Report

Workshop on Patent Thickets

initiated by the EPO Economic and Scientific Advisory Board
26 September 2012, Leuven
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Leuven, 26 September 2012

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EPO Economic and Scientific Advisory Board

While the EPO’s main focus is on its core business, it also has a strong interest in the broader economic and social ramifications of the patent system. This interest should be pursued in a collaborative way together with individuals and organisations that have shown a high level of expertise in the areas concerned. It is for this reason that the EPO set up an Economic and Scientific Advisory Board to address important economic and social issues relating to patents in a more dedicated and selective way than hitherto possible.

Mandate
The objective of the EPO’s Economic and Scientific Advisory Board is to contribute to a comprehensive analysis of the patent system in its economic and social context. The Advisory Board addresses issues that are closely related to the patent system and of significant interest to the European economy and society at large. It is the responsibility of the Advisory Board to come up with a scientifically grounded, independent assessment of these issues. The Board advises the EPO on the scope and set-up of relevant economic and social studies, provides guidance on related research projects and evaluates their impact. Using studies and analyses supplied by the EPO and other external partners, the Advisory Board is responsible for providing early warning signals on sensitive developments and issues. Moreover, it presents policy recommendations for dissemination to relevant media and stakeholders.

Composition of the Advisory Board
The EPO’s Economic and Scientific Advisory Board is composed of 11 well-known and renowned individuals (global scope with an emphasis on Europe), some of whom are economists and social scientists with a focus on the patent system, while others are practitioners with extensive experience of the European patent system. The members are nominated for a period of three years. The group is supported by a Secretary-General, whose role is exercised by the EPO’s Chief Economist.

Scope of work
The Advisory Board is independent within the scope of its mandate and is able to choose to address particular issues on its own initiative. At its inaugural meeting in January 2012, the EPO’s Economic and Scientific Advisory Board decided to hold stakeholder workshops on the following three issues:
- the role and structure of fees
- the importance of patent quality
- patent thickets

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- Chairman: Dietmar Harhoff, Professor, Ludwig-Maximilians-University Munich
- Secretary-General: Nikolaus Thumm, EPO Chief Economist
Executive Summary

This report represents the summary and synthesis of the ESAB workshop on patent thickets that was held on 26 September 2012 in Leuven, Belgium. This was the third workshop in a series held in 2012, comprising the role and structure of fees, patent quality, and patent thickets. Separate reports were produced for each topic.

The workshop on patent thickets was designed to (1) encourage the exchange of thoughts from different stakeholders and discover their perceptions of patent thickets; (2) ponder sectoral differences, both in incidence and impact; (3) suggest ideas for future research; and (4) suggest possible institutional approaches to address challenges raised by the existence of patent thickets and the implications of those approaches for different stakeholders. Other important considerations were the role of standards, royalty stacking, compulsory licensing, and patent pools.

Early discussions centred around the definition and incidence of patent thickets and there was widespread agreement on what the term represents. A patent thicket conjures up the image of a bramble, a large dense bush with thorns on the branches making it difficult to pass through without getting severely scratched. Thus a patent thicket usually involves (1) multiple patents on (2) the same, similar, or complementary technologies, (3) held by different parties, making it difficult to negotiate intellectual property rights (for example, licensing agreements) to the point where some scholars feel it might be socially inefficient. In other words, patent thickets raise entry costs for new entrants, reducing the system’s benefits for society. In such a situation, it is argued that strategic use of the patent system by applicants may be interfering with the goals of the system, by obliging innovators to spend inordinate resources on transaction costs to bring new technology that builds on prior work to market. Such high transaction costs, if and when they exist, would tend to discourage innovation rather than encourage it.

Later on discussions were devoted to understanding the different sources of complexity and their associated costs. The participants’ input can be grouped into three main categories: uncertainty factors and their impact on freedom to operate, search costs, and the cost of legal action. Uncertainty factors can be further broken down into long pendency times, low quality, and lack of ownership transparency.

Finally, the group tackled prescriptive aspects. There was a lively discussion on whether patent thickets are a problem per se. While there was no clear answer to that, participants did agree that patent thickets appear to be closely related to the management of innovation and its complexity. The group focused on solutions that might help the patent system overcome these challenges. They could be broadly classified as (1) improvements in the granting process; (2) improvements in dispute resolution; (3) improvements in standards-related IP management; (4) improvements in transparency; and (5) market-based incentives.
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1. **Introduction**

The overall growth in patent applications can be attributed to several factors, including increased technological complexity (Hall, 2004; Heller & Eisenberg, 1998). There is some disagreement as to whether this is a result of the explosive growth in innovation in sectors like the ICT and biotechnology industry, or if it is more akin to a situation where firms have sought to establish increased property rights without dramatically increasing their overall levels of innovation (Bessen & Meurer, 2008b). According to studies in the US, this has led to both a decline in patent quality and an increase in patent litigation (Bessen & Meurer, 2005). In addition, the pendency period of applications has increased dramatically, almost doubling from 19 months in the early 1990s to 34 months in 2010 (Rai, Graham, & Doms, 2010). If these elements also applied to other patent systems such as the European one, they would create uncertainty and could undermine the ultimate goal of the patent system, which is to spur innovation. Uncertainty in the patent system has a counter-intuitive effect; instead of using it less, firms are choosing to file for more patents, either to fend off perceived threats or to take advantage of the weakness in the system (Hargreaves, 2011). The combined result of all this may be *patent thickets*.

What is a patent thicket? A patent thicket conjures up the image of a thicket, or bramble, a large dense bush with thorns on the branches making it difficult to pass through without getting severely scratched. Thus a patent thicket is a “a dense web of overlapping intellectual property rights that a company must hack its way through in order to actually commercialize new technology” (Shapiro, 2001, p. 120). This makes it difficult to negotiate intellectual property rights (for example, licensing agreements¹), to the point where some observers feel it might be socially inefficient (Bessen & Meurer, 2008b; Scotchmer, 1996). In such a situation, it is argued that strategic uses of the patent system by applicants may be interfering with one of the goals of the system, by obliging innovators to spend inordinate resources on transaction costs to bring new technology that builds on prior work to market. Such high transaction costs, if and when they exist, would tend to discourage innovation rather than encourage it. And while there is a basic intuitive understanding of patent thickets and how they come about, what is lacking is knowledge about patent complexity and its ramifications for different constituencies as well as their magnitude and welfare effects. Are all applicants equal in their ability to navigate complex IP?

