested solution entails proposals to define or strengthen SSO rules that bind future owners of SEPs to existing commitments.

**Please fill out the table below in a similar fashion as above.**

Potential benefits & financial costs	* mark with X	+	0	-
	Threat of hold-up*			
	Risk of litigation*			
	Smoothness of negotiations*			
	Royalty rates being FRAND*			
		Open answer		
	Set up costs			
	Open answer			
Other costs and benefits are:				
Disadvantages, possible risks or consequences	Open answer			

## 6. Technology in the standardisation process

The large number of SEPs seems to be the result of a high reward (amongst others) for SEP ownership, as well a fairly loose policy by SSOs to circumvent patented technologies. It results in what is often referred to as over-inclusion.

This suggested solution concerns the introduction of guidance and/or rules on whether or not including a patented technology in a standard is appropriate.

**Please fill out the table below in a similar fashion as above.**

Potential benefits & financial costs	* mark with X	+	0	-
	Number of SEPS			
	Quality of SEPS			
	Number of SEP owners			
	Fragmentation			
	Quality of the innovations			
	Profitability for the innovators			
	Adoption/uptake of the standard			
		Open answer		
Set up costs				
	Open answer			
Other costs and benefits are:				
Disadvantages, possible risks or consequences	Open answer			



# Annex III Data analysis: methodology and data used

## Introduction

An important part of this study was to empirically analyse the patent landscape and licensing practices in the four standard-dependent industries. A team comprising of Rudi Bekkers, Yann Ménière, Önder Nomaler, Justus Baron, Tim Pohlman and Arianna Martinelli was responsible for this analysis. The results of the analysis are presented in the main chapters throughout the report. This Annex presents the data and the methodologies that were used for the different analyses.

Before going into detail about the data and methodologies used, we briefly present the topics of analysis.

### Six research topics

The team analysed six topics:

1. General findings on the occurrence of SEP disclosures;
2. Comparing SEPs with non-SEPs;
3. Blanket disclosures;
4. Transferring ownership of SEPs;
5. Patent pools; and
6. SEPs and litigation.

#### *General findings on the occurrence of SEP disclosures*

This research analysed the general features of standard essential patents (also called SEPs). It considers the occurrence of essential patents, including the distribution over SSOs and technology areas. It also shows how the phenomenon of essential patents has developed over time. The topic deals with SEP occurrence for (a selection of the most important) individual standards and it analyses SEP occurrence to business models. Finally, the topic considers the legal status of SEPs and investigates to what extent these patents are actually enforceable.

#### *Comparing SEPs with non-SEPs*

This topic is about assessing the 'value' of SEPs on the basis of the established scientific literature on "patent value" which draws on various bibliometric indicators. In terms of three such indicators, the SEPs' performance is compared to a larger set of randomly selected patents that are 'similar' to the actual SEPs. The analysis compares SEPs with non-SEPs in terms of the citation score, the family size, and likelihood (for the patent) to be granted.

#### *Blanket disclosures*

This topic deals with the occurrence of blanket disclosures and whether this phenomenon is associated with certain sectors or particular types of actors. It also deals with the determinants of blanket disclosures: is it true that high search costs prevent companies from doing specific disclosures, as is often argued?

#### *Transferring ownership of SEPs*

This topic is about the type and volume of SEP transfers, the transfer channels and the characteristics of the related standards. It also deals with timing of transfers with regards to

standardization processes and SEP declarations as well as the impact of SEPs transfers on the extent of SEP concentration at the standard level.

### *Patent pools*

This topic deals with generating descriptive statistics on patent pools for standard-essential patents. It includes data on failed attempts at creating pools, the size and coverage of these pools and the patterns of entry and exit of pool members.

### *SEPs and litigation*

Are litigation cases that included standard-essential patents a recent phenomenon or are they simply getting more publicity in the past few years? Are essential patents more likely to be litigated than comparable non-essential patents? These are the types of questions that this topic deals with. It concerns an analysis of the likelihood of litigation, comparing disclosed SEPs with patents that are otherwise comparable, but not disclosed to be a SEP. The topic also deals with differences between technology areas and differences between owners with different business models.

### **Remainder of the Annex**

The next section goes into detail about the data and methodologies used for the different research topics. It is followed by a brief summary of the results of the analysis. Again, the detailed results of the analysis have been presented at relevant places in the main text throughout the report.

## **Data and methodology used**

Below we first describe the general database that was used for all analysis. Subsequently we describe for each research topic the methodology applied and the additional data used. While discussing this, and when appropriate, we elaborate on methodologies and data used for sub-topics as well.

### **The main data: the OEIDD database of SEP disclosures**

The quantitative analysis requires a high-quality and up-to-date dataset of patents that are essential to standards. The most tangible source for this is certainly the lists of patent disclosures that the various SSOs make available.<sup>402</sup> A problem with these lists, however, is the work required to clean up the data. This is an exercise that can easily take half a year and consumes considerable resources.<sup>403</sup> For this study, we are in the advantageous position of having secured access to what is probably the world's most extensive and accurate database of standard essential patents, namely OEIDD.

#### **Box 1: The OEIDD database**

The OEIDD database project started in late 2010 and was initiated by Rudi Bekkers (Eindhoven University of Technology and Dialogic, Utrecht, Netherlands), Christian Catalini (University of Toronto), Arianna Martinelli (Scuola Superiore Sant'Anna, Pisa, Italy) and Timothy Simcoe (Boston University and NBER). A paper presented at an NBER conference on patent and standards in early 2012 provides an introduction of this database. It includes all essential patent disclosures of the 13 most relevant SSOs in terms of patents in standards. All patent disclosures are (1) cleaned, (2) harmonized, (3) matched and (4) complemented with additional data. The cleaning entails that information such as patent numbers, patent authorities, standards or standardization activities is examined, completed, corrected where necessary and stored in a

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<sup>402</sup> While such lists are based on self-disclosure by patent owners (and in a few SSOs also disclosure by third parties), there is no other source data that comes closer to a broad overview of essential patents.

