Study on the quality of the patent system in Europe

PATQUAL

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This document does not represent the point of view of the European Commission. The interpretations and opinions contained in it are solely those of the authors.

Definitions and abbreviations:

ARIPO	African Regional Intellectual Property Organisation
DKPTO	Danish Patent and Trademark Office
DPMA	German Patent and Trademark Office
ECLA	European Patent Classification
EESR	Extended European Search Report
EPC	European Patent Convention
EPN	European Patent Network
EPO	European Patent Office
EQMS	European Quality Management System
EQS	European Quality System
ESOP	European Search Opinion
EU	European Union
HPO	Hungarian Patent Office
INPI	Portuguese Institute of Industrial Property
IPC	International Patent Classification
IPEA	International Preliminary Examining Authority
ISA	International Search Authority
ISO	International Organisation for Standardisation
JPO	Japan Patent Office
NBPR	National Board of Patents and Registration of Finland
NPO	National Patent Office
OAPI	Organisation Africaine de la Propriété Intellectuelle
PCT	Patent Co-operation Treaty
PPH	Patent Prosecution Highway
PQS	Product Quality Standard
PRV	Swedish Patent and Registration Office
QMS	Quality Management System
SIPO	Slovenian Intellectual Property Office
SIS	Supplementary International Searches
SPTO	Spanish Patent and Trademark Office
UKIPO	UK Intellectual Property Office
UPP	Utilisation Pilot Project
USPTO	United States Patent and Trademark Office
WOISA	Written Opinion of the International Searching Authority

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Executive summary

This study is dedicated to a comprehensive assessment of the quality of the patent system in Europe. An effective system for the protection and enforcement of intellectual property rights represents an essential element for the growth of economies, which are based on the generation and exploitation of new scientific and technological knowledge. The well-known risks of market failures in the private financing of innovation investments call for a continuous effort of policy makers to the improvements of the tools that are expected to guarantee proper private returns from R&D activities while protecting also the interests of consumers and society at large. The increased salience of patents to companies competing in the knowledge economy has raised concerns throughout the world in the past decade about the actual effectiveness of the current patent systems.
The correct functioning of patent systems has been seriously challenged in recent years by different factors, both exogenous and endogenous. Among the exogenous factors, it is worth recalling the emergence of new technological and scientific fields that have posed questions about the extent of patentable subject matter, the increasing complexity of new technologies that makes more difficult and time consuming the assessment of both inventive step and actual scope of each patent, the increased activity in innovation from companies in emerging countries that have started to file an constantly growing number of patent applications with a non trivial impact on the backlogs of the main patent offices worldwide.

We acknowledge the complexity of patent systems, whose functioning is based on the interaction of a wide array of heterogeneous actors (large firms, SMEs, Patent Offices, International Granting Authorities, patent attorneys, local and international legislators, and judiciary systems, among others) that carry specific interests. Hence, the assessment of quality requires the adoption of an analytical framework that encompasses multiple instruments and the need to clearly state the boundaries of the concept of quality that will be investigated. Taking into consideration these important methodological concerns, the quality of the European patent system will be analysed in this study along two complementary perspectives: the first one relates to the quality of the granted patents *per se*, in terms of compliance with their fundamental legal requirements, and the second one relates to the quality of patent by a systemic perspective. The assessment of patent quality at systemic level requires the analysis of additional factors beyond the efficacy of the substantive examination process, like the costs for obtaining, managing and enforcing a patent. Understanding such dual nature of quality is necessary to identify complementarities and synergies generated by prospective policy interventions.

The conclusions provided in this study are strictly evidence-based. Such evidence is also expected to shed light on the expected impact of future prospective reforms of the European patent systems, both at the national and European levels.

For sake of clarity the report is structured in chapters that present the results obtained for the different research activities that have addressed the issue of patent quality along different dimensions and using diverse heuristics. The most important pieces of evidence are then re-organised and put into perspective in the last chapter that is devoted to policy conclusions. Here below we summarise the contents of the activities of the research project and related main findings.

1. Defining patent quality

In the first section of the study we discuss the definition of patent quality according to different perspectives in order to highlight how different subjects may have non homogenous views of

the relative importance of the drivers of patent quality. In this regard, we clarify that we will address the concept of patent quality both by the point of view of legal compliance with statutory requirements and by a systemic point of view.
In the most straightforward way, the concept of patent quality can be defined along two major dimensions: the techno-economic quality created by the patent's underlying invention; and the legal quality created by the patent's reliability as an enforceable property right (Burke and Reitzig, 2007).
Focusing only on the dimension of strict compliance with statutory requirements might lead to a simplification of the overall framework and to underestimation of the potential systemic impacts of low quality patents. Indeed, understanding patent quality requires the acknowledgement of the presence of significant trade-offs within patent systems. A clear example of such trade-offs attains the costs of performing a virtually perfect patent examination with a null error probability by a patent office. Such costs are both monetary, in the form of patent fees, and non-monetary (e.g., longer time required to perform the screening of all prior art).
In this regard, some scholars took a clear position on the cost-quality trade-offs, suggesting how "high" patent quality might be an inefficient goal. It would be more efficient to allow market forces (mostly in the form of patent litigation proceedings) to correct mistakes. The benefit would consist of the fact that only actually valuable patents are challenged in courts. However, such mechanisms seem to be reliable only when the related costs of accessing justice are sufficiently low.
The concept of patent quality, as perceived by the users of the system, needs to be expanded to include additional factors related to costs of patenting, timeliness, and the ease of management of granted rights. From this perspective, for a patent-granting authority the concept of patent quality can be represented as an optimisation process that balances three different dimensions: i) the performance of the product provided to customers; ii) the costs incurred; and iii) the timeliness of the service provided. Only the first of such dimensions is the quality according to the statutory definitions.
Results from the review of recent empirical studies seem to indicate a non negligible risk of actual deterioration of patent quality across different patent systems, as well as the presence of rather frequent cases of incoherence in the assessment of patentability requirements across patent offices and within them. The comparative analyses for different patent systems seem to highlight a relatively better performance of the European patent office. However, the robustness of such results is harmed by the inherent difficulty in measuring patent quality. In most of the cases, studies have relied upon the analysis of patents whose actual quality has been challenged in courts, but there is evidence that only a small minority of disputes over patents go to trial, compared to the number of extrajudicial settlements. Indeed, the evaluation of the efficacy of the examination process at patent offices is a complex task for an external observer, due to the non-negligible level of subjectivity involved in the assessment of the required conditions for patentability of an innovation.
Based on these considerations in the study we have adopted a dual definition of quality in the patent domain: the quality of a granted patent per sè and the quality of the patent system.

2. The survey to the users of the European Patent System

This section of the study presents the results of two surveys that have collected evidence on the current quality of the European patent system from both enterprises and public research organisations (PROs) across European countries. The survey addresses the issue of patent quality from the point of view of the individual patent (focusing on the quality and duration of the examination and related procedures) and from a systemic perspective, extending the analysis to the evaluation of additional factors that might hamper the perceived quality and effectiveness of the patent system. Such factors include the costs for obtaining and maintaining patents, the capability to access justice to properly enforce patents and the implicit costs related to the fragmented structure of the European patent system.
The surveyed companies are located in 20 **countries** out of the 27 EU members. 46% of respondents are SMEs. 38.9% of respondents have more than 100 patents, whereas 33.4% have less than 10.

Among three different **options to assess the quality of a patent** ("optimal balance between scope and legal certainty", "clear disclosure", and "high inventive step"), companies largely

indicated “optimal balance” and “clear disclosure” as the most significant measures of quality, regardless of firm size. Among the options to assess the quality of a patent system (“strong compliance with legal requirements for patentability”, “cost effectiveness” and “timeliness”), large companies definitely consider legal certainty the most important requisite. SMEs, on the contrary, express a preference for cost effectiveness and only secondarily legal security, whereas they are almost unconcerned with timing. This result suggests that the effectiveness of the patent system in terms of procedural features depends to a higher extent on the pecuniary costs incurred for obtaining patents, rather than the speed.

When asked to rank different items to indicate their relative importance for the quality of the patent system, “High legal certainty concerning patentable subject matter” ranked first, both for large companies and SMEs. SMEs, universities and PROs considered **“Minimised fees for obtaining and handling patents” very important**. The results suggest that companies consider a clear and secure definition of the boundaries of patentable subject matter to be extremely relevant for patent quality. This consideration might imply that companies perceive uncertainty on patentable subject matter as a potential driver of low quality patents.

The difficulties and costs for monitoring the market and enforcing granted patents against imitators are considered the most relevant reasons for adopting other measures to protect innovations. Interestingly, such motives have a higher impact than possible uncertainty on the validity on granted patents, stressing once more how effectiveness and quality of the patent system as a whole is influenced by additional factors beyond the goodness of the examination process. This is especially true for SMEs. The cost of patenting, in terms of fees, enforcement or patent attorneys, is indicated by a large share of respondents. Motives related to costs are much more relevant for SMEs than for large companies.

Companies assigned the European patent system the highest overall rating (2.90); the JPO received a positive evaluation too (2.74), whereas the rating averages of KIPO, USPTO and SIPO are below the middle value of 2.5.

The European patent system received a higher rating average from respondents that ranked “Timeliness” as the first or the second most important characteristic for the quality of the pre-grant patent system. This might to some extent reflect an appreciation by patent users of the relatively small backlog of the EPO, as compared to the other POs.

In the survey we investigated in detail the perceived quality of the search and examination process at the EPO. Results reveal that the search report of the EPO patent examiner was considered clear and satisfactory by approximately 80% of the respondents. **78% of the respondents are satisfied by the final EPO patent document in terms of scope**. On average surveyed companies state a positive valuation of the completeness and quality of prior art retrieved by patent examiners at the EPO. The communication with and the provision of guidance from the examiner in drafting and adjusting the contents of the patent are areas that, according to the evaluation of the users, might be improved. Finally, **Only half of the respondents declare that the examination process has been similar and standardised across the different EPO applications**, confirming the presence of significant heterogeneity at the level of the examiner and of management of patent documents inside the EPO. Such evidence stresses the importance of implementing appropriate tools for controlling the patent process and examination activities. Respondents do not have a unanimous perception of an upward or downward trend in the quality of the examination process at the EPO in recent years.

The survey provides interesting evidence on the relevance of patent costs in the European system. In particular, 55% of the sample of companies considers the current structure of fees complex and fragmented. **For 78% of SMEs the amount of fees until the grant of patents represents a significant financial burden.** Results clearly indicate the non-negligible impact of marginal additional validation costs. Maintenance fees for validated patents are a high obstacle for the company in 41% of the cases when considering less than four designated countries. Such percentage increases dramatically to 76% (93% in the case of SMEs) when considering more than four countries. Moreover, **translation costs represent a heavy**

financial burden for 77% of respondents, and there is an unanimous agreement that the EU Patent should provide a significant reduction beyond the current benefits generated by the London Agreement.

The issue of the enforcement of granted patents is recognised as a major problem by respondents. The most relevant typology of infringement for surveyed companies is an infringement from an imitator in Europe, North America or Japan (71%), higher than that from an imitator located in other countries (63%). 96% of respondents agree on the fact that the current fragmentation across different jurisdictions generates excessively high legal costs and excessive uncertainty on the enforceability of patents, eventually harming patenting incentives. **The expected costs of accessing patent courts are so high that they discourage patent owners from filing suits for 87% of surveyed companies**. Furthermore, the risk of diverging outcomes from infringement proceedings at different European national courts has a strong negative impact on the incentives for patenting for more than 80% of respondents. More than two thirds of surveyed companies strongly agree on the fact that the lack of technically trained judges in some European courts is a relevant obstacle to enforceability.