In the light of the above, a workshop on patent thickets was held on 26 September 2012 in Leuven, Belgium. This was the third workshop in a series comprising the role and structure of fees, patent quality, and patent thickets that were held in 2012, each giving rise to a separate report. The workshop was designed to (1) hear from different stakeholders and discover their perceptions of patent thickets; (2) ponder sectoral differences, both in incidence and impact; (3) suggest ideas for future research; and (4) brainstorm on institutional approaches that might be taken to address challenges raised by the existence of patent thickets and the implications of those approaches for different stakeholders. Other important considerations were the role of standards, royalty stacking, compulsory licensing, and patent pools.

The workshop participants considered several questions. The first series of questions was concerned with describing the issues and identifying any problems, describing patent thickets in a systematic way, exploring the role standards play in thickets, and understanding the conditions under which royalty stacking occurs. Later on, a second series of questions was raised, having to do with possible solutions, policy-based and market-based interventions and their effectiveness, the role of patent pools, and the role of compulsory licensing. The participants discussed all of these issues during the workshop.

This report is structured as follows: the next section will discuss how to identify and possibly measure patent thickets, followed by a synthesis of the discussions on those topics. After that, we discuss the different types of complexity inherent in the current system, and their costs. We then consider the different approaches proposed during the workshop to respond to those complexities, before concluding with some remarks on how different costs are borne by different stakeholders and how different remedies influence the costs.

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¹ A *licence* is simply a contract that exchanges money (the *royalty* payment, which can also be zero) for access to technology or more generally to intellectual property.
2 Measuring patent thickets

A patent thicket generally has several characteristics (von Graevenitz, Wagner, & Harhoff, 2011). It usually involves (1) multiple patents or patent applications on (2) the same, similar, or complementary technologies, (3) held by different parties. Granted patents as well as patent applications may represent a barrier for new entrants, therefore a fair measure of patent thickets should include both. While further research is needed in this area, one method of measuring thickets for patent applications is based on the X and Y coding assigned to each patent application by examiners. Using the terminology of von Graevenitz et al. (2011), such X and Y references are said to “block” the patent in question.

One can aggregate these blocking statistics up to company level and determine the type of blocking relationship (unilateral, bilateral or mutual) between two firms. Presumably, unilateral or bilateral blocking can be managed by the two parties involved. If the patent applications of three firms simultaneously block each other, then this triple might be illustrative of the three characteristics mentioned at the beginning of this section. The reason for this is that the cost of negotiating cross-licences would rise rapidly due to the increased complexity and interdependency between the parties. In fact, the number of bilateral negotiations would go up exponentially with each additional blocking firm. Now, the mere existence of a triple would not necessarily be a thicket, but a high incidence of triples (a large percentage of firms caught in a triple in a certain industry) might indicate a patent thicket. Von Graevenitz et al. (2011) draw a distinction between discrete and complex technology sectors and show the number of triples in these two broad categories, reproduced in Figure 3 in Annex 1.

Other scholars (Hall et al., 2012) suggest identifying patent thickets by using a combination of indicators such as concentration index, EP oppositions, IPC frequency distribution, citations, patent family size, etc. The suggested approach includes both patents and patent applications and could be useful to distinguish and analyse characteristics and sector specificities of possible patent thickets.

2.1 Other issues raised

In addition to defining thickets and their measurement, participants brought out several other important considerations in understanding thickets. One was the incidence of thickets in complex technology sectors, another was the role that standards play in thickets.

Complex technology sectors

The distinction between discrete and complex technology sectors was developed by Levin et al. (1987) and discussed further by Merges and Nelson (1990) and Cohen et al. (2000). The sectors refer to groups of firms whose products (or processes) require the marketing of few “patentable elements” (discrete) or many such elements (complex). Examples often cited of discrete technology sectors are chemicals and pharmaceuticals. Electronics and semiconductors are often cited as examples of complex technology sectors (Cohen et al. 2000). Semiconductors are a classic example of a complex technology sector:
- there are many patents per product;
- manufacturing is difficult & costly, but contracted out by design specialists;
- time from concept to market matters;
- there are many patents with many owners (by 2002, there were roughly 90 000 US CPU (central processing unit) patents owned by more than 10 000 entities in this sector (Detkin, while at Intel); and
- the owners of the prior art are dispersed (Ziedonis, 2004).

As in other complex technology sectors, since 1980 there has been an increasing number of EPO triples in semiconductors, which suggests a higher density of thickets.

Arguments were presented as to whether or not those thickets represented an insurmountable problem. Another presentation contrasted that situation with the pharmaceutical industry, where thickets were thought to be less prevalent and less problematic, as was also borne out by the data analysis of von Graevenitz et al. (2011).

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2 Examiners look at prior art, including other patents, and determine how each piece of prior art influences novelty or inventive step. If an individual citation, such as a prior patent, seriously calls into question the novelty of the patent under review, it is classified as ‘X.’ If it calls novelty into question only in conjunction with other references, it is classified as ‘Y.’
Standards and “standards-essential” patents

Standards come in many forms but fundamentally refer to established norms used in technical systems. A standard is a norm or measure that may be the result of a formal consensus-building procedure that is managed by a standardisation body (de jure standards) or arise spontaneously due to the degree of market penetration of a particular technical solution (de facto standards). Standards may refer to an interface (electrical outlet and plug design), technical specification (GIF format), dominant design (gasoline-powered automobile), or way of doing things (driving on the right-hand side of the road). These are not mutually exclusive categories. Standards-essential patents (SEPs), also known simply as essential patents, are patents that are required for a party to comply with a technical standard. This issue was also discussed in the workshop. One example brought up in the discussions was that of a third-party producer—a smartphone developer—whose product affects (at least) several components, many of which are based on standards, and represent thousands of patents. Another presentation estimated that such a device could utilise the technology represented in up to 15 000 patents.