<sup>403</sup> In fact, for the so-called Interplay study, the cleaning of this data was the largest activity in terms of use of resources.

standardized format. The harmonization concerns the consistent coding of information across and within the data from the various SSOs, such as firm/owner names and standardization activities. The matching means that each disclosed patent identity at either the US Patent and Trademark Office (USPTO) or the European Patent Office (EPO) is matched with data from a reference patent database, which is the OECD/EPO PATSTAT database,<sup>404</sup> and complemented with relevant metadata. This metadata includes the date of the patent application, data on the first publication of the application and information on the first publication of the patent, as well as the DOCDB and INPADOC family identities. The patent family information is particularly useful as it allows the user of the database to correct for the rather substantial degree of overlap that is present in the source data. Finally, the data is complemented information about the patent owner, such as its home region (typically the world region in which the headquarters are located) and its business model.

The unique features of the OEIDD database as described in Box 1 (particularly the coverage/completeness, data quality and link of each of the identified 17,000+ EPO or USPTO patents to a PATSTAT identity) make the database very suitable as the basis for the quantitative analysis in this study. It also allows us to perform analyses from day one and saves a considerable amount of resources, by not having to clean the data, thereby freeing resources for other parts of our project. Due to these advantages we have secured full and direct access to this database.<sup>405</sup>

#### *Limitations of the dataset*

Despite being comprehensive, OEIDD by definition shares the same limitations as its source data. One of these limitations is that patent disclosures are on the basis of self-declaration. While many SSOs have rules on what has to be disclosed, these rules cannot and do not guarantee that all actual essential patents are on the list or that all listed patents are actually essential. In a separate report prepared by the ECSIP project,<sup>406</sup> these rules and their consequences for the accuracy of the resulting disclosure data are discussed in detail. However, the SSOs' IPR disclosure databases still offer the best information on essential patents. Whenever we talk in this report about 'essential' patents (or SEPs), we are referring to patents or patent applications disclosed as being essential by their owner. Another limitation is that SSOs' source data differs both in availability and format. This inevitably has consequences for the compiled data as well, no matter how much effort is put into cleaning and harmonization.

In order to understand and interpret this data, it is useful to go back to the actual disclosure processes as they take place at SSOs. Here, companies or other organizations<sup>407</sup> submit written declarations, sometimes using a (obligatory) template, sometimes just by sending a letter. We call these disclosure events. Some of these declarations concern one single patent; others list hundreds of patents that may or may not be for the same standard and may or may not concern family members of the same invention (e.g. for different countries). Many SSOs allow the submission of a 'blanket disclosure', which is a statement declaring that the organization believes to own one or more essential patents for a specified standard, but does not provide the identity of these patents (or information on the countries in which application for these patents have been submitted). In OEIDD terms, we call all of them statements and they are the smallest unit of

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<sup>404</sup> EPO Worldwide Patent Statistical Database (also known as EPO PATSTAT) has been specifically developed for use by government/intergovernmental organizations and academic institutions. It has been developed by the European Patent Office, in close cooperation with the OECD. With over 70 million records and with a file size of over 130 GBytes, it is one of the most extensive database with 'raw' patent data currently available. We used the September 2010 version of this database for our matching efforts.

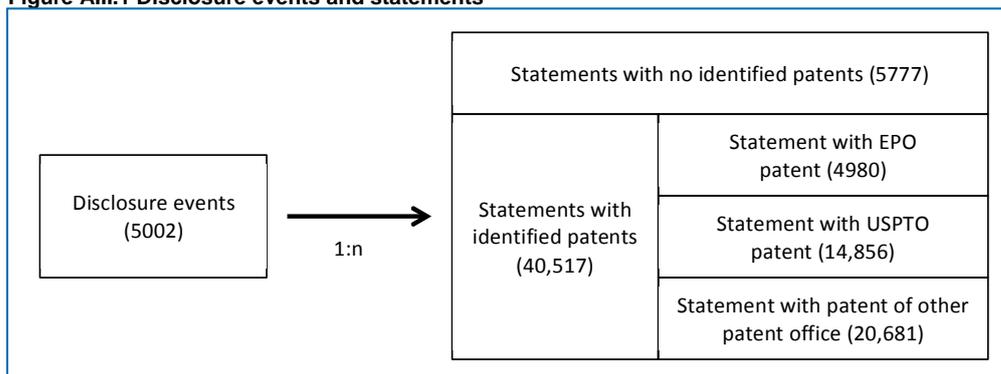
<sup>405</sup> While this database will eventually be made public, this will likely take some more time because of setting up the distribution channel, which is most likely going to be the National Bureau of Economic Research (NBER).

<sup>406</sup> See chapter 2.

<sup>407</sup> For the sake of simplicity, this report often refers to 'firms' or 'companies', even though we recognise that other organizations can also own IPRs and submit disclosures.

observation. The Figure below shows the relationship between disclosure events and statements and also provides the total numbers for these events in the database.<sup>408</sup>

**Figure AIII.1 Disclosure events and statements**



### The occurrence of SEP disclosures

This analysis was mainly based on the OEIDD database. How this data was used and which additional data we used is described below for each particular sub-topic.

#### *Disclosure of SEPs in various SSOs and technology areas*

OEIDD provides data on disclosures at 13 SSOs. However, the data for two of these bodies – ISO and IEC - is split into two distinct categories. The reason for this is that the so-called JTC1 standardization activities, which these two bodies jointly conduct on ‘information technology’, are so different in terms of patent disclosure statistics from the ‘regular’ activities of both SSOs, that just referring to the bodies as such would mask many underlying differences. Hence, ISO is divided into ISO-JTC1 and ISO (excluding JTC1). A similar situation applies for IEC. Therefore, for the sake of simplicity, we refer to 15 SSOs.

#### *How patent disclosure has evolved over time*

In order to understand the time-scales, it is important to distinguish at least two different elements. The first element is the timing of the disclosure relative to the SSO. This is typically data recorded by the SSO itself and can usually be found alongside each disclosure in their patent database. The second element is the timing of the underlying patent or patents (if it can actually be identified). There are a number of dates associated with a typical patent, most importantly: (1) the priority date, (2) the filing date, (3) the first publication of the application and (4) the first publication of the granted patent. In the context of this study, the priority date is the most interesting because this is the date that comes closest to the actual invention being made.