Respondents have also been asked to provide their **expectations from future reforms** of the European patent system. In this respect, nearly all of the surveyed companies agree on the fact that the EU Patent should provide a very high level of legal certainty. Moreover, large relevance is assigned to the cost factor, in terms of a strong reduction of both translation costs and administrative costs related to the validation procedure. Among a set of proposed initiatives, the improvement of the interaction with patent examiners received a nearly unanimous agreement. Respondents seem to suggest that this will significantly speed up the examination process and improve the clarity of granted patents.

3. The analysis of patent oppositon cases

A patent opposition is a peculiar procedure of the EPO that allows third parties to question the actual validity of a granted patent during the first nine months after the grant date. Oppositions are not filed randomly, but they usually involve patents presenting certain characteristics (in terms of strategic value and technological relevance). The observation of the incidence of EPO opposed patents and of the outcomes of the opposition proceedings can provide additional evidence on the quality of the patent examination process. We have carried out an analysis of the trends and characteristics of patent opposition cases in Europe over the time window 2000-2008. On average, about 5% of all granted patents was opposed between 2000-2008. The opposition rate slightly decreases over the years. This trend can be explained in different ways. A first straightforward explanation is that the examination process at the EPO has improved and what we observe is the effect of a “raising the bar” process. Alternatively, the rate of opposition might have decreased because more marginal patents, which are not damaging for competitors and have a lower economic value, have been granted.
Descriptive statistics highlight that while intra-sectoral opposition rates remained rather constant in the considered years, we observe a significant growth in the number of granted patents in the electrical engineering area, which is characterized on average by low opposition rates. This, in turn, has a “positive” impact on aggregated opposition rates (without being related to any change in the examination process).

The data on the outcomes of the opposition procedures seem to suggest that during the observed years there has not been a significant increase in the incidence of opposition cases ending with a revocation or amendment. **Even if for recent years little can be said due to the large number of pending cases, we do not find from our data any robust evidence in favour of an average deterioration of the quality of granted patents.** We carried out a set of econometric analyses to highlight what patent characteristics have an impact on the likelihood of observing an opposition. Controlling for industry and country effects, it emerges that there is a significant relationship between the likelihood for a patent to be opposed and the number of both backward citations to previously granted patents and the number of citations it received from subsequent patents. This evidence confirms results from previous

studies and stresses that **patents with higher economic value are more likely to be opposed**. The probability of facing an opposition is also higher when the opposed patent has a higher number of claims. The probability of facing an opposition is instead inversely correlated to the number of assignees. The presence of a priority from Japan, the U.S. and other non-European countries is inversely related to the probability of receiving an opposition. Hence, **a patent showing a European priority is significantly more subject to being opposed than a patent with a non-European priority**.
In the econometric analysis we also examine the effects of patent characteristics on the outcomes of an opposition, controlling for industry and country effects. Due to the elevated incidence of pending outcomes for oppositions initiated in more recent years, in this case we considered only patents granted during years 2000-2003. Results seem to indicate **a marginal increase in the probability that an opposition ends with a revocation of the patent when the patent has a US initial priority while an opposite effects (but still limited in magnitude) is identified for the presence of Japanese initial priority**. We also tried to assess the presence of factors affecting the duration of the opposition proceedings. After controlling for the time of the filing of an opposition we obtain that the number of claims, the presence of multiple opponents, the number of forward citations are positively correlated to the probability of a case being still pending. Patents belonging to Chemistry and Electrical Engineering fields are more likely to be in pending status than those in Mechanical Engineering. Clearly the duration of the proceedings can be affected by numerous and diverse factors including the characteristics and the amount of new evidence proffered by the parties. In this respect, we stress that **although we have identified some factors that seem to show a positive - but rather weak - correlation to the duration of the opposition proceedings, what really matters is the average non negligible duration of such proceedings that generates a prolonged period of uncertainty for both the patent owner and the other companies**. Any reform and intervention aimed at reducing the average duration of such uncertainty period would have a positive impact on the quality of the system as a whole. The overall evidence collected through the analysis of opposition cases does not allow us to conclude that there has been a significant decrease in the level of quality along the observed years.

4. An analysis of international initiatives for improving patent quality

This section of the study is devoted to a review and discussion of a set of initiatives for patent quality, some of which can serve as a reference for the EU patent system. Such initiatives include codes of conduct for patent applicants, participated models of patent peer review, training of patent examiners and patent prosecution highways. Here below we summarise we summarise the main evidence for just the first two of the above mentioned initiatives.
Public interests require that the applicants disclose information on their inventions under a duty of candour. In common practice, such duty has traditionally been limited to requiring that the applicants provide an exhaustive description of the inventions that would make them replicable to an expert. It does not require that the applicants refrain from retaining information on relevant prior art or omit all potentially relevant information in their possession. Several cases in which patent trolls and clear abuses of the system have occurred in recent years, especially in the USA, have shown that the **applicants in bad faith can take advantage of the mild enforcement of the duty of disclosure**. Advocates in favour of expanding the duty of disclosure have also highlighted the set of problems that arise from the choice of wording and lexicon in patent applications (including the strategic use, or hiding of words). In terms of enforceability, an expansion of the duty of disclosure can be obtained in several ways. First, the obligations to which applicants and/or the patent attorneys are subjected while applying for a patent can be expanded. These obligations, such as, for example, prescribing the description in the patent application of the prior art, the field of art to which the claimed invention pertains, and the problems that the claimed invention helps to solve, can be required in procedural manuals like the **Manual of Patent Examining Procedure and/or in Codes of Conduct. Compliance to these manuals can either be required by law and enforced under the provisions against inequitable conduct, or can be supported by mechanisms that do not impose but rather give advantages to the applicants in exchange of a richer disclosure**. At present, compliance to these practices is not required under penalty of the rejection of the application. Several proposed solutions have been suggested to sustain the use of such codes. For example, a fast examination of

maximum duration of one year can be ensured to those applicants that voluntarily offer an extended disclosure, in exchange for their contribution to an easier examination. Another possibility is to ensure the presumption of validity only to those patent applications that offer extended disclosure, whereas the other patents will only be a registration at a certain date, but the burden to prove their validity will remain upon the assignee. Some proposals go further and suggest forms of sanctions for those that do not comply with the extended disclosure. However, it has to be highlighted that there are also arguments against extending the duty of disclosure. First, many contest that applicants should not be required to produce excess information or bear the burden of proof when this harms or constraints their private rights. Second, more information required is equal to increasing the indirect cost of patenting that the applicant has to bear. This would discourage patenting mostly from individual inventors and from SMEs, whose decisions are typically more cost-sensitive. Third, attorneys and professionals maintain that they can only be required to act in the interest of their customers, whereas it is the NPO's duty to act in the public interest. In terms of users' perspectives, respondents to the PatQual survey to the patent users seem to agree that there should be a strong correspondence between patent quality and disclosure. In particular, 78% of the firm respondents and 76% of the university respondents regarded as very important or important the fact that "a high quality patent has a very clear disclosure of innovative contents".

The second mechanism is generally referred to as the "community patent review", or the "Peer-to-Patent: Community Patent Review". The latter is the name chosen by the most complete and advanced experiment in the matter that has been performed under an agreement between the USPTO and the New York Law School (NYLS). Under this mechanism, the patent office examiner remains ultimately in charge of performing a full examination, but he or she can **benefit from the contribution of external experts**. These are organised in a community of peers and can collectively signal relevant prior art. The suggestions of the community are non-binding and the examiner ultimately retains both control and responsibility for the final assessment. The identification of relevant prior art is made in two basic steps. First, participants post potentially relevant prior art; each item can be discussed, annotated and voted for its relevance to the specific patent application. Ultimately, the ten most voted items are selected and submitted for consideration to the patent examiner. The other items are filtered out and will not be submitted. A first pilot study of Peer-to-Patent Review opened on June 2007. Results appeared to be overall encouraging. Benefits from this type of initiatives include clearly a more complete screening of prior art at little cost fro the patent office and the fact that third parties (and the defendants of the public domain) are enabled to take concrete actions to prevent violations of their rights that occur when a patent is issued by mistake. Several critical issues and several potential disadvantages should nonetheless be considered. Peer-to-Patent: Community Patent Review seems to be effective to the extent that a wide participation of contributors is achieved. **With uneven participation, there are risks that the mechanism would mostly benefit large incumbents that have sufficient resources to monitor new applications and oppose prior art**, rather than SMEs. For example, 32% of the companies that answered the PatQual questionnaire confirmed this fear and this proportion grows to 47% for university Technology Transfer Offices responses and to 51% if we consider only the responses of SMEs. The idea here is that there may be frequent misjudgements in the examiners work, but at least these mistakes should apply randomly to patent applications. Under uneven community participation, the examination can turn out to be more severe in certain technological domains or against certain classes of applicants (individual inventors, SMEs). Many respondents to the questionnaire indicate that they would prefer the patent offices to retain full control on the examination and appreciate their contribution as *super partes* experts specialised in evaluation. Another perceived disadvantage of the Peer-to-Patent: Community Patent Review relates to requiring that the patent applications become freely accessible soon after the filing. It is worth mentioning that official procedures enabling third parties to submit prior art exist already in several patent offices. For example, the European Patent Convention, under Art. 115, enables the following: "In proceedings before the European Patent Office, following the publication of the European patent application, any third party may, in accordance with the Implementing Regulations, present observations concerning the patentability of the invention to which the application or patent relates. That person shall not be a party to the proceedings." the procedure offered by the Art.115 of the EPO appears to be a viable and good alternative to introducing a whole new process systematically implemented for all

patents, like that of the Peer-to-Patent: Community Patent Review pilot. By coupling the two systems, you can combine the community screening with the third party contribution mechanisms and obtain the advantage of a largely participated screening, while saving on management costs, and simply exploiting a procedure already in place and functioning.

5. An overview of initiatives and assessments to improve patent quality in the EU

In this section of the study we undertake an overview of the existing mechanisms that support patent quality enhancement in selected patent offices in Europe. The aim is to gather examples of practices at both the national and international level and assessments thereof. The chapter presents initially a review of academic studies that have analysed specific pro-quality mechanisms. Then it presents a collection of data on the current tools for quality at the European Patent Office and at selected National Patent Offices, with a specific focus on quality management systems. In particular we discuss a set of mechanisms for quality designed by the EPO and selected European patent offices (e.g. raising the bar initiative, utilisation of search work from other patent offices, patent examiners training).
The core part of the chapter is then dedicated to the presentation of results from a **survey among selected patent authorities in Europe**. The survey aimed at identifying both the mechanisms currently adopted by patent offices to ensure high quality and the criticalities encountered. Analysed mechanisms deal with examination process, quality assurance, involvement of third parties, patent procedures, and co-operation among granting offices. Concerning the examination process mechanisms to maintain the skills of patent examiners appear to be the most important ones. **With respect to quality assurance, mechanisms to randomly select patent applications for review of search quality, and to randomly select granted patents for review of quality of examination are regarded as the most effective mechanisms for improving patent quality**. Concerning the perceived effects of patent procedures, the survey results suggest that mechanisms to provide preliminary opinions on patentability to encourage early amendment or withdrawal are frequently perceived to have a positive impact on improving patent quality by patent authorities.