If a party cannot comply with a standard except via a series of bilateral negotiations with every intellectual property holder, it becomes almost impossible to actually comply with the standard, thus weakening the usefulness and diffusion of the standard and hindering interoperability of the end-products, e.g. the smartphones. It was proposed that the sheer complexity of this situation and the resulting thicket could have an adverse effect on product innovation in standards-based settings.

3. Different types of complexity and their costs

It is not feasible to acquire data on the number of companies that do not enter the market because of patent thickets. Nor is it possible to quantify job losses. That is due to the impossibility of knowing a counterfactual. The workshop participants examined the “root causes” of complexity and the resulting costs. The following sets out the main issues raised by the participants.

3.1 Uncertainty factors and their influence on “freedom to operate”

Having many patents is not a problem in and of itself. Failures arise when economic players cannot develop their business, or market players abandon their innovation activities due to an inability to assess the validity of their intellectual property. Thus, one theme that was raised repeatedly was uncertainty over the freedom to operate (in the general rather than the legal sense), or uncertainty about the transaction costs necessary to develop and commercialise a product. In fact, the reason for the prevalence of patent lawsuits may have much to do with the effectiveness of patent offices’ review processes. This may take the form of pendency and quality – and is not restricted to the US, according to the participants; even if the US system seems to magnify these problems, they are evident in Europe as well.

Pendency

The pendency of a patent is the time that elapses between the initial application for a patent and the ultimate decision, whether that be grant (issuance), rejection, or withdrawal. Almost all workshop experts agreed that pendency is a major issue and probably contributes in an important way to thicket in complex technology sectors.

Thus it was proposed by several working groups that the patent thicket problem is not only about the number of patents granted, but also about the huge number of pending patent applications. The speed of processing of patent applications is one of the greatest challenges facing all of the major patent offices. While the problem is clear, the cause may not be so discernible. Many people suggest that the increase in patent filings is a measure of increased innovation; however, the increase in filings happened to coincide with three significant events: the popularisation of the

1 The subsystems of smart phones’ standards profiles that were discussed included:
- radio technologies, e.g. GSM, UMTS, LTE, Wi-Fi, Bluetooth
- communication technologies, e.g. circuit switched, packet switched, internet
- navigation, e.g. GPS
- audio/video, e.g. MP3, MPEG, AVI
- camera, sensor
- software, e.g. web services, office, games
- design patents
internet, the decision to allow patenting of business methods (in the US), and the ability to patent biological life forms. This did not so much promote innovation in new technologies as the patenting of different ways of doing the same things. The explosion of patent applications, it could be argued, was not a technology boom, but instead more of a workload challenge for the patent offices. The result was that the pendency time for applications lengthened dramatically, and with that came uncertainty. Inventors could not know if or when their patent would be granted, or what form, as represented by claims, that grant might take. Thus, each pending application had a lower perceived value, which in turn resulted in inventor firms obtaining less investment. This led to a counter-intuitive effect, whereby firms choose to commit themselves even more: in the face of uncertainty related to pendency times as well as the perception of decreased quality due to examiner work overloads, they file more patent applications in the hope that they can both increase their IP capital and gain protection by obtaining a critical mass of weaker patents (Hargreaves, 2011). Some experts claimed that tax issues may also contribute to this phenomenon.

Quality
The previous workshop defined patent quality as “the degree to which a patent satisfies the statutory patentability requirements, leaves little doubt as to its breadth, and discloses information that enables a person skilled in the art to implement the protected invention” (European Patent Office, 2012a, p. 8). Relatedly, Wagner (2009) refers to patent quality as “the capacity of a granted patent to meet (or exceed) the statutory standards of patentability—most importantly, to be novel, non-obvious, and clearly and sufficiently described” (Wagner, p. 2138).4

Related to the above, quality is thought to be a function of demand and patent office supply. According to a study conducted by Quillen, Webster and Eichmann (2003), the EPO and JPO issuance rates tend to be in the 60-80% range, whereas the USPTO grants 95-97% of all patent applications. Jensen and Webster (2004) argue that this sets a dangerous precedent, as the USPTO is probably issuing a number of bad patents that do not represent true innovation, and that “a less rigorous examination is cheap to administer, but induces uncertainty regarding the patent’s validity and thus diminishes the power of patents to prevent imitation” (p. 420). Given a fixed set of resources, there might be a trade-off between lower pendency and higher quality, as more thorough examinations probably take more time. According to the participants, having many lower quality patents issued raises uncertainty and increases the probability that patents may be granted with overlapping claims, thus resulting in thickets.

Lack of transparency in ownership
In general, several participants and a few of the presenters brought up the issue that when intellectual property changes hands, there is often no record of the transaction. Patent aggregators function as a form of registry for patents, thus allowing some accountability; however, this also provides an element of anonymity in that a patent or a group of patents identified with a specific company can signal a technology development vector, whereas the same group of patents as part of an amalgam of disparate technologies under the umbrella of an aggregator organisation dilutes or completely misdirects the signalling that some believe is inherent in the public mandate of the patent mechanism (Scotchmer, 1996). Yet some observers view patent aggregators more as a solution to the thickets issue than as a problem, as aggregators can create pools. However, the experts agreed that aggregators’ practices are not transparent and there is often secrecy as to who owns what, which technologies they have acquired, etc.

Lack of transparency can create uncertainty over who is in the market, what their intentions are, whether a certain player is trying to create a patent fence, and whether property is already licensed. Thus lack of transparency leads potentially to more infringements, higher transaction costs, and higher costs for dispute resolution. An expert indicated that thickets mostly occur in technology areas with significant market potential. These encourage many companies to start R&D work, and due to this substantial R&D investment we generally see a rapid development of the technologies concerned. Many patents are filed on the basis of that R&D investment, and this leads to areas with a high density of patents and patent applications, i.e. to patent thickets. For companies wanting to participate in the markets for such technologies, it takes more effort than in less dense patent areas to navigate through these thickets and determine which licence arrangements they need for the products or services they want to market. But these patent fields must be navigated whatever their density, and in semiconductors, telecoms, optical storage and biotechnology, for example, patent thickets seem not to have widely hampered the rapid development of the

4 For more details on patent quality, its measurement, and suggestions for improvement, see the EPO (2012a) report on patent quality: http://www.epo.org/about-us/office/esab/workshops.html
market for these technologies or prevented new firms from entering the market. A separate navigation issue is patent quality and long pendencies, but that potential problem is the same for any patent area, whether a thicket or not.