#### *Disclosure of SEPs for individual standards*

To most insiders it will come as no surprise that disclosed SEPs are strongly skewed to a relatively small set of standards. A few standards attract hundreds or even thousands of disclosed SEPs, whereas most standards (that do have disclosed SEPs) only have a few. Before we were able to report on this distribution, however, the information on standards in the patent disclosures needs to be cleaned and harmonized. This is not an easy task, which is further explained in Box 2.

<sup>408</sup> In some SSOs, these disclosure events can be examined for instance by retrieving a facsimile copy of the letter or filled-in template. In other SSOs, there is only a database with (often numerous) records, which are the result of disclosure events. As the OEIDD database strives for a harmonized representation of all data, disclosure events are ‘recreated’ by grouping all statements that are submitted by the same organization, on the same day, to the same SSO.

## Box 2: The cleaning and harmonization of references to standards

Cleaning and harmonizing the standards for which patents have been disclosed as being essential is a challenging exercise. The nature of disclosure data is such that this exercise is, by definition, restricted in scope and quality. While some SSOs require submitters to choose a clear, readily-formulated definition for these standards, most do not. As a result, when submitters refer to standards, they use a vast variety of notations, which are often incomplete, imprecise, erroneous or vague.<sup>409</sup> There are very significant differences in the ways SSOs define and number their standards. Some SSOs predominantly organize this with standards names, some with names of the groups that produced such standards (Technical Committees, Technical Subcommittee, Working Group or 'projects') and some with a combination of both. There are also standards that are jointly developed by two or more of these organizations, posing challenges for such harmonization itself.<sup>410</sup> In addition, there is also the more fundamental discussion of the appropriate boundaries for standards. When should different releases, updates or 'successors' to a standard be regarded as a new entity?

As a result, any harmonization and coding of 'standards' is both dependent on many (often trivial) choices and prone to imperfection. Despite such challenges, we believe it is nevertheless very desirable for a study as this to code these standards. Therefore we have adopted a very pragmatic approach to harmonizing standards. We grouped references that are inextricably linked, either by definition or implementation. Our approach is best explained by demonstrating examples. Different releases or updates of a standard were grouped together (such as ITU V.32 and V.32bis). At ETSI, for instance, we grouped all 15 'projects' that together form their 2G GSM standard and the 20 'projects' that form their 3G UMTS/W-CDMA standard. At IEEE, we grouped all the wireless LAN standards under the 802.11 heading. At ISO/IEC and ITU, we grouped the MPEG-4 standards into one category (including the ISO/IEC 14496-10 AVC standard and the H.264 at the ITU, but also the other 14496 parts). Similarly, all MPEG-2 standards were grouped (that is: JTC1 ISO/IEC 13818 and sister definitions H.222 and H.626 at the ITU). Again, we realize that there are trivial choices here and other insiders in the standardization community might have made other choices, but we believe that in the context of this study, our categorization is justified.<sup>411</sup>

### *Patent disclosure and business models*

We examined the business model of parties that disclosed having standard essential patents. We determined the business model for 334 organizations, which included all organizations with 7 or more statements in the database, as well as firms with 6 or fewer statements but with a well-known firm name (to ensure that we did not miss any very significant firm that nevertheless only made one very broad blanket claim). This sub-sample accounts for just over 80% of all declared essential IPR. The remaining tail of firms is long (981 organizations) but mostly made up of small firms and also includes numerous inventor names. Each of the investigated organizations was assigned to one of eleven business model categories. While any such classification is inherently subjective, we found that it was often (though not always) relatively easy to assign organizations to a particular category:

- A. Pure upstream knowledge developer or patent holding company (excl. universities);
- B. Universities/public research institutes/states;
- C. Components (incl. semiconductors);
- D. Software and software-based services;
- E. Equipment suppliers, product vendors, system integrators;

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<sup>409</sup> It is hard to identify the referred standards when the only reference a disclosure includes is like 'draft-brusilovsky-pak-11', 'rim-ipr-draft-allen-dispatch-imei-urn-as-instanceid-00' or 'juniper-ipr-draft-kuarsingh-v6ops-6to4-provider-managed-tunnel-00'. There are also many typos such as TIA J-SDT-009 (which should be TIA J-STD-009).

<sup>410</sup> For instance the popular H.264/AVC standard for video coding was developed jointly by ISO, IEC and ITU. At the first two organizations, this is known as JTC1 ISO/IEC 14496-10 - being part 10 of the broader MPEG-4 standard, while at ITU, it is known as H.264 standard, a 'stand alone standard'.

<sup>411</sup> We would also like to point out, that for the purpose of our analysis, it is preferable to have a slightly more encompassing than too narrow a definition of standards.

F. Service providers (telecommunications, radio, television, etc.).

Categories A, B, C and D can be considered 'upstream' business models: these organizations serve parties downstream in the business chain, either by supplying knowledge or products. Categories E and F can be considered 'downstream' business models: these companies provide products or services to end-users.

#### *Dead or alive?*

Apart from the question whether or not a disclosed patent is actually essential, the mere fact that a party has disclosed a patent does not necessarily mean that patent is actually granted and enforceable. Using the so-called Inpadoc Legal Data for all the disclosed patents we identified at the EPO and the USPTO, we categorized each patent into one of the following, mutually exclusive categories:

- 'Alive': the patent has been granted and is enforceable;
- 'Pending <20 yrs.': there has been a patent filing, but no patent grant yet;
- 'Pending >20 yrs.': there has been a patent filing, but 20 years have passed so a future grant is impossible;
- 'Lapsed': the patent was granted, but the owner failed to pay the fees, rendering the patent enforceable,<sup>412</sup>
- 'Expired': as the name implies, the patent has reached its maximum lifetime and is no longer enforceable.

#### **Comparing SEPs with non-SEPs**

This analysis builds on the OEIDD database, as introduced earlier. In order to do any comparison with non-SEPs, a crucial task is to create a control (or: reference) database of non-SEPs comparable to the essential patents we have. If this task is not done properly, any observed differences could simply stem from a different distribution, instead of actual differences between SEPs and non-SEPs.