6. Conclusions

Over the past decade, the growth in the number of patent applications filed in Europe and other major economies has exceeded economic indicators such as the rise in GDP or proportionate increase in spending on R&D. Current trends reveal an increase in the length of patent applications as well, both in terms of pages of description and the number of claims defining the scope of the invention. Scientific advances have resulted in greater demand for applications in high technology fields such as biotechnology and computing, where there is particular public interest on what inventions should be patented. Furthermore, the increased innovation activity of companies in emerging countries indicates that these entities have started to file an constantly growing number of patent applications with a non trivial impact on the main patent offices worldwide. These events have put an increasing pressure on the world's leading patent offices that face growing backlogs of unexamined patent applications.
There is no single definition of patent quality. For granted patents, quality can be considered from the viewpoint of the patented invention meeting all the statutory requirements as interpreted by case law from the courts. The legal perspective of patent quality therefore deals with whether the conditions for an invention to be patented are fulfilled, principally, novelty, inventive step, not relating as such to an excluded area (e.g. methods of doing business), and sufficiency of disclosure. However, taking a broader perspective and looking at the quality of the system as a whole, it is relevant to consider how the quality of patents is contributing to the intended purpose of patents to encourage innovation and the diffusion of technology. At this point, additional factors, including the costs for obtaining, managing and enforcing patents become relevant.
The empirical evidence in this study (provided by the exercises conducted through the users' survey, patent opposition statistics, office mechanisms survey and interviews) confirm that, **when patent quality is analysed from the perspective of a "single patent", Europe shows better results in comparison to other areas, especially when considering the search and substantive examination at the EPO. At the same time the current administrative configuration of the European patent system shows significant**

criticalities mostly related to the costs that patent owners incur for the validation, translation, and enforcement. Such costs are to a large extent linked to the fragmented nature of the system.
The European Patent System is complex and the views of the patent stakeholders collected in this study from the companies, universities as well as patent authorities represent vested interests. Policy recommendations addressing the dual nature of quality need to take into account how regimes are reformed or constructed.
A radical reform by means of EU patent and European patent court represents a challenge. Incremental reforms that address specific issues related to patent quality are nevertheless still viable.
Based on the evidence collected in this study, the discussion on potential reforms can be organised along the following dimensions: i) improvements in the patent examination process; ii) reductions of the barriers to patenting; iii) improvements in the patent enforcement.

Concerning the improvements in the patent examination process, we stress that the quality of granted patents builds upon a double process of patent drafting on the side of applicants and patent examination on the side of patent offices. Such double process can be positively influenced along a number of measures:

1. develop projects aiming at improving the access by users to the sources of technical and scientific knowledge required identifying relevant prior-art. the final quality of granted patents is significantly affected by the quality of the original application. In this perspective, the availability for companies of more effective tools to retrieve relevant prior art (jointly with machine translation of extant patent documents) can have a positive impact on the input side, e.g. better drafted applications.
2. allow a more effective and rapid communication between patent examiners and applicants during the search and examination process.
3. set-up initiatives to foster the contribution of third parties as a supplement for the identification of prior-art.
4. sign in for a “code of conduct” for patent prosecution to avoid a deliberate abuse of the system.
5. increase efforts to maintain the skills of patent examiners and randomly select patent applications for review of search quality.
6. provide preliminary opinions on patentability in order to encourage early amendment or withdrawal.
7. intensify the exchange of information among NPOs and EPO examiners, and share/reuse the searches done by other offices to avoid duplication in the work of patent offices.

Concerning the reductions in the barriers to patenting, the current fragmentation of the European patent system poses serious concerns about the negative effects on competitiveness of European innovative companies. The high costs for translation, validation and enforcement of a patent might induce sub-optimal IPR strategies specifically from less financially endowed applicants, including innovative start-up firms. In this regard, initiatives may include:

1. simplification in the patent prosecution, such as launching electronic only procedures. Establishing digital prosecution in which the application and every substantive communication between the applicant and examiner, including office actions, amendments, information disclosure statements, and the like, are exchanged electronically over the Internet.
2. the recognition of the “SMEs status” of applicants, with direct-related financial considerations.
3. the provision of free-of-charge automatic translation systems. Creating a rapid and efficient online translation system tailored specifically to the needs of inventors looking for information on existing patents in order to overcome language barriers that might inhibit innovation incentives. Individuals and SMEs have to go through a lengthy and costly process when venturing into a new market. A thorough search for existing patents is a must, but this is made more difficult by language barriers, the distribution of information sources over a multitude of sources and - last but not least - the technical and legal expertise required.

Concerning the improvements in the enforcement capabilities, based on the evidence collected in the study, we suggest that lines of intervention might include:

1. improve the quality of the litigation system through a centralised court exclusively dedicated to patents and appoint technical qualified judges.
2. reduce the costs of access to justice also by stimulating the use of alternative mechanism to reduce the costs of patent infringement, such as mediation and arbitration.
3. speed up the EPO opposition proceedings in order to avoid uncertainty. The uncertainty during opposition procedure is aggravated if the patent holder enforces the opposed patent in court.

1 Introduction

1.1 Objectives and scope of the study

An effective system for the protection and enforcement of intellectual property rights represents an essential element for the growth of economies, which are based on the generation and exploitation of new scientific and technological knowledge. The well-known risks of market failures in the private financing of innovation investments call for a continuous effort of policy makers to the improvements of the tools that are expected to guarantee proper private returns from R&D activities while protecting also the interests of consumers and society at large. The increased salience of patents to companies competing in the knowledge economy has raised concerns throughout the world in the past decade about the actual effectiveness of the current patent systems.

The economic relevance of an efficient patent system to spur innovation and competitiveness in Europe has been clearly stated by the European Commission and by the European Council in various recent documents (European Commission 2004 and 2007; Council of the European Union, 2004; European Parliament and Council 2004).

Numerous researchers claim that the correct functioning of patent systems has been seriously challenged in recent years by the different factors, both exogenous and endogenous. Among the exogenous factors, it is worth recalling the emergence of new technological and scientific fields that have posed questions about the extent of patentable subject matter, the increasing complexity of new technologies that makes more difficult and time consuming the assessment of both inventive step and actual scope of each patent[1], as well as the increased activity in innovation from companies in emerging countries that have started to file an increasing number of patent applications with a non trivial impact on the workloads of the main patent offices[2]. Among the endogenous factors, there is evidence worldwide of strategic conducts by some patentees that aim at exploiting the weaknesses of patent systems, in terms of the low average quality of granted patents[3]. Such strategic conduct in some technological areas can generate "patent thickets" where numerous and possibly overlapping patents exist, preventing market entry by new and small innovators.

When patents are improperly issued, the public suffers without justification by paying supracompetitive prices and having reduced innovation incentives. The strong potential negative impact of a deteriorating patent system on competitiveness and innovation incentives is witnessed by the large number of reports that, since the late nineties, have been issued by governmental agencies worldwide calling for urgent patent policy reforms[4]. The

[1] Numerous empirical studies have provided sound evidence that this is specifically the case in the ICT sector (Hall and Ziedonis, 2001).

[2] The latest WIPO (2009) statistics on patent applications clearly reflect such an ongoing trend. The increasing workload is a global phenomenon that started in the late nineties: Nagaoka (2006) shows how the duration of the examination process at the Japanese Patent Office passed from an average of 19 months in 1998 to 26 months in 2006. van Zeebroeck et al. (2008) present an analysis of the evolution in patent voluminosity observed at the European Patent Office (EPO) over the past two decades. Their results highlight that the average size of applications has doubled and that this trend is mostly due to applications filed via the PCT route and/or with a US priority application. The increasing voluminosity can have a significant impact on EPO workload.

[3] Harhoff et al. (2007) present an in-depth analysis of the negative effects of strategic patenting and of the correlation between this phenomenon and patent quality.

[4] On this issue, see Hall (2007).

scholarly community has constantly monitored the evolution of patent systems and in recent years has launched serious warnings about the risks connected both to the reduction in the quality of issued patents and to the diffusion of strategic patenting. The first clear comprehensive evidence in this direction came from the United States after the contributions by Jaffe and Lerner (2004) and more recently by Bessen and Meurer (2008). However, the European patent system cannot be considered exempt from the risks and profound negative implications of low quality patents (Van Pottelsberghe, 2009)[5]. The complex bundle of interactions that links patents and other areas of uppermost importance for European competitiveness, including competition policy, technology standards policy, international trade policy, and healthcare policy, makes IPR policy a central pillar for European policy.

This study aims at providing new evidence on the current quality of the European patent system. Such evidence is also expected to shed light on the expected impact of future prospective reforms of the European patent systems, both at the national and European levels. The quality of the European patent system will be analysed in this study along two complementary perspectives: the first one relates to the quality of the granted patents *per se*, in terms of compliance with their fundamental legal requirements, and the second one relates to the quality of patent by a systemic perspective. The assessment of patent quality at systemic level requires the analysis of additional factors beyond the simple efficacy of the substantive examination process, like the costs for obtaining, managing and enforcing a patent. Understanding such dual nature of quality is necessary to identify complementarities and synergies generated by prospective policy interventions[6].

A patent system is a complex environment whose functioning is based on the interaction of wide array of heterogeneous actors (large firms, SMEs, Patent Offices, International Granting Authorities, Patent Attorneys, local and international legislators, and judiciary systems, among others) that carry specific interests. Hence, the assessment of the quality requires the adoption of an analytical framework that encompasses multiple instruments and the need to clearly state the boundaries of the concept of quality that will be investigated. In the next section, 1.2, we provide details on the different determinants of the concept of patent quality. Here below we summarise the analytical instruments adopted in the study and the scope of the study.
The quality of the European patent system has been analysed through four different channels:

1. **Survey of the users of the patent system**. The core part of the study consisted of the collection of information from European companies and public research institutions on their perceived level of quality of the European patent system. The possibility to join the consultation has been widely diffused across European industry associations and academic institutions. Surveyed subjects have been asked to provide their view on both the quality of the patent examination process and the points of strength and most critical aspects of the current European patent system. The survey takes a comparative approach with respect to non-European patent systems. A specific questionnaire has been designed to address European public

[5] On this issue, see also the earlier works by Kingston (2001) and Barton (2000) claiming the need for urgent patent policy reforms. Guellec and van Pottelsberghe (2007) provide examples of very low quality patents at the EPO. The study by van Pottelsberghe and van Zeebrooeck (2008) shows statistical evidence suggesting a substantial downward trend in the potential value of patents granted by the EPO.

[6] The economic efforts by patent authorities to reduce “errors and mistakes” clearly show decreasing returns. It seems more efficient to accept the fact that a reasonably small amount of patents are erroneously or mistakenly granted and then let the ex-post opposition, litigation, mediation or arbitration system solve the controversy for the (often rather limited) share of granted patents that have an actual economic value. However, such an approach would make sense as long as access to justice is guaranteed at reasonable cost and time. Therefore, actions for the reduction of the duration of proceedings or for increasing the reliability of outcomes at courts (due to the presence of technically trained judges) would have both a direct and indirect positive impact on the perceived quality of the patent system. Similar forms of synergies can be achieved through reforms addressing the costs of patenting.

research organisations, including academic institutions. In recent years, numerous policy initiatives have taken place across Europe to foster patenting activities by public research institutions to eventually favour technology transfer. Due to their specific characteristics, public research institutions are likely to have a peculiar view of the current quality of the European patent system and to envisage specific criticalities.

2. **Survey of European national patent offices and the EPO**. We have collected evidence on the mechanism that a sample of European patent granting authorities have put in place, or are planning to, to promote a high quality patent environment. Such a task has been performed through a survey and a set of interviews with staff members of selected European National Patent Offices and the EPO.

3. **Analysis of patent opposition at the European Patent Office**. The European Patent Office allows third parties to challenge the validity of granted patents during a window of nine months after the grant date. Opposed patents can be upheld, amended or revoked. Hence, taking appropriate controls, the analysis of the outcomes of opposition procedures across time can contribute to shed light on the quality of the examination process. In the study we analyse all the oppositions that have been filed to the EPO during the period 2000-2008 and evaluate their trends according to different dimensions, including the technological sector and the original priority of opposed patents. We also study the relationship between the duration of the examination process at the EPO and the likelihood of observing an opposition.

4. **Analysis of overseas initiatives for patent quality.** Based on the evidence collected through the survey to national patent offices and the EPO, we have performed a cost-benefit analysis of a set of instruments that are expected to contribute to keep a high quality of granted patents. This analysis specifically aims at incorporating in the discussion the effects exerted by the adoption of such pro-quality measures on the different stakeholders of the patent systems. In particular, we focus on the discussion of the pros and cons of allowing third parties to contribute to the patent examination process by providing the examiners with relevant prior art.