3.2 Search costs

In general, lack of awareness of prior art on the part of applicants leads to weaker applications and possibly overlapping claims. Likewise, on the patent office side, higher search costs may in fact lead to agreeing to patents that should not be granted, or to granting broader patents when a narrower version would have been appropriate. The result of this process is, of course, multiple overlapping claims held by different parties, thus increasing uncertainty about freedom to operate, as well as raising costs for contesting the patents, litigation, and transaction costs in the form of licence negotiations. In fact, some participants claimed that in a challenge (opposition proceedings) or litigation, the parties seem to uncover much more documentation on prior art than that found by the patent office examiners (cf. Lemley, 2001). Participants acknowledged that in fast-moving technologies it may be difficult for patent offices to recruit examiners skilled enough to make informed judgments, while product information (especially that included in non-patent literature) is also difficult for examiners to access.

3.3 Cost of legal action

Businesses today often include contingency for litigation in their strategic IP plan. Patent litigation is not just a common occurrence; it is such a likely occurrence in the American context that the US government found it necessary to establish a special court of appeals in the hope of streamlining the process and clearing the docket more quickly. The experts fairly broadly agreed that the phenomenon of patent thickets has always existed but what has changed is the tendency to litigate. Different elements have led to this change in litigation behaviour. For instance, (1) IT industry business models have changed, (2) there is less trust (confidence) in the validity of each patent and in the system in general, and (3) companies take a gamble that the litigation costs will be less than the royalties if they win. There was the general observation from the experts that litigation is not a minor issue; it is costly and disruptive to business.

4. Measures proposed and their ramifications

In the breakout sessions of the workshop, the participants were asked to brainstorm about measures that might help reduce the impact of patent thickets. In this section, we review the suggestions developed in the sessions, organised into six categories. The six categories are not mutually exclusive, but are distinct and reinforce each other. They are (1) improvements in the granting process; (2) improvements in dispute resolution; (3) improvements in standards IP management; (4) improvements in transparency; (5) market-based incentives; and (6) compulsory licensing.

4.1 Improvements to the granting process

Experts came up with a number of suggestions on how the granting process might be improved, which would simultaneously reduce uncertainty, raise quality, lower costs, and reduce the chances of thickets forming. These concerned (1) pricing, (2) speed, (3) quality, (4) office management, and (5) jurisdiction.

Pricing changes

Pricing has often been thought of as something related to the costs of the services that the patent office provides. However, there was agreement among participants that pricing could move beyond mere cost-covering aspects to those more about providing incentives to behaviours that the patent office would like to encourage in the public interest. Thus fees should not be seen only as a way of funding an office, but also as a way of steering patent applicant behaviour, setting high quality standards, and reducing the numbers of patents (European Patent Office, 2012b).

Several participants felt that to prevent too many patents from entering the system, there should be a price system to reduce the number of low-quality applications. Patent procedural fees have been seen as an effective policy tool to increase patent quality. Other suggestions in the same vein included paying higher fees to receive a speedier decision.

Many participants recognised that there is a wide public perception that the more patents one owns, the better. Patents are also often thought of as good measures for innovation (even though it is recognised
that patents really measure more input than output performance). The overall feeling in the workshops was that there has been an attempt in the EU to make patents cheaper, including the new unitary patent. However, the experts questioned the need to have lower fees. Fees, including initial filing fees, possibly grant fees, and renewal fees could be adjusted accordingly. For example, setting a higher price may reduce strategic behaviour. The participants also wanted to explore whether incentives are correctly aligned if only granted patents generate fees. Several experts mentioned the possibility of charging a high “renewal fee” already after three years, which some felt could be an effective way of finding out whether a patent is truly valuable. Such a system would allow more patents to expire, potentially reducing competing claims and reducing complexity.

**Speed**

Speed is an important factor for some innovative high-tech industries, but there is a mismatch between the (high) speed at which especially cumulative innovations are created and the relatively (low) reaction speeds of the regulatory authorities and the courts. Here the experts felt that action may be needed to bridge the gap. Some preliminary ideas revolved around the possibility of a time limit for granting a patent. Or, more obviously, increasing resources to ensure that the offices have the capacity to handle patents in a more expeditious fashion.

**Quality**

Improvements in patent quality are also thought to reduce the incidence of thickets via lower chances of multiple conflicting claims granted to different parties. Higher-quality patents mean that the boundary of each piece of intellectual property is better defined and less likely to conflict with others. Thus this part of the discussion focused on improvements in examination and limiting patent scope. Though patent quality was extensively discussed in the first workshop, the group in the final plenary felt strongly that the boundaries of intellectual property are not changing as rapidly as the current quality standards grant. The average quality of patents granted is still lower, and the more likely that future patents will be valuable.

**Management of the patent office**

As mentioned above, even within patent offices pressures may exist to favour patent granting at the cost of patent quality. In patent offices financed by fees on granted patents, rejected patents represent lost revenue. Examiners in some offices must also explain rejection, but not grant, so that it involves more work. In the US, for instance, due to appeals, examiners can only definitively get a patent application off their desk by granting it, so they seek to restrict bad applications to as few valid claims as possible, instead of rejecting (Lemley, 2001). Thus some experts proposed that streamlining the incentive structure for patent examiners across patent offices, as has already happened at the EPO, might lead to higher-quality patents.

**Jurisdiction**

The unitary patent and the Unified Patent Court could in the future provide a possible solution by eliminating “forum shopping” and by having one decision across the region and thus increasing certainty. In particular, the Unified Patent Court should provide a further post-grant quality assessment of patents. See the next section for more ideas on dispute resolution.