Given the practical concerns, our initial aim was to select randomly 20 similar patents (with replacement) for each of the 9,408 SEPs identified in the OEIDD database. We imposed three different similarity criteria, one on technology category (i.e. the IPC codes), one on application year and one on application authority. The latter two criteria are straightforward: for a given 'focal' SEP, each matching (randomly selected) non-SEP should have the same application authority (i.e. EPO and/or USPTO) and the application year should be within the limit of plus or minus two years of the focal patent.

The definition of the former similarity criterion is more complex, mainly because patents may be assigned to any number of different IPC codes. For this discussion, we will call the part of the IPC code before the forward slash '5 digit' (e.g. H04L 12) and the entire code '6 digit' (e.g. H04L 12/56).

Our strong criteria define similarity on the basis of 6-digit IPC similarity as follows:

1. For a focal patent with one IPC code, each matching patent should have at most two IPC codes, one being identical to that of the focal patent;
2. For a focal patent with two IPC codes, each matching patent should have at most four IPC codes, two being identical to that of the focal patent;
3. For a focal patent with three IPC codes, each matching patent should have at most eight IPC codes, three being identical to that of the focal patent;

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<sup>412</sup> For the EPO, the situation is somehow more complex, as lapsing occurs nationally. We consider a patent lapsed if it was applied for in Germany and/or France and/or the UK and subsequently lapsed in at least one of these countries.

4. For a focal patent with more than three IPC codes, each matching patent can have any number of IPCs greater than three as long as the IPC code list includes at least three IPC codes of the matching patent.

For focal patents with up to three IPC classes, the sampling procedure prioritizes matching patents with the lower number of IPC classes; for focal patents with more than three IPC codes, priority goes to matching patents with the higher number of IPC code matches.

Eventually, this 'strong criteria' turned out to be too strong. For about half of the SEPs, the number of patents in the entire PATSTAT database was less than 20. Therefore we had to relax our 6-digit-based criterion to 5 digits, while conforming to all the remaining restrictions. However, throughout the (otherwise random) sampling procedure, 6-digit matches took priority over 5-digit matches whenever they existed. In order to reduce the polarity between the SEPs with a low number and a high number of matches; we also relaxed the "20 matching patents" criteria and made the maximum size of the matching set (for each focal patent) a random number between 10 and 20.

Consequently we compiled a control set of 121,971 matching patents. No appropriate matching patents could be found for only 166 of the 9,408 SEPs. For another 164 SEPs, the IPC codes were unknown (i.e. not present in PATSTAT), thus we could not find matching patents for these either. Taking into account the remainder of 9078 patents, 121,971 matching patents imply that we found an average of 13 non-SEP matches per SEP.

#### *Citation score of SEPs versus non-SEPs*

Economists of innovation have attempted to assess the value of patents using a number of characteristics such as citations received, renewals, family size, opposition, etc.<sup>413</sup> So far, the number of forward citations (i.e. received by a patent) is the most popular indicator of patent value. Following the pioneering contributions of Carpenter et al.<sup>414</sup> and Trajtenberg,<sup>415</sup> various studies have consistently established that forward citations are systematically correlated with the economic value or the industrial importance of patents.<sup>416</sup> The idea behind the use of forward citations as indicator of a patent's value is relatively straightforward: if a patent receives many citations, this means that the technological solution outlined in the patent serves as a basis for a large number of subsequent technological developments. Another related argument is that if a patent receives many citations, this may also mean that it has been frequently used by patent examiners to reduce the scope of protection claimed by subsequent patents; this again points to the significance of the technological solution contained in the original patent.<sup>417</sup> For all these reasons, it seems acceptable to presume that the number of forward citations will capture the technological value of a patent.

When considering the citation performance of essential patents, it is important to realize that there may be an endogeneity effect: patents may receive citations *because* they are disclosed as being

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<sup>413</sup> A detailed survey of this literature is provided in Van Zeebroeck, N., 2011. The Puzzle of Patent Value Indicators. *Economics of Innovation and New Technology* 20, 33-62.

<sup>414</sup> Carpenter, M.P., Narin, F. & Woolf, P., 1981. 'Citation rates to technologically important patents'. *World Patent Information* 3, 160-163.

<sup>415</sup> Trajtenberg, M., 1990. A Penny for your Quotes: Patent Citations and the Value of Innovations. *RAND Journal of Economics* 21, 172-187.

<sup>416</sup> See for example Albert, M.B. et al., 1991. Direct validation of citation counts as indicators of industrially important patents. *Research Policy* 20, 251-259, and Sampat, B.N. & Ziedonis, A.A. (2004). 'Patent citations and the economic value of patents', in: Moed, H.F., Glanzel, W. & Schmoch, U. (Eds), *Handbook of Quantitative Science and Technology Research*. Kluwer, Dordrecht, the Netherlands, 277-299.

<sup>417</sup> Van Zeebroeck, 2011, see Note 413 above.

essential.<sup>418</sup> This effect is studied in a paper by Rysman and Simcoe<sup>419</sup>, among others. Therefore, any comparison of the performance between SEPs and non-SEPs should bear in mind this possibility.

We compared the citation performance of the SEPs in our database with the control set of non-SEPs. Since the latter is based on a matching process and, therefore, has identical distributional features in terms of application years and technology class, we had already satisfied the standard corrections as suggested by Jaffe and Trajtenberg.<sup>420</sup>

#### *Patent family size of SEPs compared to non-SEPs*

Many patents do not come alone: they are part of patent families. A patent family, putting it simply, is a set of patents for the same invention. These might be applications in different countries or applications in one and the same country (continuation patents, continuations-in-parts, divisionals and re-issued patents)<sup>421</sup>. The latter is usually done to extend the scope or the protection period of the patent and is more of a strategic nature. There are different definitions of patent families,<sup>422</sup> of which the DOCDB family and the INPADOC family are the best known.

A larger patent family indicates that the patent owner is willing to spend more resources on protecting that invention, most likely because it represents greater value for the company (whatever way this value emerges: excluding, revenue-generating, cross-licensing, defensive, blocking competitors' technology routes, etc.).

We investigated whether or not essential patents have larger families. Here, we aim to disentangle the family size in terms of multiple countries, on the one hand, and the family size within individual countries, on the other.