Concerning the scope of the study, it is fundamental to clarify *ex ante* that we will not directly address the costs and benefits of specific reforms currently under scrutiny at the European level[7]. The study does not aim at drawing conclusions or provide policy advice on issues only indirectly related to patent quality, such as the extent of patentable subject matter. Concerning the geographical extent of our study, we have addressed the EU 27 in the survey. In the study we made an effort to address different stakeholders involved in the patent system (including European innovative companies and public research institutions active in patenting, as well as patent grating authorities). We acknowledge that the evidence collected in this study represents the partial view of specific subjects involved in the patent system. The main objective of future patent reforms is to keep a proper balancing of such interests. The timing of this study is particularly pertinent in light of the current negotiations on the proposed Community patent. The creation of a new unitary patent right for the entire EU will provide new opportunities for businesses and the benefits this will provide needs to be addressed and estimated. In this perspective we claim that the evidence provided by this study can contribute to drive future fact-based policymaking in the patent field.

[7] Previous reports by the European Commission have examined in detail the implications of such reforms. See Van Pottlesberghe (2009) on the community patent and Harhoff et al. (2007) on the impact of a unified jurisdiction for European patents

1.2 Defining patent quality

The identification of a clear and unique definition of quality for a patent is a complex task due to the diverse objective functions that characterise the different subjects involved in the patent system. In the most straightforward way, the concept of patent quality can be defined along two major dimensions: the techno-economic quality created by the patent's underlying invention; and the legal quality created by the patent's reliability as an enforceable property right (Burke and Reitzig, 2007).

In an important contribution, Merges (1999) followed the latter approach, clearly stating that high quality patents are simply valid patents, whose legal certainty cannot be challenged.
Hence, the most suitable way to evaluate patent quality is to measure how well the patent meets the statutory requirements of the jurisdictions in which it is issued: patentable subject matter, utility, novelty, non-obviousness, appropriate disclosure and enablement. Patent quality can also be assessed from the standpoint of certainty as to the validity and scope of the patent claims when challenged at courts.

Weak patents, due to an inadequate examination process, might damage competition and eventually harm innovation incentives, with detrimental effects for consumers. A somehow complementary approach to the interpretation of patent quality is the one based on economic considerations. In this case, a desirable, high quality patent should cover only those inventions that would not have been made without the incentive provided by the protection of the intellectual property right. However, many patents that are not commercially valuable are presumably of good quality from the standpoint of the statutory criteria. Therefore, this measure of patent quality is perhaps more a subjective indicator of whether or not something is a desirable invention, rather than a reflection of the quality of the patent itself (Walmsley Graf, 2007).

In this study, we address the concept of patent quality according to the perspective of legal compliance with the fundamental statutory requirements for patentability.
However, focusing only on the dimension of strict compliance with statutory requirements might lead to a simplification of the overall framework and to underestimation of the potential systemic impacts of low quality patents. Indeed, understanding patent quality requires the acknowledgement of the presence of significant trade-offs within patent systems.
A clear example of such trade-offs attains the costs of performing a virtually perfect patent examination with a null error probability by a patent office. Such costs are both monetary, in the form of patent fees, and non-monetary (e.g., longer time required to perform the screening of all prior art). Lemley and Shapiro (2005) discuss this issue in detail, stressing how a relevant stream of economic analyses has emphasised that expending the resources required to increase the certainty of issued patents may not be economically efficient, given the very small percentage of granted patents that end up being commercially important.
In particular, Lemley (2001) took a clear position on the cost-quality trade-offs, suggesting how "high" patent quality might be an inefficient goal. It would be more efficient to allow market forces (mostly in the form of patent litigation proceedings) to correct mistakes. The benefit would consist of the fact that only actually valuable patents are challenged in courts. However, such mechanisms seem to be reliable only when the related costs of accessing justice are sufficiently low. Furthermore, a large literature has highlighted how the action of invalidating a patent generates significant positive externalities, eventually reducing private incentives to litigation (Lemley and Shapiro 2005; Gilbert, 2004; Farrell and Merges, 2004). Moreover, other scholars have argued that the benefits of avoiding highly uncertain patents are sufficiently great that society should devote to it additional resources (Gallini, 2002)

The concept of patent quality, as perceived by the users of the system, needs to be expanded to include additional factors related to costs of patenting, timeliness, and the ease of management of granted rights. From this perspective, for a patent-granting authority the concept of patent quality can be represented as an optimisation process that balances three different dimensions: i) the performance of the product provided to customers; ii) the costs incurred; and iii) the timeliness of the service provided. Only the first of such dimensions is the quality according to the statutory definitions.

However, it has to be recognised that patent office "customers" are not a homogenous entity because they include subjects seeking patent protection, the ones who do not seek patent protection but freedom to operate, as well as the ones who just use patent information as a source of technical knowledge. Moreover, among patent applicants, significantly different goals and related requirements can co-exist: some companies can adopt aggressive patenting strategies, whereas others use patents mostly as a defensive tool; some applicants might be seriously concerned with the monetary costs of the patent examination, whereas others might accept higher costs for a sounder and more in-depth analysis of prior art. Hence, the combination of performance, cost and timeliness is different and conflicting, depending on the usage of the patent system. In assessing the notion of quality from the perspective of a granting authority, it is worth recalling the existence of additional factors, both external and internal. Concerning external factors, statutory requirements represent in principle a rigid constraint. An additional external factor attains the level of certainty of the patentable subject matter. On this issue, Hall (2007) stresses that most of the changes in patent policy on patentable subject matter in the United States resulted from court decisions, which do not always necessarily take into consideration the broader implications on the quality of the patent system at large.

Concerning internal factors, it should be considered that the internal system of incentives of granting authorities might produce non-desirable effects on patent quality. When the patent fee system is characterised by cross-subsidisation because examination processes are partly financed by renewal fees, incentives might emerge to grant too many patents. Cowan et al. (2006) stress that for a patent-granting authority, it is more difficult and time-consuming to deny a patent than to grant it. The grant of a patent does not have to be justified vis-à-vis the applicant, whereas a refusal will have to be based on sound reasons.

In the survey to the users of the patent systems, presented in Section 2 of this report, we have explicitly asked European companies and public research organisations to provide their own views on the relative importance of the different components of patent quality. Based on the previous considerations, we have analysed the relative importance of legal certainty, cost effectiveness, level of inventive step and timeliness.

1.3 Patent quality and the characteristics of the European Patent System

The perceived quality of a patent cannot be separated from the characteristics of the overall patent system in which it operates. Hence, the assessments of patent quality in Europe need to take into account the peculiarities of the European patent system. Numerous recent contributions have clearly singled out a set of critical aspects of the European patent system that might offset the perceived quality of granted patents based solely on the goodness of the examination and granting process by European national and international granting authorities. Van Pottelsberghe (2009) provides an in-depth discussion of the most seriously harmful factors. In particular, the current fragmentation of the patent system, with national patent offices and jurisdictions having the ultimate power to grant and enforce patents, generates three major consequences: i) very high costs for patent applicants compared to other geographical areas (mostly due to translation costs and the risk of having to cope with multiple infringement proceedings across different European jurisdictions); ii) higher uncertainty for patent applicants (due to the risk of seeing different outcomes at trial in different national courts); iii) higher managerial complexity of granted patents (due to the need to comply with country-specific administrative issues); and iv) systemic incongruities (due to the fact that national patent offices can grant a patent even if the same application is being challenged through an opposition procedures at the EPO with the risk of incurring litigation costs at national courts even for patents eventually revoked after the opposition).

A detailed discussion of the policy implications of the issues affecting the quality of the European Patent System is beyond the scope of this report. We refer the reader to the recent reports from the European Commission, which have addressed the costs and benefits of the

European Union patent system (van Pottlesberghe et al. 2009) and of a unified jurisdiction for patents (Harhoff, 2009). Here below we provide a synthesis of the most recent evidence.

1.3.1 The relative costs of European patents

The administrative costs for the examination, validation and maintenance of patents can represent a significant financial burden for patentees, especially in the case of small and medium enterprises. Few available studies have highlighted the actual presence of a non-negligible elasticity of the number of patent applications to such costs, raising serious concerns about their negative impact on patenting incentives and eventually on innovation efforts. De Rassenfosse et al. (2007) provide first empirical evidence showing that the fee elasticity of the demand for priority applications is negative and significant. The authors state that, taking into consideration the elevated variation in absolute fees and in fees per capita across countries, their empirical evidence indicates a suboptimal treatment of inventors across European countries. Hence, they claim that fees should be considered as an integral part of an intellectual property policy, especially in the current context of worrying backlogs.
The current fragmented structure of the European patent system significantly contributes to rising patent costs. The data presented in van Pottelsberge and Mejer (2008) is straightforward and highlights significantly higher costs for the European patent system compared to the US, Japan, China or Australia. The difference in costs with respect to other systems is mostly driven by translation costs. The London Agreement specifically aimed at reducing translation requirements. However, European patents on average are still far more expensive than a patent granted in the United States

1.3.2 The patent enforcement system in Europe

A major concern for patent applicants is the potential cost of patent enforcement in legal disputes (Bessen and Meurer, 2008). Litigation costs include court costs, fees for lawyers, patent attorneys and experts, costs of witnesses, technical investigations and costs related to appeals. The threat of being involved in a costly and uncertain infringement case, as well as the risk of retaliation, can negatively affect ex ante research and development (R&D) incentives, particularly for less financially endowed companies. Moreover, when a patent right is not credibly enforceable its private value vanishes and potential infringers have an incentive to act opportunistically.
In recent years, a number of studies have highlighted an increase in patent disputes, both in Europe and in the United States. Despite the growing number of patent suits, the number of cases terminating during or after the trial has been stable through time (Bessen and Meurer, 2005), which suggests a rising role of extrajudicial settlements. Scholars are questioning whether or not the direct and indirect costs associated with enforcing patent rights are imposing an implicit tax on innovation in vital segments of the economy (e.g., Barton, 2000; Jaffe & Lerner, 2004; Hall and Ziedonis, 2007). Whereas the negative impact of excessive litigation has been largely identified, the policy action for the enhancement of patent enforceability within the European Patent System has to face additional constraints that relate to the peculiar European institutional settings. Currently, an infringed patent holder has to defend its European patent across all jurisdictions in which the patent right has been granted, with an inevitable explosion in legal costs as well as in time-to-market opportunity costs.
European jurisdictions show an elevated heterogeneity in the tools for handling patent disputes. Some countries have introduced specialised courts. However, heterogeneity in litigation systems attains also the use of technical expertise during the proceedings. Whereas some systems involve technical judges, others draw on extensive use of technical experts without bringing the dedicated technical expertise “into judges’ chambers” (Harhoff et al., 2009). Jurisdictions also differ with respect to their assessment of damages and to the ways used to quantify them (Reitzig et al., 2007). Such heterogeneity contributes to an increased likelihood of diverging outcomes across different jurisdictions, with clear detrimental effects in the ex-ante firm-level incentives to patent and invest in R&D.

1.4 Review of previous studies on patent quality

In the past decade, there has been rising concern about the implications of a deterioration of the quality of patent systems worldwide. Despite a growing number of contributions providing signals in this direction, until now most of the evidence has been anecdotal, and few comprehensive statistical analyses are available. This is due mostly to an inherent difficulty in measuring patent quality. In most of the cases, studies have relied upon the analysis of patents whose actual quality has been challenged in courts, but there is evidence that only a small minority of disputes over patents go to trial, compared to the number of extrajudicial settlements. Below we provide a concise review of those recent academic contributions that have empirically assessed patent quality. In particular, we limit our review to those studies that are based on statistical analyses. In the following Section, 4, we will further review some recent studies on patent quality, focusing on the mechanism to improve quality.