### 4.2 Improvements in dispute resolution

The experts had several suggestions regarding dispute resolution. While some of these are not in the purview of the patent office(s), they were deemed important as a basis of discussion. Dispute resolution is related to patent thickets in that multiple overlapping claims by different parties inevitably lead to challenges or litigation, which increases uncertainty and costs. Thus if there were ways to improve dispute resolution, it would lead to quicker and fairer decisions, which simultaneously reduce uncertainty and costs. Dispute resolution falls into three main categories: opposition challenges undertaken just after examination; litigation for infringement and validity; and alternative dispute resolution mechanisms.

**Improving oppositions**

Given the increased workload patent examiners face, they have precious little time to spend researching prior art. Some companies rely on this fact in the hope of getting obscure prior art “grandfathered” into a patent by including it in claims and aiming to get it past the examiner. In its increasing efforts to improve its patent system, the US has adopted something very similar to the EPO opposition process in which challenges to the technical validity of patents are handled administratively by the patent office and not through judicial channels.

The experts argued that better opposition processes to combat unjustified patents should be considered. The current opposition system was considered slow and therefore less attractive. The participants had
several ideas for improving challenges, starting obviously with the resources necessary for the EPO to handle opposition cases more quickly, thus reducing the time between the initial challenge and the final decision. There was also the question of the deadline for making a challenge. The experts debated whether the nine-month window was adequate as a deadline for opposition, with some arguing that the deadline should be shorter to resolve the uncertainty quicker, but others arguing that SMEs might find it difficult to meet the nine-month deadline. The consensus seemed to be that important patents will be challenged by interested parties and that extending the deadline beyond nine months would hinder more than help, whereas shortening it (say three to six months) should help more than hinder. Australia, for example, allows only three months to oppose a patent on substantive grounds. Other ideas involved, for example, reducing the time frames of each step of the opposition process, e.g. initial statements, documentation of evidence of procedural or substantive challenges, etc. Shorter deadlines will focus the attention of opponents and resolve the uncertainty sooner. Finally, there were some suggestions revolving around giving national IP offices the chance to challenge EPO patents during the initial window by sharing grant information and encouraging them to be vigilant.

Better litigation systems
Of course, litigation cases can be reduced simply by improving patent quality and other aspects of the granting process, as discussed above. However, once a patent has been granted and the opposition window has expired, there may be court challenges in at least two different areas. First, the holder of the patent may sue others for infringement and/or extract royalties if the infringer refuses to negotiate a licence. Second, opponents may challenge the patent’s validity in a court.

The experts had several ideas to improve these processes, starting with bifurcation measures. Bifurcation refers to general rules that hold that infringement lawsuits must be treated separately from lawsuits challenging validity. One of the results of bifurcation is that weak patents (low-quality patents that will eventually be revoked) can still lead to separate infringement lawsuits by their owners. As infringement lawsuits often proceed more quickly than invalidation lawsuits, holders of low-quality patents could seek injunctions against perceived infringers to extract royalty payments from them. In some extreme cases (very weak patents), infringement lawsuits may put the action on hold while waiting for the other court to rule on validity, but this is not the norm.

Obviously, court cases on infringement cannot be held up indefinitely while waiting for validity to be tested. On the other hand, it seemed to the participants that validity testing was taking too long, allowing some aggressive companies holding low-quality patents to quickly sue and possibly settle before their patents were revoked. There were suggestions about waiting some minimum time to test validity rather than having the court cases run completely in parallel. A consensus did emerge, however, on the desirability of specialised, speedy courts to handle patent validity. It was proposed that a potential example existed in Austria, which has a Nullity Department of the Austrian Patent Office and, for appeals, a Supreme Patent and Trademark Senate, which is a special court established within the Supreme Court. Such courts would employ technical experts knowledgeable in the technological areas under review and familiar with antitrust and other pertinent legal matters.

Other ideas included holding infringement royalties in “escrow” or other ways of reclaiming royalties paid on invalid patents. These were considered intriguing but perhaps slightly impractical, as firms could set up companies with the sole purpose of holding IP and passing it on to the parent corporation prior to validity testing in the courts. There were other more “out of the box” suggestions as well, including the possibility of cross-border injunctions, and even cross-Atlantic juries from the US and EU and specialised in IP.

Non-practising entities and litigation
The increasing number of patents and their growing economic importance around the globe has led companies from other sectors, such as the finance industry, to develop new business strategies for the use of patents. In recent years, thousand of patents have changed hands as companies have sold their assets to those in a better position to exploit them, the "non-practising entities" (NPEs), better known as patent trolls. NPEs can facilitate value extraction from patents, enabling market transfer and reducing transaction costs. However, in some cases, NPEs may also collect a divergent patent portfolio, not to license or develop products but rather to attack entrepreneurs who use these ideas, with the sole intent of suing them and profiting from the damages awarded. In this scenario NPEs represent a form of patent thicket, raising transaction costs or blocking the market entry of companies. To reduce the potential harm of NPEs in Europe, different actions would be needed such as reducing litigation costs,
faster resolution of validity proceedings and a cautious approach to the use of injunctions (Hall et al., 2012). The creation of the Unified Patent Court might lead in this direction, reducing the negative effects created by this form of patent thicket.

**Better alternative dispute resolution mechanisms**

The experts also undertook an examination of arbitration and mediation for potential patent disputes. Larger players are less inclined to favour alternative dispute resolution measures, whereas SMEs might be more interested. However, the experts agreed that secret bilateral settlements would help neither patent quality nor patent thickets, as they would not reduce uncertainty. Thus alternative dispute resolution measures would need to be accompanied by public records of the settlements. While its characteristics and mandate have not yet been established, the Unified Patent Court will also provide a Mediation and Arbitration Centre to solve patent disputes at an early stage.

### 4.3 Improvement in standards

**IP management**

As discussed above, standards in complex technologies are fraught with potential IP disputes, as contributors to the standard have different objectives and interests. Many of the problems revolve around membership in patent pools that can be created in order for the standard to be adopted by the standard-setters or third parties. Some of the patents are deemed “essential” to the operation of the standard and what creates complexity in IP management for standards is when one of the owners of the essential patents attempts to parlay the critical nature of their patent into higher and possibly “unreasonable” royalty revenues. This is obviously related to thickets because for a third party to become compliant with the standard may require navigating a complex and dense arrangement of claims, and the royalty stacking for compliance may cost more than the projected revenues from supporting the standard. Thus the experts at the workshop suggested some ideas for dealing with IP management in the standards context. These ideas fell into two areas: (1) enforcing FRAND; and (2) managing patent pools, especially for standards-essential patents.