#### **Blanket disclosures**

The empirical analysis uses the OEIDD dataset, which has been introduced earlier. In principle, we limit our data to those eight SSOs where blanket disclosures are allowed. We also collected additional firm-level data in order to learn more about the determinants of blankets, such as firms' overall patent portfolios including those in knowledge areas relevant to specific standards for which they make disclosures.

The total dataset of the eight selected SSOs encompasses 2,908 disclosure events and 11,054 statements. However, in several of our specific analyses we sometimes had fewer observations. There are various reasons for this: (a) for some observations, the disclosure date (day-month-year) is missing on the original disclosure; (b) for some observations, the name of the claimant (!) is missing on the original disclosure; (c) for some observations, the identification of the standard is missing on the original disclosure; (d) for some observations, we could not determine the business model of the claimant. In the most restrictive cases, the total number of disclosure

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<sup>418</sup> Firstly, SEPs are more 'visible'. Secondly, companies may direct their follow-up research towards existing SEPs, hoping that new research is valuable for products relating to (popular) standards, and perhaps even become SEPs for newer releases of the standard themselves.

<sup>419</sup> Rysman, M., & Simcoe, T. (2008). Patents and the Performance of Voluntary Standard-Setting Organizations. *Management Science*, 54(11), 1920-1934.

<sup>420</sup> Jaffe, A. B., & Trajtenberg, M. (Eds.). (2002). *Citations & Innovations: A Window on the Knowledge Economy*. MIT Press.

<sup>421</sup> For a discussion on such patent types, see Hegde, D., Mowery, D. C., & Graham, S. J. H. (2007). *Pioneers, Submariners, or Thicket-Builders: Which Firms Use Continuations in Patenting?* NBER working paper No. 13153.

<sup>422</sup> A widely adopted, 'broad' family definition is one in which patents are grouped that share at least one priority document (examples are INPADOC by the EPO/OECD, and Derwent DII by Thomson Reuters). A narrower definition is one in which all family members have to share exactly the same set of priority documents (e.g. DOCDB, also by the EPO/OECD).

events can drop to 2,358 (i.e. 81% of the full set) but often the drop is more modest, depending of course on the specific variables required for a given analysis.

While the detailed presentation of these results has not been embedded in the main text of the report we present this in Annex IV.

### Transferring ownership of SEPs

The SEP transfers database is compiled from the registers of reassignments at the European (EPO) and French (INPI) patent offices, which cover all changes of ownership respectively for European patents transferred during the examination phase (EPO register) and for French patents filed through the national route and granted European patents validated in France<sup>423</sup> (INPI register) from 1998 to 2009. For each reassigned patent, this dataset provides information on the name of the new owner (the assignee) and the date of ownership transfer registration. Information on the initial applicant of patents was collected from the OECD EP-PAT database (for patents filed at EPO) and the INPI F-PAT database (for patents filed at INPI).

To construct our sample we merged the database of European patent reassignments with a second dataset of 11,476 declared SEPs (distinct patent families) from 1992 until 2010. Declared SEPs were retrieved from public patent declaration databases of ISO,<sup>424</sup> IEC,<sup>425</sup> CENELEC, ITU-T, ITU-R and IEEE. The data merge resulted in 617 observations as to the transaction of a distinct patent family.<sup>426</sup> Overall, only 13 patents have changed ownership twice during the period. Out of 1,400 standards where we identified declared SEPs, 153 standards were subject to traded SEPs. We further identified 58 distinct SEP sellers and 51 distinct SEP buyers.

We checked the identity of the applicant and new owner of each transferred SEP in order to sort these transfers into three separate categories. In some cases, the former and new owners were subsidiaries of the same mother corporation. Such reassignments are likely to proceed from fiscal optimization and strategic motives at the group level. We label them as “Internal” SEP transfers if they take place between established entities of the same group and as “Acquisition” if they immediately follow the acquisition of the initial SEP-owning entity by the group. Finally, SEP reassignments that are not identified as “Internal” or “Acquisition” correspond to bare SEP transfers between two legally independent entities and are labelled accordingly as “Bare” transfers. Consequently, “Bare” and “Acquisition” transfers are especially interesting, since they imply a market-mediated transfer. We identified 253 “Bare” transfers (41% of all transfers), 92 “Acquisition” transfers (15%) and 274 “Internal” transfers (44%). We further categorized each patent transfer in connection with the standard where the transferred SEP has been declared. These standards were then differentiated by SSO and technology area.

### Patent pools

The data used is mostly based on information provided by licensing administrators. Having searched the websites of well-known pool licensing administrators, including the archives of news releases on past activities and projects, we identified the attempted and effective pool creations (an attempted pool creation is defined as any serious effort to create a pool, such as a call for patents).

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<sup>423</sup> About 98 percent of European patents are designated in France. Hence the INPI register covers nearly all granted European patents.

<sup>424</sup> We present the results for the JTC1 activity of ISO and IEC separately, in order not to mask the other activities at these two bodies.

<sup>425</sup> Ibid.

<sup>426</sup> By proxying SEPs, looking at those patents that are declared essential, we are obviously prone to some bias, because not all actual SEPs might be disclosed properly, and companies might have disclosed non-SEPs (e.g. under and over disclosure). We also cannot observe SEPs that are part of blanket disclosures. It is not possible, however, to overcome such bias.

The data covers 60 attempted or effective pool creations since 1992, which have resulted in 45 pools and 11 failures; 4 calls for patents were still open. For all the existing pools, we additionally sought to systematically obtain information on pool members (licensors), licensees and included patents from the pool administrators' websites. The information on pool members and licensing administrators was available for all 45 pools, whereas information on licensees was available for 25 of these pools. Using the Internet Archive ([www.archive.org](http://www.archive.org)), we could compare the current lists of members, patents and licensees with previous lists, providing information about the patterns of entry and exit of members and growth and decline in the number of licensees. This information was tracked as far back in time as possible (in most cases to the start of the licensing program).