The evaluation of the efficacy of the examination process at patent offices is a complex task for an external observer, due to the non-negligible level of subjectivity involved in the assessment of the required conditions for patentability of an innovation. Data that can be useful to understand the actual inventiveness and soundness of a patent are available only ex-post and are observable only for the subset of patents that are eventually granted[8]. Hence, researchers have made an effort to develop sophisticated technical approaches to try to infer from the observable evidence implications on the quality of the examination process, including for those patent applications that have been rejected.

Concerning EPO patents, the analyses carried out by Harhoff (2006, a) show that during the years 1980-2000 there as a marked increase in the number of X-type references per claim for European granted patents. An X -type reference is a reference that is potentially damaging to a claim in a patent and may cause the claim to be deleted. This trend is also confirmed for more recent years (Harhoff et al. 2007). As the grant rate for the same years does not decline, this might suggest that on average more questionable patents are being granted by the EPO. However, the observed trend for this indicator might also be due as well to the fact that the examiners at the EPO have been able to find more critical references, thanks to improvements in search strategies and technologies. If this were the case, the evidence would not have sound implications for the assessment of patent quality.
Burke and Reitzig (2007) present an econometric methodology to investigate the degree and typology of inconsistency in patent offices' decision making. They argue that consistent decision-making in judging a patent's validity and basing this on its underlying technological quality are important elements of patent office services. To understand which level of quality patent offices provide, particularly in new technological areas, the authors study the concordance of the European Patent Office's (EPO) granting and opposition decisions for individual patents. Their analyses are based on the observation of patent bibliographic indicators. They investigate the biotechnology industry in the 1980s, finding no empirical evidence that the EPO provided maximal or optimal assessment quality.
Palangkaraya, Webster and Jensen (2010) provide an interesting and sound analysis of patent examination errors by studying the case of inconsistent decision between Patent Offices with respect to the granting of a patent covering the same innovation. The authors use a sample of triadic patents applied at the EPO, USPTO and JPO. The authors analyse twin patent examination decisions made at the EPO and JPO between 1990 and 2004 (conditional on a patent having been granted by the USPTO). These twin patent applications are patent applications for the same invention, as indicated by the same unique priority number in the applications. Using a proxy for inventive step as the predictor of the correct decision, they estimate that an incorrect decision is made on applications between six to ten percent of the time. Specifically, they find that the probability that a "true grant" application is refused is 6.1 percent, whereas the probability that a "true refusal" application is granted is 9.8 percent. Patent offices are less likely to make incorrect decisions the longer the duration of examination and the greater the applicant's experience with submitting applications.

[8] Such data can include the number of subsequent citations received by a granted patent, the outcome from its extension to other patent offices that perform additional screening, the outcomes of opposition procedures, litigations or re-examinations.

Furthermore, the likelihood of incorrectly granting a patent is a decreasing function of the technological specialisation of the office. The authors conclude that while many claim that over the last decade the USPTO has been increasingly liberal in its treatment of “bad” patents, there is no evidence that this occurred at the EPO and JPO.

Cockburn et al. (2003) provide an interesting study of patent quality that addresses the heterogeneity of the performance of patent examiners in the US. Their study is based on a dataset of 182 patents for which the Court of Appeals for the Federal Circuit (CAFC) ruled on validity between 1997 and 2000. For each patent, the authors are able to recover the identity of the corresponding USPTO primary examiner, and then collect historical statistics derived from his entire patent examination history. The authors find that patent examiners and the patent examination process are not homogeneous. There is substantial variation in observable characteristics of patent examiners, such as their tenure at the USPTO, the number of patents they have examined and the degree to which the patents they examine are later cited by other patents. Interestingly, the author does not find evidence that examiner experience or workload at the time a patent is issued affects the probability that the CAFC finds a patent invalid. The overall data suggest how idiosyncratic aspects of examiner behaviour have a significant impact on the nature of the granted patent rights, calling for the importance of designing and adopting appropriate organisational tools to control and limit such heterogeneity.

As previously recalled, from the perspective of a patent applicant the timeliness of the examination process can be a key component of the overall level of quality. Some recent empirical studies have investigated this issue, attempting to discover the determinants of the duration of the patent examination process and to assess the extent of the influence of applicant behaviour on the duration of the process.

Harhoff and Wagner (2009) analyse the duration and outcomes of patent examinations at the European Patent Office using a dataset covering a random sample of more than 200,000 applications filed between 1982 and 1998. The authors take into account three groups of possible determinants affecting examination length: applicant characteristics, indicators of patent quality and value, and other aspects related to the complexity of the examination task. Their results indicate that more controversial claims lead to slower grants but faster withdrawals, whereas well-documented applications are approved faster and withdrawn more slowly. In particular, the authors find evidence suggesting that patent applicants accelerate grant proceedings for their most valuable patents but that they are also able to prolong the battle for such patents if a withdrawal or refusal is imminent.

Regibeau and Rockett (2009) study the relationship between the length of patent review and the importance of inventions in a theoretical model, which was then tested on a sample of US patents from 1988 to 1998. They find that after accounting for the importance of innovations, the welfare-maximising patent approval delay decreases over time. Furthermore, controlling for a patent's position in the new technology cycle, the optimal examination time decreases with the importance of patents.

The available evidence from the empirical studies that have addressed through different tools a direct measurement of the evolution of patent quality in different systems can be summarised along the following points.

First, the data seem to reflect the actual risk of a deterioration of the quality of granted patents, although with some caveats. Second, there is evidence of non-negligible inconsistencies in the assessment of patents across different patent offices and within the same patent office. Third, the comparative analysis for different patent systems highlights a relatively better performance of the European patent office.

The results are still partial, and to our knowledge, there is no previous publicly available study that has systematically explored the quality of the patent system by directly involving patent owners in the evaluation process[9]. This report contributes to the previous literature by presenting new evidence on patent quality by collecting and elaborating on data provided by European companies and public research organisations.

[9] Patent offices, including the EPO, conduct internal studies for assessing the level of satisfaction of users with the examination services. Results are commonly used for internal quality control and are not disclosed to the public.

2 The survey to the users of the European Patent System

2.1 Introduction

This section of the study presents the results of two surveys that have collected evidence on the current quality of the European patent system from both enterprises and public research organisations (PROs) across European countries. The design of the questionnaires has been built taking into consideration the issues reviewed in the previous chapter 1. In particular, the survey aims at identifying the most critical aspects of the current system as well as the expectations of European firms and PROs from prospective reforms.

The survey addresses the issue of patent quality from the point of view of the individual patent (focusing on the quality and duration of the examination and related procedures) and from a systemic perspective, extending the analysis to the evaluation of additional factors that might hamper the perceived quality and effectiveness of the patent system. Such factors include the costs for obtaining and maintaining patents, the capability to access justice to properly enforce patents and the implicit costs related to the fragmented structure of the European patent system.

Given the heterogeneous nature of the concept of quality in the area of patents, respondents are provided the possibility to express their view on the definition of patent quality. This should provide useful guidance in the assessment of the expected impact of policy reforms.

In this respect, the survey is expected to also shed light on the variegated relevance of patent quality across different typologies of users. The data collected allows for the observation of the specific implications of patent quality for innovators, classified according to their technological sector, size (SMEs and large corporations), and scope of the market (national, European and global).

The decision to involve universities and public research centres in the analysis comes from the increasing relevance of technology transfer policies as a tool to foster innovation in Europe. Aside from this, in recent years some studies have highlighted the non-trivial contributions of academic patents in some sectors (Lissoni et al 2008). Public research organisations are likely to face specific constraints and might have a peculiar view of the quality of the current European patent system.

The chapter is organised as follows. In section 2.2, we describe the structure of the questionnaire. In sections 2.3, we summarise the process adopted for the dissemination of the invitation to join the consultation. In sections 2.4 and 2.5, we present and discuss the evidence that emerged from the two surveys to firms and PROs, respectively. Finally, section 2.7 concludes, drawing the main results.

2.2 Structure of the questionnaire

The questionnaire was divided into five sections. Those companies and PROs that do not own any patents are allowed to fill in the first section and some key questions of the second, but they are subsequently redirected to a different set of questions aiming at assessing the possible reasons behind their choice not to patent their inventions. The different sections for patentees are the following:

Section 1 Company data. Respondents are requested to provide some general information on their companies. In particular, respondents are asked to report information on the size of the company, the volume of their current patent portfolio, the geographical extension of their final market, their main technological sector and their R&D investment intensity.

Section 2: Usage of the patent system. In this section, we gather information from companies on their involvement in the patent system and their usual procedures when applying for patents. This section includes questions asking for a definition of patent quality and a rating of the quality of the European patent system, according to different perspectives. In particular, the components of quality are separated between those relating to legal compliance, the pre-grant process, and the systemic dimension of patent quality. This set of information allows us to better interpret results from subsequent questions in which respondents are asked explicitly to provide a direct, synthetic evaluation of the European patent system, by comparing it to other systems.

Section 3: The quality of the patent system - the search and examination process. In this section, we investigate in detail the companies' perceptions of the quality of the search and examination process at the European Patent Office. Questions also address the impacts of the fee structure and the translation costs.

Section 4: The quality of the patent system - the enforcement of granted patents: This section asks the respondents to provide their opinions on features related to the enforcement of granted patents. Evidence is collected on the most frequent typologies of infringement they experienced. Moreover, respondents are invited to express their views on the effectiveness of the current patent litigation system in Europe and to highlight the most important sources of inefficiency.

Section 5: Proposals for the improvement of the quality of the European patent system. In this section, respondents are invited to express their views and their expectations about a set of relevant policy initiatives. The first set of questions addresses the perceived impact of the introduction of the European Union Patent. The second set asks about other initiatives that have been proposed as possible ways to improve patent quality, such as the peer-to-patent review, or the "raising the bar" initiative.

2.3 Dissemination of the questionnaire

The questionnaire is based on a web platform and access was granted by sending a unique personal link to each respondent via an invitation email. The possibility to join the consultation was promoted through the support of European industry associations. About 100 associations were contacted to circulate the flyer among their members to give the survey the widest diffusion. The complete list of organisations that provided support is reported in Annex 1. Furthermore, the survey was advertised by the IPR HelpDesk website and DG Research of the European Commission sent a communication to all the recipients of grants within the 7th Framework Programme (FP7).

2.3.1 Additional contacts

The database of firms and PROs was enriched by including the email addresses of some additional relevant companies from four sources: the TNO Innovation Policy Group dataset, which includes mainly SMEs from all over Europe; the 2008 top EPO applicant list limited to Europe-based companies; a sample of the top 1,000 EU companies as reported in the 2008 EU Industrial R&D Investment Scoreboard; and a sample of firms randomly extracted from the complete list of European assignees of patents granted in 2008 by the EPO. For all of these companies and PROs the email addresses were mainly identified from each organisation's official website. We collected answers from 221 companies and 98 Universities and PROs. In the following sections, 2.4 and 2.5, we provide the statistics on these answers.