**Enforcing FRAND**

Standard-setting organisations normally require contributors to agree to license on fair, reasonable and non-discriminatory (FRAND) terms as a means of preventing excessive rent-seeking, hold-ups, or anti-competitive practices from those members who hold IP elements of the standard (Mariniello, 2011). Unless a patent pool has been set up around the standard, there is no statutory requirement that companies license under FRAND terms; failure to uphold FRAND agreements is subject to contract litigation and competition scrutiny.

Contributors to a standard could however exhibit conflicting interests: whereas they would prefer to be offered fair, reasonable, and non-discriminatory terms on licences to ensure compliance with the standard, they would nevertheless choose for themselves to maintain flexibility and not offer such terms for their piece of the standard. Many of the experts came up with suggestions to avoid such hold-up situations, which are not in the public interest.

Some solutions require SEPs to be licensed on FRAND terms (see more below, though this was thought to be impractical), or giving contributors incentives to offer FRAND terms. For example, one group suggested that parties that commit to FRAND and have SEPs could enjoy some extra protection, or quicker decisions, or other benefits. However, if this were the case there would need to be steep penalties or claw-back provisions for those parties that back out of FRAND terms later on. Another proposal was to bundle the information from the standardisation body (group) and the patent office, which might create more transparency. In such a scenario, only patents declared essential would be part of the information bundle, while non-essential patents would be excluded. Such an approach might also be useful when searching to see what IP is necessary for a product to comply with multiple standards. However, one should bear in mind that non-SEPs with commercial value - not constrained by FRAND terms - can also be effective in creating hold-ups and raising costs for new entrants.

---

1 Royalty stacking is the process of aggregating all the royalties that must be paid to all parties when an invention builds upon or infringes multiple intellectual property claims. The disadvantage of this is that the upstream demands for royalties by the patent holders, while individually relatively small, as a cumulative amount can be prohibitive to the extent that downstream producers are unable to support the product upon which the technology is based.

2 The European Commission has also launched an investigation into Motorola’s handling of FRAND agreements, suspecting that its activities are anti-competitive. http://www.patentlyo.com/patent/2012/04/the-frand-wars-whos-on-first.html, viewed November 2012.
Improving patent pools

Patent pools result from the collaborative pooling of the patents necessary to build or operate a complex product. The common circumstance necessitating a patent pool is where multiple companies own or control distinct patents that, as a whole, define or enable a product, and the patents are therefore pooled and licensed as a bundled good. This enables widespread technologies such as mobile telephones to operate in a common fashion and may become the basis of an established standard, or a pool may be generated at the insistence of a standards authority. One of the first known patent pools was formed in the early 20th century so that competing companies owning patents essential to the manufacture of aircraft could freely operate in an open and competitive market (Shapiro, 2001).

Because patent pools represent an efficient means by which technology firms can obtain a bundle of licences essential to the foundation of a product, they are more likely to have confidence in the product and, instead of focusing their attention on inventing around certain technologies, they can devote their resources to creating new innovations, thus raising the level of the market. However, depending on the legislation, patent pools may be limited only to those patents essential to the technology, specifically patents that are complementary and would otherwise block each other, and should not include patents that are ancillary or easily invented-around (Van Overwalle, 2010). If pools become too bloated with superfluous patents, they then act like thickets, and take on an anti-competitive role (Lerner et al., 2007; Lerner & Tirole, 2002).

The alternative to a patent pool is the distinct licensing of each technology related to a product. This introduces inefficiencies for both parties, as each negotiation may be influenced by factors unrelated to the technologies themselves, as well as uncertainty as to the final outcome and the related costs (Aoki & Schiff, 2008). This creates a tremendous amount of uncertainty in the licensing process and the markets for technology (Arora, Fosfuri, & Gambardella, 2001).

Participants agreed that companies prefer patent pools in important areas because: (1) unlike individually negotiated licensing agreements, which can take too long, they reduce transaction costs; (2) they are independently scrutinised by teams to check whether they comply with the standards; (3) they provide a level playing field where all members fall under the same rules, rather than having to face a range of different royalties that apply in different countries; and (4) in certain ways, they can tackle the problem of divisional applications. Regarding point (4), if one party attempts to acquire a bigger share in the pool by simply filing more divisional applications, this could be thwarted for example by a regulatory mechanism that counts all divisional applications as only one application. However, the risk of fragmentation would still exist, especially in the ICT sectors. One idea was to create stronger fiscal incentives to join patent pools, and remain in them.

Another was to create a separate organisation that owns the SEPs and transfer ownership of such patents to the pool rather than simply granting licences to the pool. Such a move would prevent opportunistic behaviour by the owners of the essential patent.

Another idea that was floated as a potential way to alleviate such uncertainties in the licensing process is the implementation of IP clearing houses. For example, the Society of European Stage Authors & Composers (SESAC), and Broadcast Music, Inc. (BMI), are two clearing houses that represent the interests of those who hold copyright, usually to musical performances and broadcasts. Currently, there are a limited number of clearing houses in the patent field. Those that do exist are primarily concerned with the biological sciences and areas such as genetic testing and agriculture, but they show promise of reducing uncertainty, litigation and costs (Van Overwalle, 2012; van Zimmeren, Vanneste, Matthijs, Vanhaverbeke & Van Overwalle, 2011).

4.4 Transparency

Several measures could be implemented in order to improve transparency. First and foremost is the issue of requiring patent holders to properly declare their ownership. Consistent with Bessen & Meurer (2008a), several experts suggested that intellectual property should be treated more like other forms of property, including having a registry requirement. One advantage of treating IP like physical property would be the ability to attach encumbrances to it. Previous discussions about FRAND agreements note that they are subject to the firm that owns the essential patent continuing to honour the agreement. If instead such a FRAND commitment were to be registered to the patent itself then this would have the same effect as a deed restriction on a physical plot of land, thus providing greater transparency and consistency in standards-essential patent licensing.