Data concerning patent pools used for the analysis have been put online by Justus Baron, along with other standard related datasets. This information can be found here:

<http://www.law.northwestern.edu/faculty/programs/searlecenter/innovationeconomics/data/technologystandards/index.html>

### SEPs and litigation

The data used are derived from the OEIDD dataset. We linked the essential patents in this database with litigation data originating from Derwent. Since we only had access to the litigation data of US patents, we created a subset that consisted of all granted USPTO patents in our disclosed essential patent dataset, plus a USPTO DOCDB family member of any disclosed EPO patent (in so far as no USPTO family member of that patent was already in the set). This resulted in a final sample of 5,768 granted US patents. Considering patents covered by one single piece of legislation made the data more consistent and allowed us to ignore possible institutional differences at different patent offices.

In order to investigate the effect of being essential on litigation, we built a one-to-one matching control sample (referred to as 'baseline') by randomly choosing undeclared USPTO patents with the same technological class,<sup>427</sup> the same application year and the same grant year. Consequently, the two samples have identical joint distribution of technological classes and pendency years. The final set includes 11,535 patents: 5,768 SEPs plus 5,768 control patents. The patents were applied for between 1948 and 2009.

One caveat of our data is that we only observe 'official' litigated cases. Settlements or arbitrage processes are typically not made public and, so, cannot be viewed.

## Summary of the results

### Occurrence of SEPs

We estimate that there are 12,000 to 18,000 unique SEP patent families. The number of patents that are essential for standards is substantial. For the 13 selected, large standard-setting bodies, we found 5,000 disclosure events, with 46,294 statements (either a specific patent or a blanket). However, there can be considerable (geographic and non-geographic) overlap in this data. We identified around 20,000 USPTO or EPO families, relating to 7,988 unique innovations (DOCDB patent families). It is known that the disclosure databases used for this analysis are far from perfect and subject to both under- and over-disclosure. The fact that many standards bodies allow 'blanket disclosures' also means that a significant group of essential IPR is not identified. While it is hard to estimate the actual amount of SEPs, we believe that these may well be in the range of 1.5 to 2

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<sup>427</sup> Since we are considering USPTO patents, we used the USPC technology class, matching at the 3-digit level.

times the number of patents identified for the selected standard-setting bodies. Then there are of course also many other standard-setting bodies. The well-known live inventory of SSOs by Andrew Updegrave<sup>428</sup> includes over 800 organizations, of which the lion's share is best characterized as consortia. Given the typically much narrower size and scope of these bodies, and the fact that many are in areas that do not 'attract' a great deal of standard essential patents, we believe that these organizations altogether have fewer SEPs than the 13 organizations we reviewed.

On average, the number of SEPs is doubling every five years. While there are clear peaks (and lows) for certain years, which can probably be contributed to a 'big' standard being developed, the long-term growth is relatively stable.

On average, patents are already 8 years old when they are declared essential. But it is not possible to determine whether these are 'late disclosures' or whether the standard has simply been developed much later than the patent application was submitted.

In almost any dimension, SEP occurrence is highly skewed. *Number-wise*, it is very much concentrated in:

- a few SSOs (ETSI, and then at a considerable distance IETF, ITU, and JTC-1 (at ISO and IEC));
- a few technology areas (telecommunications, and at some distance, audio-visual, IT, and LAN technologies);
- a few standards (just 7 of the 1,486 standards represent 72% of all patent statements).

However, we should stress that numbers do not say everything. A standard with a single SEP owner demanding 15% of running royalties affects implementers more than a standard with hundreds of owners that together only demand, say, 5%.

Equipment suppliers are responsible for the largest share of SEP declarations and statements. This share is around 60%. Component and software suppliers together have another 22%, while Non Practicing Entities (NPEs) including universities and research institutes account for around 14%.

Many SEPs are not enforceable. Of all the identified SEPs at the EPO, only about half are actually 'live' patents. The remaining patents are either pending (especially recent applications), expired or have simply lapsed (because the owner failed to pay the patent fee).

### Comparing SEPs with non-SEPs

The citations performance, often considered an indicator of patent value, differs between SEPs and non-SEPs. In later years, SEPs show a higher score. This is consistent with earlier literature but may be due to an endogeneity effect (that patents get cited *because* they are disclosed as essential). In earlier years, SEPs had a poorer citation performance. This result has not been previously reported in the literature and is difficult to interpret. A positive explanation is that these patents are quite unique and advanced for their time and it takes a while before follow-up research catches up. A pessimistic explanation is that SEPs are actually not that valuable at all (and their later higher scores are *only* due to endogeneity).

On average, SEPs are applied for in many more countries than non-SEPs. Almost 50% of the SEPs have family members in 6 or more countries. For non-SEPs, this is only 22%. Regarding family size within a given country (as a result of continuation patents, continuations-in-parts, divisionals, re-issued patents), we see little difference between SEPs and non-SEPs.

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<sup>428</sup> See <http://www.consortiuminfo.org/links>.

SEPs are more often granted than comparable non-SEPs. However, since there is no way to rule out selection bias by the patent owner themselves (when deciding what to disclose), we cannot argue whether or not this indicates a higher patent 'quality' of SEPs.

### Blanket disclosures

Eight of the thirteen large SSOs we investigated allow organizations to submit blanket declarations. In those organizations, such blanket declarations are a very common phenomenon, representing 60% of all disclosures. There are, however, significant industry differences. For telecommunications, LAN and audio-visual standards, the proportion of blanket disclosures varies from 66 to 71%; whereas for IT standards it is much lower, namely 34%.

In discussions, larger firms have often indicated that they prefer to be allowed to submit blanket claims, because searching their large portfolios of relevant patents for essential patents incurs considerable search costs. They also claim that they prefer to submit blanket claims if they are involved in many standardization activities at the same time. In our analyses, however, we found no substantiation for large companies' search costs claims. In fact, we found the opposite: the *larger* a firm's patent portfolio, the *less* likely it is to make blanket disclosures, all other things being equal. So there must be other (strategic?) reasons why, given the choice, certain firms submit blanket claims and others do not.

We also found that companies willing to make a royalty-free commitment are more likely to make a blanket disclosure. This finding is quite understandable. Since these companies gain no financial benefit from their patents, they might not want to make search costs and, also, implementers should have little concern not knowing the patent identities, since they get free access to them anyway.

### Transferring ownership of SEPs

SEP transfers were almost non-existent before 2005 and thereafter increased rapidly. A large majority of the transferred SEPs has been declared at ETSI for Telecommunications standards, JTC1 coming next. Yet, in both cases this represents less than 10% of all SEPs declared to the SSO. ETSI has also by far the largest number of standards that are subject to SEP transfers.