2.4 Results from the survey to companies

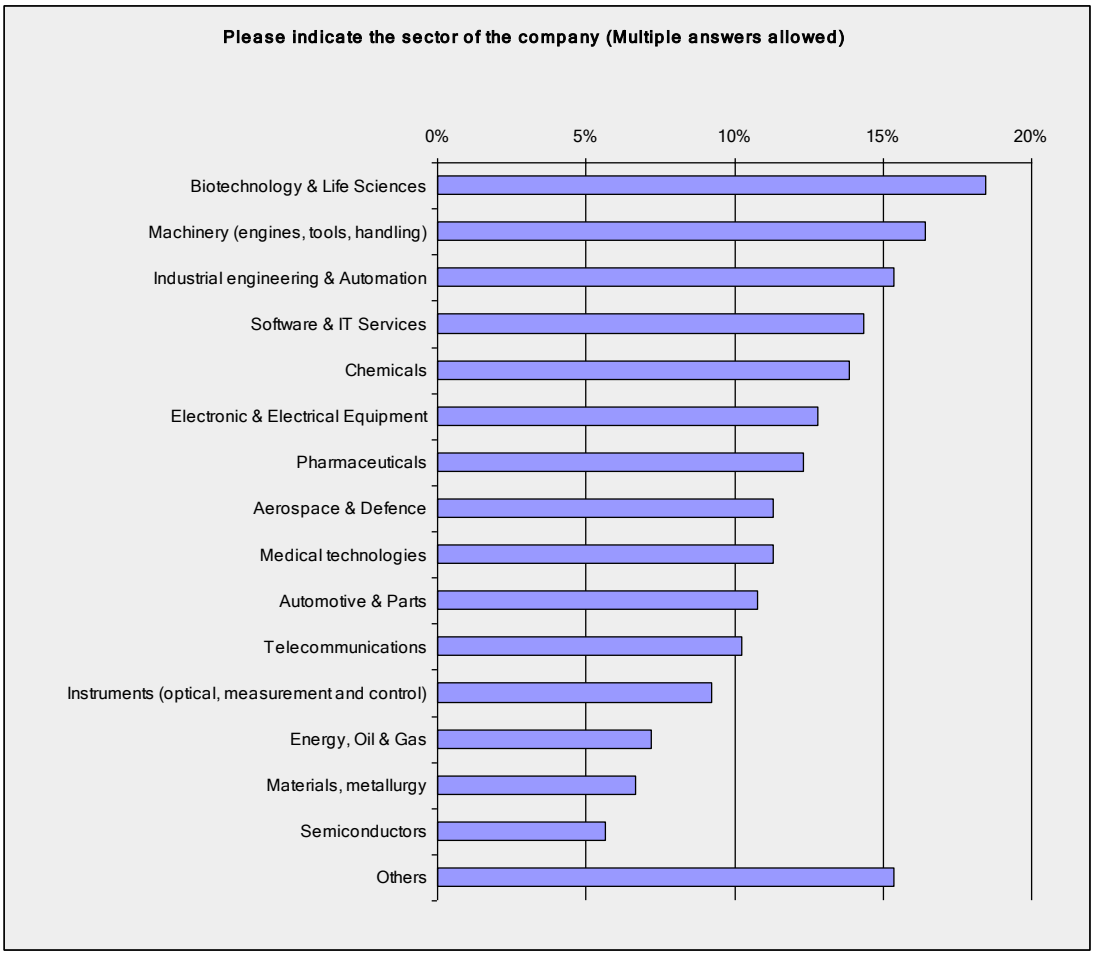
The following paragraphs present selected statistics about the characteristics of the sample of respondent companies and the key results. In Annex 8.2 we show the detailed statistics for the questions that are not reported below.

Before analysing the responses of European companies, some *caveats* must be highlighted. The guiding strategy in disseminating the questionnaire was to give the largest number of companies the chance to express their opinions on the quality of the European patent system. For this purpose, no stratification checks or stratified re-sampling were carried out. Hence, the final sample cannot be intended as representative of the European population of firms, from a standard statistical approach. The questionnaire requires a rather deep knowledge of the patent system, which might not be commonly spread even among patent holders, especially if they rely heavily on the activities of third parties, such as patent attorneys and law firms, for the management of their IP portfolio. While this might have reduced the number of respondents, it allowed us to collect extremely valuable and in-depth information on the perceived quality of the European patent system.
It is worth recalling that even those companies that do not hold any patents have been allowed to join the survey and to specify whether or not the decision was motivated by criticalities of the European patent system.
Most of the questions adopted a scale ranging from 1 to 4. The following tables generally report a column with the percentage of respondents selecting the two higher values (3 and 4) and a column with the weighted average rating each item received (a value of 2.5 would represent the middle average rating value). The comparison of the share of high responses and the average value provides a measure of the dispersion of the expressed ratings. For sake of clarity in some cases the table headings report the precise text of the related question of the survey.

2.4.1 The characteristics of the sample of respondents

The respondent companies represent almost all of the **industries,** as it can be seen in Figure 1. The corresponding question gave respondents the opportunity to select multiple answers and to specify an additional sector in a comment: for these reasons, the values do not sum up to 100%.

Figure 1 Industry breakdown of respondent companies



The **size** of the companies in the analysed sample is measured by the number of employees, according to the standard European classification of large enterprises (more than 250 employees) and SMEs (less than 250). The final sample shows a good balance between the two classes of companies: 46.2% of them are SMEs. Among SMEs it is possible to identify the following sub-classes: medium (11.3%), small (19.3%) and micro (15.6%)[10]. Such classification will be used in this report to refine the results of some key questions, especially where there are significant differences between the answers provided by large companies and SMEs.

The surveyed companies are located in 20 **countries** out of the 27 EU members. Two thirds of the questionnaires have been filled by firms in the following seven countries: Austria, Belgium, France, Germany, Italy, Spain and the United Kingdom.

One third of the respondents stated they were part of a multinational group, whereas about half of the sample comprises independent firms. The **globalisation degree of the activities** of respondent companies is shown in the following Table 1. The largest part (76%) of the firms in the sample sells worldwide, whereas only a small share (13%) produces and sells mainly in the domestic market. Thirty percent of the sample produces mainly in the domestic market and sells worldwide.

[10] The standard European classification describes firm size in the following four categories: “Micro” companies with less than 10 employees; “Small” with 11 to 50 employees; “Medium” with 51 to 250 employees; “Large” with more than 250 employees.

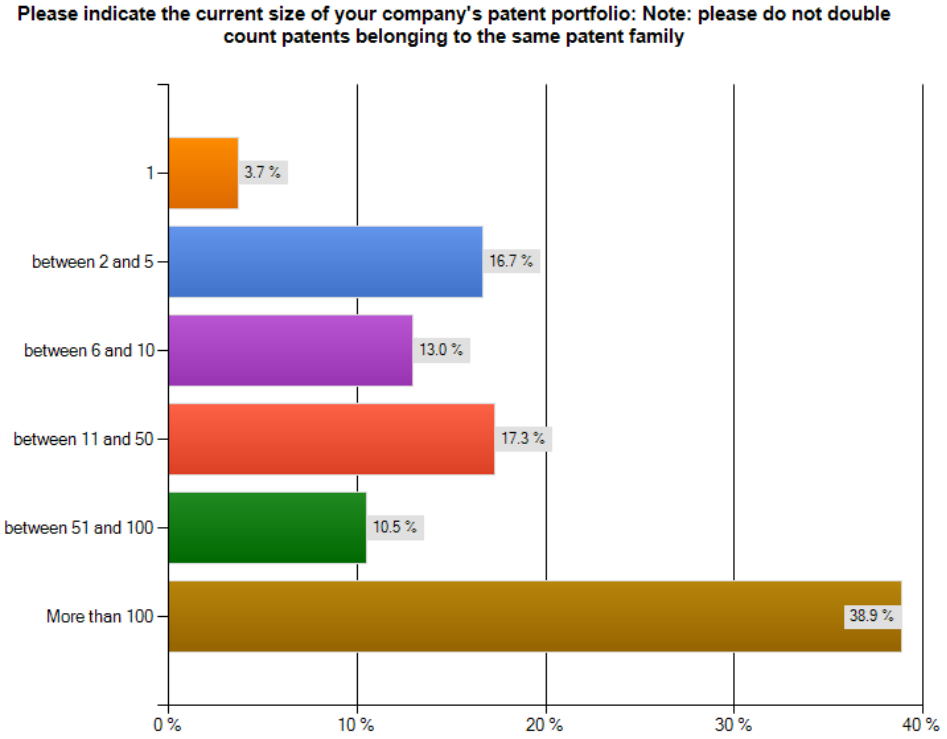
Table 1 Geographical scope of production sites and sales markets of respondent companies.

		Sales market			
		mainly in the domestic market	across Europe (EU27 member states)	worldwide	Total
Production sites:	mainly in the domestic market	13%	6%	29%	48%
	across Europe (EU27 member states)	0%	4%	5%	9%
	also outside Europe	0%	1%	42%	43%
	Total	13%	12%	76%	100%

Nearly all (98%) the respondents report a positive ratio of **R&D expenditures** on sales in the last five years. In particular, 27% of the companies invest less than 5% of sales in R&D and approximately half of the sample invests more than 10% of sales, meaning that the sample is comprised of firms that heavily rely on R&D in their businesses.

As expected, the nature of the consultation generated a high incidence of firms holding large **patent portfolios**: 38.9% of respondents have more than 100 patents, whereas 33.4% have less than 10 (Figure 2).

Figure 2 Respondents' size of patent portfolio



We asked firms to express their opinions on the most effective **tools to appropriate the returns from R&D investments**. On average, respondents consider patents the most important. The preferred two alternative channels are secrecy and fast time-to-market (Table

2). Such a result is not in line with the evidence commonly reported in the literature (Cohen et al., 2000),[11] meaning that the surveyed sample is comprised of firms heavily relying on patents to protect their innovations.

Table 2 Please provide an evaluation of the effectiveness of the following tools to appropriate the returns from R&D investments in your company (Rating scale: 1 = low importance ; 4 = high importance)

Answer Options	% of 3 and 4	Rating Average
Patents	**84%**	**3.33**
Utility Models	**35%**	**2.25**
Design Models	**33%**	**2.13**
Copyright	**38%**	**2.24**
Trademarks	**63%**	**2.84**
Industrial secrecy	**76%**	**3.11**
Use of complementary assets	**44%**	**2.40**
Strategical 'lock-in' of customers	**60%**	**2.60**
Fast time-to-market and product development cycles	**78%**	**3.16**
Retention of highly skilled personnel subject to non-disclosure clauses in employment contracts	**66%**	**2.87**
Inclusion of technology within a standard	**59%**	**2.69**

As mentioned, even firms that do not hold any patents were allowed to join the survey (17% of the respondents). When asked to report the two most relevant reasons for not patenting, such companies stated in most of the cases that: “Patents are not effective in preventing imitation of the company's products or services” and “The current cost for enforcing patents is too high for the company”. The most often mentioned alternative methods these companies adopted to protect their innovations are “Industrial secrecy” and “Fast time-to-market”.

2.4.2 Usage of the patent system - The determinants of patent quality

The first set of three questions aims to identify the definition of quality of a patent (Table 3) and of quality of the patent system (Table 5 and Table 7).

The **first question** proposed three different options to assess the quality of a patent: optimal balance between scope and legal certainty (“optimal balance” item), clear disclosure, and high inventive step. The first two options are largely preferred as a measure of quality, even if all of them are considered important. Large firms and SMEs expressed the same ranking for the three options albeit with slightly different values.
What needs to be stressed here is that, regardless of the size of the respondent’s firm, the item receiving the highest evaluation involves a kind of trade-off between scope and legal

[11] For product innovators in the manufacturing sector, Cohen et al. (2000) found that secrecy (51% of the respondents) and fast time to market (51%) were the most effective mechanisms of protection, followed by control of complementary manufacturing assets (46%) and complementary distribution assets (42%). Patents ranked lower (36%).

certainty. In this sense, we might argue that companies are well aware that quality builds on a balancing process in which strict legal compliance is just one component, albeit the most important one.
The "optimal balance" item received the highest rating average, especially from large companies that, on the contrary, penalised the "high inventive step" item slightly above the middle separating value of 2.5. The interpretation of the relatively low value observed for "inventive step" is not straightforward and might need further investigation. This would imply that raising the inventive step would not exert positive effects on the perceived patent quality. However, it is not clear whether or not respondents have properly weighted the effects of the inventive step on their own patent capabilities against the general impact on the system. On this issue, it is worth anticipating here that when asked about the relevance of a policy initiative aiming at raising the minimum required inventive step, most of the companies provided limited agreement on the pro-quality impact of such an initiative.
Generally, large companies seem to have a more distinct view of the relative relevance of the different proposed components of quality, whereas the rating provided by the SMEs shows a smaller degree of variation across the three items describing patent quality.