Such an arrangement, according to some participants, would inherently require closer communication
between national and international patent offices and standards-setting organisations, as mentioned above. This may help to solidify practices around standards setting, and to encourage faster processing and a preferential fee structure for patents declared standards-essential in exchange. This would, of course, blur the lines between private and NGO standards organisations and governmental patent organisations, and may raise issues related to allowing market forces to dictate the optimal standards.

Although it is possible to ascertain the renewal status of a patent, in certain countries it is not immediately clear whether a patent is in effect. The potential exists for unscrupulous owners of IP to pursue claims against potential infringers for patents that are no longer in effect. Although a careful review of such claims would reveal the invalid nature of the patent, some experts felt that more effective reporting at national level of the active status of patents would increase transparency in this issue.

4.5 Market-based solutions

Workshop participants explored some ideas relating to market-based measures to reduce complexity and costs, raise quality, and therefore reduce the possibility of patent thickets. Most of these market-based measures were concerned with giving incentives to various parties to change their behaviour or help them with certain situations. The experts discussed three areas in particular: (1) better initial applications; (2) reducing claims; and (3) helping SMEs.

Scope and incentives for better initial applications

The ideas proposed concerned improving the quality of incoming applications. There could be different fees or rewards to encourage applicants to draft better applications. For example, there could be higher fees for filing, with rebates given for successful grant. Or reduce the (large, as proposed above) renewal fee after three years for parties demonstrating a high-quality patent. Another idea was to give companies an incentive to ask for accelerated procedures and offer a fee reduction afterwards in case of proven high quality. In general, most experts thought that an increase in examination fees, better-quality searches and lower initial renewal fees for high-quality patents could be an interesting combination and might convince applicants to reduce the number of especially low-quality applications, reducing “noise” in the system and thus the incidence of patent thickets.

Incentives for applicants not to claim things they have not invented

One element of the higher-quality applications envisaged above has to do with clearer, more focused and fewer claims. The experts also considered incentives to draft clearer claims. Applicants often “reach” for broader claims. This increases uncertainty, costs (dispute resolution), and also the possibility of thickets. Many of the ideas suggested for improving application quality above also help with reducing and focusing claims; for example, fee management (higher initial fees for examination), rewards for higher-quality patents, and fees for faster examination offset by lower renewal fees. In addition, some of the ideas about claim transparency were also discussed in relation to reducing the number and scope of claims in applications.

Helping SMEs

Some of the experts felt that SMEs were unduly burdened by the current situation. Other participants felt that rather than trying to impose changes on the entire current system, another option might be to simply give some kind of support (information, legal advice, monetary subsidies, or legal representation) directly to SMEs to help them navigate the current IP system. This could be an interesting idea if there were a way to distinguish true SMEs from small companies set up to transfer IP to large corporations once it has been granted or tested.

\footnote{See Footnote 6.}
5. Conclusion

The final plenary session was designed to reach conclusions about patent thickets. There was extensive debate about whether patent thickets are a problem per se, and the experts could not agree on that issue. Generally speaking, industry-based experts were less concerned about patent thickets as an insurmountable problem than experts from other organisations. However, everyone was able to agree that managing patent thickets appears to be part of a broader discussion about managing innovation and complexity, and that successful firms need to develop multi-dimensional strategies to cope with complexity. All breakout groups independently and in plenary agreed that patent thickets are a natural outcome (or symptom) of the other aspects of the current system and that there is no way to reduce the incidence of patent thickets in a vacuum.

It was suggested that there is no “patent thicket” problem as such. Thickets mostly occur in technological areas with significant market potential. Many patents are filed on the basis of substantial R&D investment, and this leads to areas with a high density of patents and patent applications. But these patent fields must be navigated whatever their density. Problems are caused by low-quality patents, and the slowness and cost of the system. Therefore, patent thickets may not be a problem per se. There is however a general consensus that they appear to be closely related to innovation management and its complexity.

The issue, which was discussed extensively in the final plenary, is that treating patent thickets as root causes to be minimised directly might have negative consequences for some stakeholders while benefiting others, whereas treating some of the root causes of patent thickets may benefit almost all stakeholders.

Table 1 summarises the costs discussed and their impact on various stakeholders. For example, it was clear that large firms in both discrete and—surprisingly—complex technology sectors have little trouble managing the complexity of the current situation. On the other hand, several groups acknowledged that dealing with the legal system may be too difficult for SMEs and individual inventors. The high cost of the IP-related legal system for new entrants has been borne out in recent research.

To conclude and summarise, the issues about the various stakeholders and how they are affected by different types of complexity are described in more detail in Table 1. In Table 1, we have down the left column the types of “cost of complexity” and across the top we have the various stakeholders. As we can see from the table (and as was clear in the final plenary), large incumbents in sectors of all types (ICT

<table>
<thead>
<tr>
<th>Type of “cost of complexity”</th>
<th>Large incumbents, ICT + complex sectors</th>
<th>Small innovators, ICT + complex sectors</th>
<th>Small and independent, lower complexity</th>
<th>Pharma and lower-complexity sector patenters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncertainty over “freedom to operate”</td>
<td>Able to react</td>
<td>Can get it wrong</td>
<td>Able to react</td>
<td>Able to react</td>
</tr>
<tr>
<td>(Lack of transparency)</td>
<td>Can be held up</td>
<td>Could be serious</td>
<td>[not discussed]</td>
<td>Not a serious issue</td>
</tr>
<tr>
<td>Search costs for innovation</td>
<td>Able to absorb</td>
<td>Can impose cost, difficult to absorb</td>
<td>Able to absorb</td>
<td>Able to absorb</td>
</tr>
<tr>
<td>Cost of legal action</td>
<td>Able to absorb</td>
<td>Can bankrupt</td>
<td>Can破产</td>
<td>Able to absorb</td>
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</table>

Thanks are due to Tony Clayton who suggested this approach.
+ complex sectors in column 2 and pharmaceuticals + discrete sectors in column 5) can pretty much surmount all the current costs of complexity, whereas small producers and independent inventors in ICT and complex sectors might find the various costs problematic. SMEs and independents in discrete technology sectors share some of the problems (e.g. litigation costs) but in general are not as concerned with freedom to operate.