A large majority of SEP transfers took place after their declaration to the SSO (69.9% of cases) and the official release of the standard (83.5%), which suggests that both events may facilitate transfers. However, this sequence mainly reflects the timing of transfers for SEPs declared at ETSI. In other SSOs, most transfers took place after the standard release, but not after the declaration.

Although most traded SEPs cover very large standards (with more than 60 declared SEPs), this does not significantly change the distribution of SEP ownership for such standards. In contrast, SEP transfers have a significant impact (from 10 to 50% of all declared SEPs) on the distribution of SEP ownership for smaller standards in Telecommunications, Audio-visual and Security areas. Overall transfers increase SEP concentration in around 80% of cases, thereby reducing transactions costs and royalty stacking in the market for SEP licenses. About 80% of the standards where concentration increases, belong to the Telecommunication technology area and the average increase of concentration is also highest in this sector.

### Patent pools

Patent pools are concentrated in relatively narrow technological fields: they are particularly present for coding and compression technologies, as well as for broadcasting and audio/video home systems. Over time, the rate of pool launches per year has increased after 1997 and reached its

highest level in 2004, with ten launches. Since 2006, the number of pools created every year varies between one and three, with the exception of 2009, when seven pool launches were observed. Only a minority of patent pools gathers a large share of the companies declaring essential patents for the relevant standard. Less than one third of the companies declaring essential patents for the respective standards were identified as members of the pools in our sample. More than one fourth of the pool members joined the respective pool later than one year after launch. Patent holders taking a license from the pool are more likely to be among the late entrants, whereas companies having declared standard essential patents to the relevant SSO are more likely to be among the initial members.

### SEPs and litigation

Essential patents are more likely to be litigated than non-essential patents: the estimated likelihood of litigation over their whole lifetime is around 16%, compared to 3% for a matched set of patents with otherwise similar characteristics. In other words, their likelihood to get litigated is over five times as high. Most litigation takes place after the patent is disclosed as being essential.

Although in absolute numbers there are more litigation cases for telecommunications standards than any other technology area we studied; the *relative* litigation rate of telecommunications, 6% of all patents, is lower than in LAN technology (14%), audio-visual standards (also 14%) and security technologies (12%).

We also observe differences between companies with different business models. In short, downstream players are less 'litigative' than upstream players. Essential patents disclosed by universities are very often litigated (as much as 23%). After investigating a number of actual cases, we saw that each has its own story and that these patents were often transferred to other owners before they were litigated.

Patents declared under a Royalty-Free commitment are litigated significantly less often than those in the royalty-bearing categories. This is not unexpected: these owners do not require financial compensation for their patents anyway.<sup>429</sup>

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<sup>429</sup> One might wonder why these patents are litigated *at all*. The answer is that we observed all litigations, not only those specifically related to the use of the patent in the context of a standard. It is highly likely that a patent owner makes a royalty-free commitment for the use of the patent to implement the standard, but requires paid licenses for any other use.



## Annex IV Determinants of blanket disclosures

This annex provides a further analysis into the determinants why organizations submit blanket disclosures instead of specific disclosures – at least when the SSO offers them the choice to do so. Exploiting an original and rich dataset, we are able to empirically test some arguments concerning the determinants of blanket disclosure behaviour. In particular, we focus on two hypotheses. The first hypothesis relates to an argument often put forward by companies while lobbying in favour of blanket disclosures indicating the substantial search cost they might incur. In this respect, we are going to estimate the extent to which the size of a firm patent portfolio (as a proxy of the search cost) correlates with the likelihood of that firm to issue a blanket disclosure. The second hypothesis concerns the possible strategic use of blanket disclosures in relation to the value of the patent of the firm in question. In the licensing of SEPs, the usual asymmetry of information present in patent licensing affects and potentially harms the prospective licensee more than the patent owner. As a consequence, in the context of SEPs, patent owners might have an incentive to retain private information about the patent by using blanket disclosures that do not allow potential licensees to further check the actual content of the SEPs. In this respect, we are going to estimate to what extent the quality of a firm's patent portfolio correlates with the likelihood of that firm to issue a blanket disclosure.

To test the above hypotheses, we performed a series of regression analyses. The unit of these analyses is the disclosure event and the dependent variable is a binary variable equal to one when the disclosure is blanket and zero otherwise. Hence, we use LOGIT regressions. In order to test our hypothesis we collected additional firm-level data about firm's patent portfolio size and value. These additional data were collected by OECD/PATSTAT database and we performed a number of additional measures to harmonise assignee names.<sup>430</sup>

Firstly, we measured the overall size of the patent portfolio of each organization (variable Ln\_Know\_Stock in our regression), calculated following the literature and using the inventory method with a depreciation rate of 15%.<sup>431</sup> There might be a concern, though, that some firms have a very extensive product or market profile and that this portfolio measure includes 'too much'. If we are thinking in terms of search costs, a firm that much check for SEPs in the area of telecommunications does not likely need to search its portfolio on, say, nuclear technology. Therefore, we calculated a second measure: the patent portfolio specific to a given standard (variable Ln\_Spec\_Know\_Stock).<sup>432,433</sup> For each standard in our set, we calculated an 'IPC classification profile' on the basis of known essential patents. This profile reflects the knowledge relevant for the standard in question. Then, for each firm, we calculated the relevant patent portfolio

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<sup>430</sup> The OECD/PATSTAT database, which was central to our analysis, does not provide a harmonized applicant name. This creates two types of problems: i) the identification of all possible way a company name appear in PATSTAT and ii) the identification of all the subsidiaries and the decision of whether to include them in the patent count. As the number of company is limited the first problem was solved through a manual search in PATSTAT. The second problem was partially tackle by using the CESPRI-KITES database, which unfortunately covers only few sectors and therefore not all the companies in our dataset. In order to assess the general reliability of our patent search by company (and group) we double-checked the overall result for some firms with the Derwent DII database (a database that has integral assignee-name cleaning), to ensure that there were no firms with a significant undercounting.