Table 3 Rating averages of the importance of items related to legal compliance for assessing the quality of a patent (Rating scale: 1 = low importance – 4 = high importance)

Answer Options	% of 3 and 4	Rating Average
A high quality patent has an optimal balance between scope and legal certainty	84%	3.32
A high quality patent has a very clear disclosure of innovative contents	77%	3.11
A high quality patent has a very high inventive step	60%	2.74

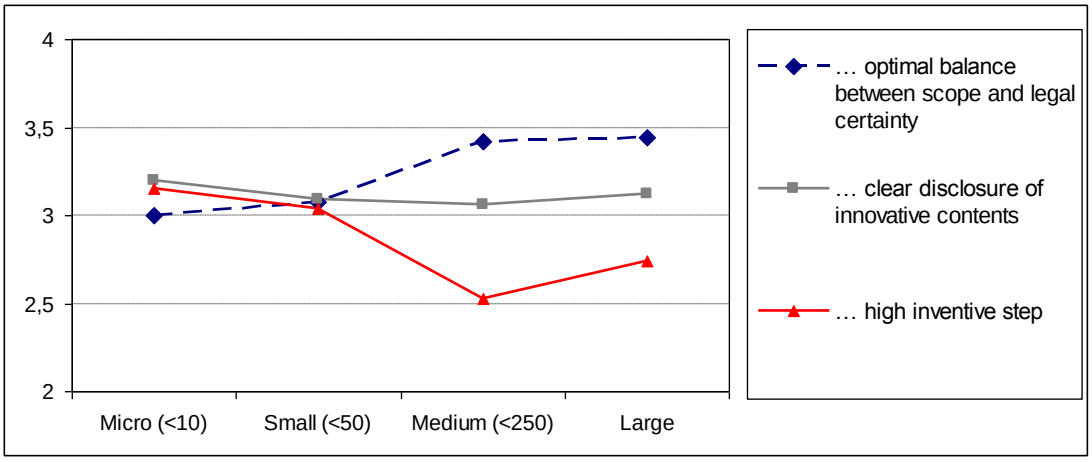
Company size: employees (more/less than 250)	Large companies		SMEs	
Answer Options	% 3-4	Rat. Avg	% 3-4	Rat. Avg
A high quality patent has an optimal balance between scope and legal certainty	90%	3.44	83%	3.16
A high quality patent has a very clear disclosure of innovative contents	81%	3.12	75%	3.12
A high quality patent has a very high inventive step	53%	2.74	63%	2.92

The analysis of the responses broken down by company size reveals some interesting evidences (Table 4 and Figure 3).The perceived importance of the "optimal balance" item appears to grow with size. At the same time, Micro and Small companies report a larger appreciation for the "high inventive step" item than Medium and Large firms. The "clear disclosure" item on the contrary is quite unanimously perceived on a high level of relevance despite of the size of the respondents.

Table 4 Importance of the components related to legal compliance for assessing the quality of a patent; values are broken down by firm size.

Company size (number of employees)	Micro (<10)		Small (<50)		Medium (<250)		Large	
Observations	20		24		19		100	
Answer Options	% 3-4	Rat. Avg	% 3-4	Rat. Avg	% 3-4	Rat. Avg	% 3-4	Rat. Avg
A high quality patent has an optimal balance between scope and legal certainty	70%	3.00	71%	3.08	89%	3.42	90%	3.44
A high quality patent has a very clear disclosure of innovative contents	80%	3.20	70%	3.09	71%	3.06	81%	3.12
A high quality patent has a very high inventive step	75%	3.15	83%	3.04	47%	2.53	53%	2.74

Figure 3 Importance of different components of quality of a patent; results are broken down by firm size according to the number of employees (in brackets). 2.5 is the middle value.



In order to evaluate possible sector specificities in the assessment of the different components of patent quality, we have grouped industries in four main classes

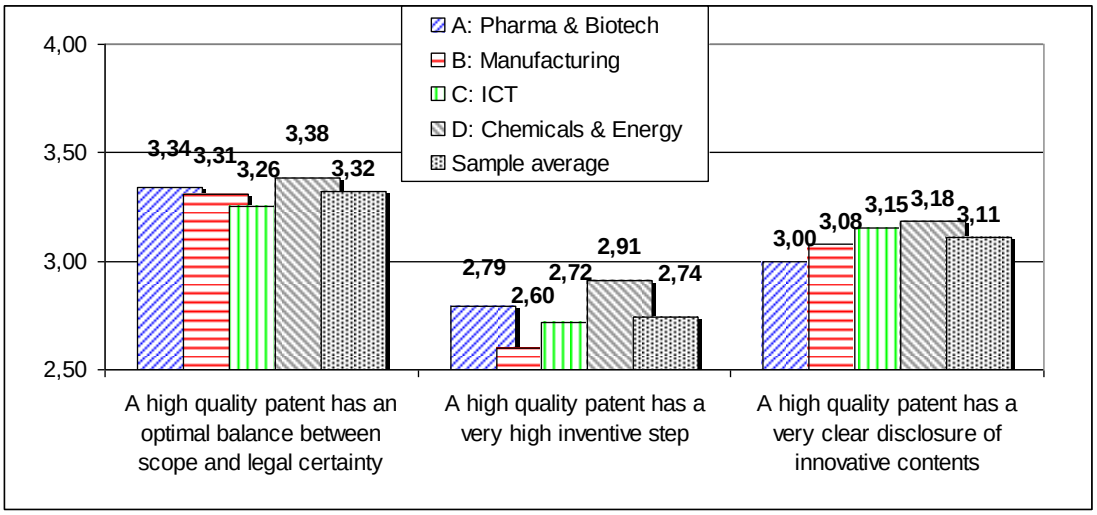
- A: *Pharma & Biotech* (including those companies which operate in the following industries: “Pharmaceuticals” and “Biotechnology & Life Sciences”)
- B: *Manufacturing* (industries: “Automotive & Parts”, “Industrial engineering & Automation”, “Instruments (optical, measurement and control)” and “Machinery (engines, tools, handling)”)
- C: *ICT* (industries: “Electronic & Electrical Equipment”, “Semiconductors”, “Software & IT Services” and “Telecommunications”)
- D: *Chemicals & Energy* (industries: “Chemicals” and “Energy, Oil & Gas”)

Such classification allowed to keep a sufficient number of responses in each group and at the same time to distinguish among industries which generally present different approaches in the development of innovative products and in the usage of patents.

As it is shown in Figure 4, the components of quality received different evaluations from companies operating in the selected macro sectors, even if the average ratings are not so dissimilar to suggest opposite perceptions.

In the case of the component referring to the “optimal balance”, industries are very close in the perceived evaluation of its relevance and only between “ICT” and “Chemical & Energy” macro sectors there is a small variation.
On the contrary, a certain variance is observed for the “high inventive step” item, especially for the evaluation received by companies in the “Manufacturing” macro sector (lower average) and in the “Chemical & Energy” macro sector (higher).

Figure 4 Importance of the components related to legal compliance for assessing the quality of a patent; outcomes are broken down by main industrial class and compared to the whole sample average. 2.5 is the middle value.



We investigated also which aspect of **the quality of the patent system** is more relevant for patent users:

- Legal certainty: compliance with legal requirements and legal security
- Cost effectiveness (limited to procedural fees and excluding translation or patent attorney costs)
- Timeliness

The global preference is for “legal security”, but the results vary when considering the respondent type: large companies definitely consider legal certainty the most important requisite, far above the other two; SMEs, on the contrary, express a preference for cost effectiveness and only secondarily for legal security, whereas they are almost unconcerned about the timing issue. Hence, indications coming from users seem to suggest that the effectiveness of the patent system, in terms of procedural features, depends to a higher extent on the pecuniary costs incurred for obtaining patents, rather than on the speed of granting.

Table 5 Ranks of items according to their relative importance for the quality of the patent system (Ranking scale: 4th place / lower importance / rate 1 – 1st place / higher importance / rate 4). Note: the 4th option "Other (please specify)" received very few answers and it is not reported here.

Answer Options	% of rank 1st or 2nd	Rating Average	Overall Rank
Strong compliance with the legal requirements for patentability [legal security]	77%	3.20	1st
Cost effectiveness [affordable procedural fees]	65%	2.91	2nd
Timeliness [a patent is granted within 3 years from the filing]	49%	2.63	3rd

Company size: employees (more/less than 250)	Large companies		SMEs	
Answer Options	% of rank 1st or 2nd	Rat. Avg	% of rank 1st or 2nd	Rat. Avg
Strong compliance with the legal requirements for patentability [legal security]	84%	3.34	67%	2.97
Cost effectiveness [affordable procedural fees]	55%	2.66	82%	3.30
Timeliness [a patent is granted within 3 years from the filing]	48%	2.62	48%	2.61

As it is reported in details in Table 6 and charted in Figure 5, company size appears to be correlated to the perceived relative relevance of the proposed components of patent system. According to the collected responses, the attention on the "Cost effectiveness" item decreases with the growth of firm size as it can be expected on the base of the relation between firm size and financial constrains. On the contrary, the importance of the component referring to legal requirements increases along with the number of employees. Timeliness is perceived quite unanimously from all the types of companies.

Table 6 Importance (expressed through relative ranking) of the components of the quality of the patent system; values are broken down by firm size.

Company size (number of employees)	Micro (<10)		Small (<50)		Medium (<250)		Large	
Observations	19		23		18		96	
Answer Options	% 3-4	Rat. Avg	% 3-4	Rat. Avg	% 3-4	Rat. Avg	% 3-4	Rat. Avg
Strong compliance with the legal requirements for patentability [legal security]	55%	2.70	67%	3.05	82%	3.18	84%	3.34
Cost effectiveness [affordable procedural fees]	89%	3.53	87%	3.30	67%	3.06	55%	2.66
Timeliness [a patent is granted within 3 years from the filing]	44%	2.50	50%	2.65	50%	2.67	48%	2.62

Figure 5 Importance (expressed through relative ranking) of the components of the quality of the patent system; values are broken down by firm size. 2.5 is the middle value

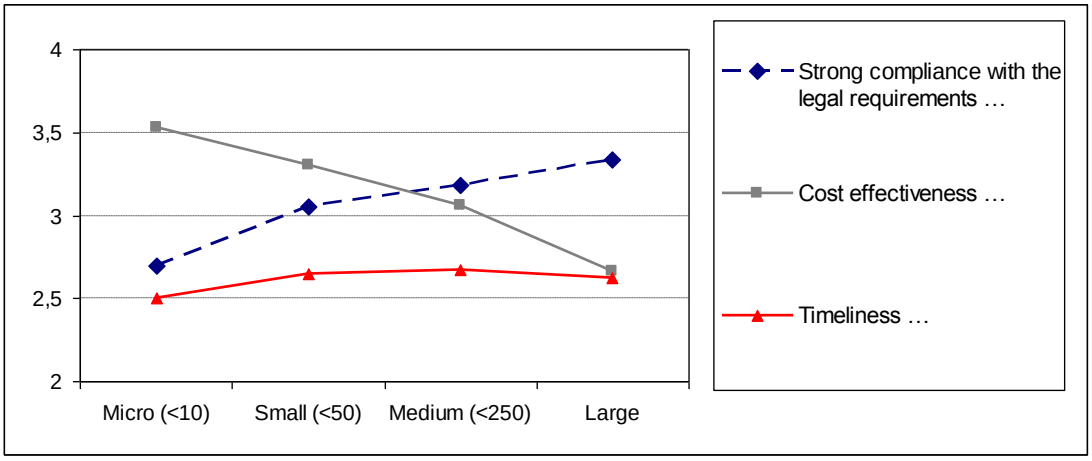
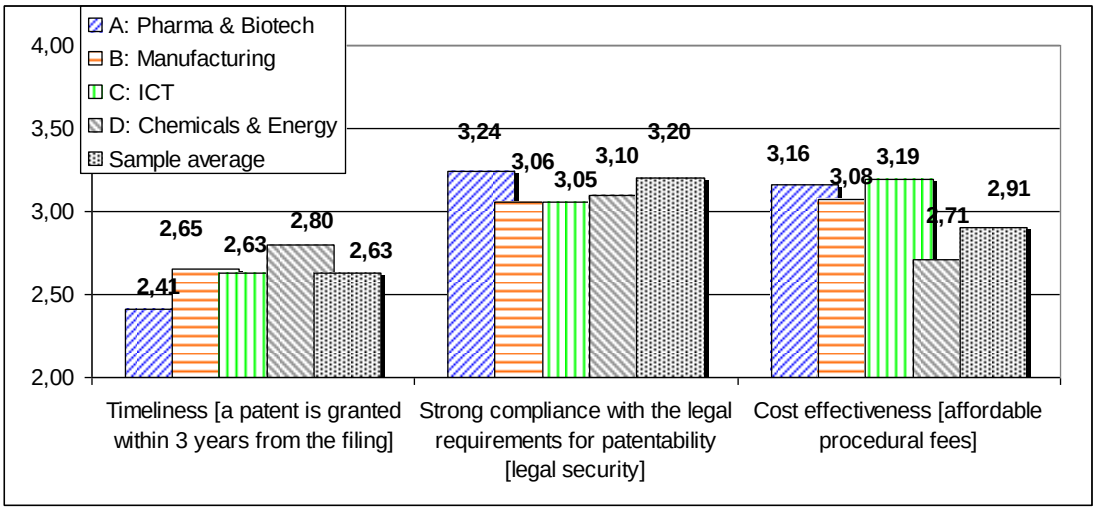


Figure 6 shows the different evaluations from companies operating in the selected macro sectors: the average ratings are not significantly dissimilar, suggesting that the dimensional factor matters across industries.