In the final summary Table 2, we examine the proposed remedies as discussed above, and which costs they presumably attack. In Table 2, we have down the first column the potential improvements suggested in the workshop. Across the top, we have the various costs of complexity. Each cell in the table represents a remedy that could potentially have an impact on each cost. It is clear from Table 2 that improving the granting process can lead to a reduction in multiple costs. For example, by improving the quality of granted patents, the number of claims will be reduced, thus leading to more certainty about freedom to operate and, later down the road, to lower litigation costs as there will be less litigation for infringement and validity. In addition, more higher-quality grants would reduce the search costs of innovation for all parties. Likewise, improving standards processes would greatly reduce costs in all four categories (for complex technology sectors). Streamlined licensing means it would be easier to comply with the standard, thus increasing certainty of freedom to operate.

FRAND terms with fewer parties backing out would reduce the cost of litigation, and having owners of IP in SEPs commit to FRAND despite future ownership changes would also increase transparency. Lastly, if SEPs were bound together the search costs of innovation would again be reduced. Similar logic can also be applied to understanding and improving dispute resolution processes, having an IP registry, and compulsory licensing.

<table>
<thead>
<tr>
<th>Potential improvement</th>
<th>Uncertainty over “freedom to operate”</th>
<th>Cost of legal action</th>
<th>Lack of transparency in ownership</th>
<th>Search costs for innovation</th>
</tr>
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<tbody>
<tr>
<td>Granting process (pricing, quality, etc.)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Dispute resolution (specialised court, better opposition)</td>
<td>✓</td>
<td>✓</td>
<td></td>
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<tr>
<td>Standards (streamlined licensing)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Transparency (registry)</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Market-based solutions (encouraging better applications; patent pools)</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
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<tr>
<td>Compulsory licensing</td>
<td>✓</td>
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Thus, the approach envisioned at the end of the workshop was focused on the management of complexity in the innovation process. Using such a method as outlined above may enable policymakers and other stakeholders to prioritise and take appropriate action to treat the underlying causes of patent thickets, thus, it is hoped, reducing the cost of innovation complexity and increasing returns for inventions on their merits. Further cross-industry research is needed in order to measure and allocate patent thickets (including both granted patents and pending applications).
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Annex 1

Figures

Figure 1: Total patent filings per year worldwide
(Source: WIPO Statistics Database, October 2012)

Figure 2: Patents granted worldwide in selected industries
(Source: WIPO Statistics Database, October 2012)
**Figure 3:** Triples in discrete and complex technology sectors at the EPO, 1980-2003 (von Graevenitz et al., 2011) (The drop in triples in 2004 was due to grant lags at the EPO (Harhoff et al., 2006))
**Annex 2**

**List of participants at the EPO Economic and Scientific Advisory Board’s Workshop on Patent Thickets**

**Date:** 26 September 2012  
**Venue:** Salons Georges, Leuven (Belgium)

<table>
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<tr>
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Observers from the EPO
Fabio Domanico, Margot Fröhlinger, Stephen Hey, George Lazaridis, Ciarán McGinley, Minna Nikolova-Kress, Giovanna Oddo, Yasmin Siedsma, Karin Terzić

Acknowledgements
The European Patent Office and the Economic and Scientific Advisory Board would like to thank the presenters, the facilitators of the work groups, as well as the chairs (in alphabetical order):
Carine Crepin, Giustino de Sanctis, Bronwyn Hall, Robin Jacob, N. Ayşe Odman Boztosun, Ruud Peters, Mariagrazia Squicciarini, Geertrui Van Overwalle, Dirk Weiler, Rosemarie Ziedonis.
The European Patent Office and the Economic and Scientific Advisory Board would also like to thank all those who participated in the workshop (see Annex 2) for the fruitful discussions and their valuable contributions.
Annex 3

Programme of the ESAB workshop on Patent Thickets

08.45  
**Opening and welcome address**
Nikolaus Thumm, EPO Chief Economist, Secretary-General of the ESAB  
Dietmar Harhoff, LMU Munich, ESAB Chairman

09.00  
**Plenary 1**
*Chair: Ruud Peters, Philips Intellectual Property and Standards*

The role of patent thickets in different industries  
Stakeholder perspectives

**Academia**  
Rosemarie Ziedonis, University of Oregon  
**Experiences of the courts**  
Sir Robin Jacob, University College London  
**Information and communication technologies**  
Dirk Weiler, ETSI and Nokia Siemens Networks  
**Life sciences**  
Karine Crepin, Sanofi-Aventis  
**Patent practitioner**  
Giustino de Sanctis, Sisvel International SA

10.30  
Coffee break

11.00  
**Group work**

What are the problems? How can patent thickets be described by type, dimension and industry? What is the specific role of standards for the development of patent thickets? Where and under what conditions does royalty stacking occur? Does the dimension of the problem require specific remedies?

*Chair of group 1: Mariagrazia Squicciarini, OECD*  
*Chair of group 2: Sir Robin Jacob, University College London*  
*Chair of group 3: N. Ayşe Odman Boztosun, Akdeniz University*  
*Chair of group 4: Bronwyn Hall, UC Berkeley*

12.00  
**Plenary 2**
*Chair: Dietmar Harhoff, LMU*

Presentation and discussion of group work findings

13.00  
Lunch break
14.00    Group work

What are the possible solutions? Are specific policy interventions required
or are market-based tools better suited to address the problem?
What is the specific role of patent pools and compulsory licensing?

Group chairs as above

15.00    Coffee break and group photo

15.30    Plenary 3
Chair: Geertrui Van Overwalle, University of Leuven

Presentation and discussion of group findings
Recommendations for best practice in dealing with patent thickets.
What are the unresolved issues, challenges and areas for further research?

17.00    Closing remarks
Dietmar Harhoff, LMU Munich
Nikolaus Thumm, EPO

End of workshop

17.15    ESAB meeting (ESAB members only)

Next steps
End: 18.15

20.00    Dinner at Restaurant d’Artagnan
Naamsestraat 72
3000 LEUVEN