<sup>431</sup> Following Hall, B., Jaffe, A., & Trajtenberg M. (2005). Market Value and Patent Citations. *The RAND Journal of Economics*, 36(1), pp. 16-38.

<sup>432</sup> This is computed as the Hirschman-Hertfindal index (HHI) on the share of disclosures per standard per year.

<sup>433</sup> Ideally, we would like to calculate the value of precisely the SEPs owner by this party, but this is exactly the point of blanket disclosures: we do not know which these SEPs are because the party is not willing to provide that specific information.

(i.e. all patents in the relevant classes of the IPC profile) for each of the standards for which they had disclosure events, regardless of whether these were with specific disclosures or with blanket disclosures. Finally, to test our hypothesis on the value of portfolios, we did the same analysis on the relevant patent portfolio, but weighted the results on forward citation received (variable Ln\_Weighted\_Spec\_Know\_Stock).

In order to account for other factors that may possibly affect the decision between a blanket or specific disclosure, we include control variables such as: the type of licensing agreement (whether it is a FRAND, a royalty free or other), an SSO dummy to further control for institutional differences, the number of standards in which the firm is involved (measured as the number of different standards it disclosed patents in whatever way), the dispersion of the standardization effort of a company<sup>434</sup> and, finally, a Telecom dummy if the standard relates to the field of telecommunication.

The table below reports on the results of the regression analysis and, for each model, both the firm and firm-SSO fixed effect estimations have been displayed. Model 1 shows a negative and significant effect of the patent portfolio size on the likelihood to observe a blanket disclosure. The robustness of this estimation is confirmed in the second column where we control for both the firm and SSOs fixed effect. Model 2 estimates a similar model, but now looking at the more sophisticated portfolio measure, which focuses only on the part of the portfolio relevant for a specific standard. As the result holds (i.e. the coefficient is again negative and significant) we can reject the high search cost argument: in fact companies with a larger patent portfolio are less likely to make a blanket disclosure. Model 3 focuses on the use of blanket disclosures in order to cover up patent value. The negative and significant coefficient of the variable of interest indeed shows that the higher the value of the specific to a standard patent portfolio, the less likely it is to observe a blanket disclosure. A sensible interpretation would be: the higher the value of a patent portfolio, the more the holder wants to signal its value by disclosing all the details, thus allowing potential licensees to investigate it. Finally, in order to control for possible relations between our two different hypotheses (the 'search cost' and the 'covering up' hypothesis) we ran a regression in which we include both the independent variables for the generic patent portfolios and the citation-weighted specific patent portfolio. The results in model 4 show that the latter variable absorbs all the significance, showing that the covering up effect might be stronger than the effect of the size of the patent portfolio.

To conclude, we find that **the larger the patent portfolio of a firm, the less likely it is to submit a blanket disclosures**, all other things being equal. However, the more (different) standardization activities in which a firm is involved, the more likely it is to submit a blanket disclosure. Therefore, we can conclude that the size of a patent portfolio is not the reason that firms revert to blanket disclosures (in contrast to what is often argued by these firms themselves). In regards to the use of blanket disclosures for covering up low value patent portfolios, we find that **the higher the value of the relevant patent portfolio or an organization for a standard, the less likely it is for the organization to submit a blanket disclosure**. Therefore, the ability to actually indicate a precise patent identity can work as a signal for all the SSOs stakeholders about the value and the essentiality of a patent.

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<sup>434</sup> A company that is active in, say, telecommunications, nuclear power stations, and shipbuilding, does not necessarily need to investigate its full patent portfolio when searching potential SEPS for a specific standardization activities.

**Table AIV.1 LOGIT regression, dependent variable is blanket disclosure event**

Variable	Model 1		Model 2		Model 3		Model 4	
	FIRM FIXED EFFECT	SSO AND FIRM FIXED EFFECT	FIRM FIXED EFFECT	SSO AND FIRM FIXED EFFECT	FIRM FIXED EFFECT	SSO AND FIRM FIXED EFFECT	FIRM FIXED EFFECT	SSO AND FIRM FIXED EFFECT
Ln_Know_Stock	-0.0355**	-0.0316**					-0.0113	-0.0166
Ln_Spec_Know_Stock			-0.0197**	-0.0183**				
Ln_Weighted_Spec_Know_Stock					-0.0178*	-0.0251**	-0.0332	-0.0434**
Licensing Commitment (1)								
FREE	0.1737***	0.1945***	0.1482***	0.1925***	0.1133***	0.1628***	0.1242***	0.1777***
OTHER	0.1833***	0.1655***	0.047	0.0551	0.0651*	0.0804**	0.0651*	0.0807**
SSO (2)								
IEC	-0.2749***		-0.2654***		-0.4484***		-0.4185***	
IEC - JTC1	-0.2003***		-0.1068		-0.1321*		-0.0978	
IEEE	-0.044		-0.066		-0.0529		-0.0233	
IETF	-0.4478***							
ISO	-0.1233		-0.1565		-0.1862		-0.1465	
ISO - JTC1	-0.0871		-0.1076*		-0.1305*		-0.0988	
ITU	-0.1031*		-0.1273**		-0.1270**		-0.1016*	
TIA	-0.3169***		0.2789***		0.2749***		0.2969***	
Number of standards	0.0026**	0.0012	0.0035***	0.0011	0.0031***	0.0011	0.0035***	0.0017
HH	0.0811**	0.1235***	0.1346***	0.1643***	0.1291***	0.1687***	0.1186***	0.1567***
Telecom Dummy	-0.0119	-0.016	-0.014	-0.004	-0.0104	0.008	-0.0115	0.0053
Constant	0.9048***	0.7793***	0.7293***	0.6671***	0.7327***	0.7171***	0.9604***	1.0494***
N	3056	3229	2681	2827	2297	2297	2297	2297
Group	229	593	218	535	177	392	177	392
R-Square	0.377	0.552	0.355	0.525	0.353	0.504	0.3538	0.5055

Dependent variable: Dummy equal to 1 if the disclosure is blanket and 0 otherwise. All the models are linear regression models with robust standard errors and different fixed effects. Legend: \* p<.1; \*\*p<.05; \*\*\* p<.01. (1) Baseline is FRAND, and (2) Baseline is ATIS.



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