Figure 6 Importance (expressed through relative ranking) of the components of the quality of the patent system; values are broken down by main industrial class. 2.5 is the middle value



In the following Table 7 we move to a more detailed analysis of patent **quality from a systemic perspective**. The focus goes beyond the simple examination and grant. Companies were asked to rank five different items rather than express a scalar evaluation of each of them[12].

One interesting piece of evidence emerged: "High legal certainty concerning patentable subject matter" ranks first, both for large companies and SMEs. Moreover, as expected "Minimised fees for obtaining and handling patents" is much more important for SMEs. The results clearly suggest that patent users consider a clear and secure definition of the boundaries of patentable subject matter to be extremely relevant for patent quality. This consideration might imply that companies perceive uncertainty on patentable subject matter as a potential driver of low quality patents.

[12] Please note that because this question required ranking five items (and the "Other" option), the rating values are higher than are those for the rest of the questionnaire, ranging from 1 to 6.

The results on enforcement suggest that initiatives to improve access to justice for patent owners are likely to have strong impacts on the perceived quality of the European patent system.

Table 7 Ranks of the items according to their relative importance for the quality of the patent system (Ranking scale: 6th place / lower importance / rate 1 – 1st place / higher importance / rate 6). Note: the 6th option "Other (please specify)" received very few answers and it is not included here

Answer Options	% of rank 1st or 2nd or 3rd	Rating Average	Overall Rank
High legal certainty concerning patentable subject matter	78%	4.65	1st
Strong enforcement tools and easy access to justice	70%	4.31	2nd
Complete and clear disclosure of inventions	57%	3.81	3rd
Minimised fees for obtaining and handling patents	48%	3.61	4th
Timely grant of patents	49%	3.54	5th

Company size: employees (more/less than 250)	Large companies		SMEs	
Answer Options	% of rank 1st 2nd 3rd	Rat. Avg	% of rank 1st 2nd 3rd	Rat. Avg
High legal certainty concerning patentable subject matter	83%	4.86	66%	4.23
Strong enforcement tools and easy access to justice	76%	4.43	66%	4.27
Complete and clear disclosure of inventions	57%	3.74	60%	3.94
Minimised fees for obtaining and handling patents	36%	3.23	65%	4.20
Timely grant of patents	45%	3.45	55%	3.64

Table 8 reports rating averages and the percentages of the top ranks for all the groups of firms and each component of systemic patent quality while in Figure 7 the most significative and clear trends have been charted. For the items "Complete and clear disclosure of inventions" and "Strong enforcement tools and easy access to justice" it is not evident an explicit correlation with firm size.

Table 8 Importance (expressed through relative ranking) of the components of the quality of the patent system; values are broken down by firm size.

Observations	19		22		19		98	
Answer Options	% top rank	Rat. Avg	% top rank	Rat. Avg	% top rank	Rat. Avg	% top rank	Rat. Avg
High legal certainty on patentable subject matter	53%	3.74	77%	4.64	75%	4.44	83%	4.86
Strong enforcement tools and easy access to justice	63%	4.13	55%	3.86	67%	4.40	76%	4.43
Complete and clear disclosure of inventions	56%	3.89	50%	3.59	68%	4.37	57%	3.74
Minimised fees for obtaining and handling patents	100%	5.25	59%	4.09	59%	3.82	36%	3.23
Timely grant of patents	57%	3.93	63%	3.79	44%	3.33	45%	3.45

Figure 7 Importance (expressed through relative ranking) of selected components of the quality of the patent system; values are broken down by firm size. 3.5 is the middle value

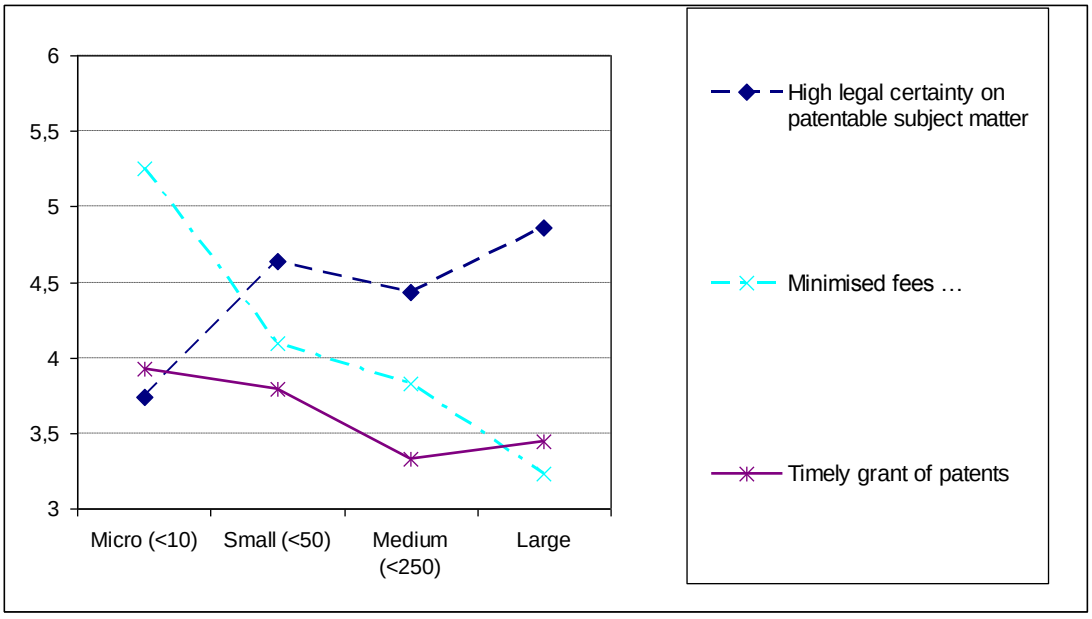
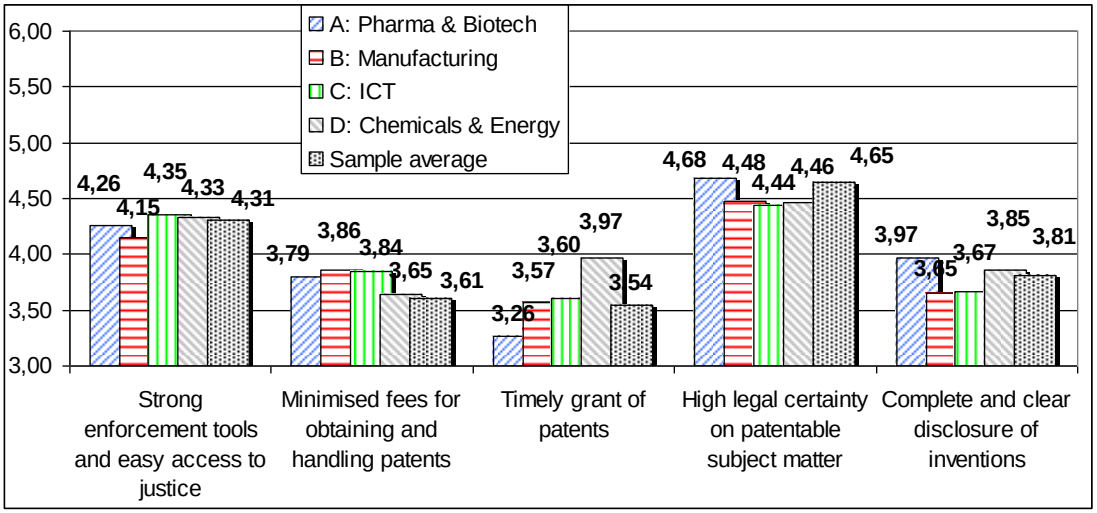


Figure 8 shows the different evaluations from companies operating in the selected macrosectors.

Figure 8 Importance (expressed through relative ranking) of the components of the quality of the patent system; values are broken down by main industrial class. 3.5 is the middle value



For all the three previous questions on the relevance of the components of quality, we performed additional analyses to investigate possible correlations between:

- the assigned rate to each component of patent quality and the preferred filing strategy adopted when applying at the EPO (directly at the EPO, first at the National Patent Office and then at the EPO, through PCT, etc.[13]);
- the assigned rate to each component of patent quality and the patent portfolio size.

Concerning filing strategies, no significant correlation has been found even if companies preferring to file first at their National Office seem to assign a slightly higher relevance to the cost components while those filing directly at the EPO seem slightly less interested in cost issues and slightly more in legal compliance and security. With respect to patent portfolio size, as expected firms with larger portfolios turn to be less concerned with the cost issues and more on the legal security.

Taking into consideration the answers that they provided for the previous questions, respondents were then required to **rate the quality of the European patent system and of the four most important patent offices in the world**, in terms of the number of applications and the relevance of the corresponding market: the Japan Patent Office (JPO), the Korean patent office (KIPO), the Chinese patent office (SIPO) and the US patent office (USPTO) (Table 9). We asked companies to provide an evaluation of non-European offices only if they had significant past experience with them.
The overall values assign to the European system the highest rating average[14] among the five offices, and approximately three fourths of the respondents rated its quality 3 or 4. It is important to recall that here we are comparing the European patent system as a whole (and not only the EPO) with other geographical areas where the jurisdiction of the patent office is national. In the following questions, we address the EPO in detail.
Among the non-European POs, only the JPO received an overall judgement above the middle value of 2.5, with more than half of the respondents considering the quality of the PO good or high. The perceived quality of the KIPO and the USPTO are very close to each other.

[13] Responses to the correspondent question are described in section 2.4.3 “Filing strategies in Europe”.
[14] It is worth noting that only one respondent answered “Very Low” quality for the European system.

Table 9 Perception of the current quality of the European Patent System and of selected patent offices, on the basis of the previous answers on the components of patent quality (Rating scale: 1 = very low quality – 4 = very high quality)

Answer Options	% of 3 and 4	Rating Average
European Patent System	77%	2.90
JPO (Japan)	68%	2.74
USPTO (U.S.A.)	44%	2.40
KIPO (Republic of Korea)	39%	2.33
SIPO (China)	33%	2.19

Company size: employees (more/less than 250)	Large companies		SMEs	
Answer Options	% 3-4	Rat. Avg	% 3-4	Rat. Avg
European Patent System	83%	2.97	69%	2.79
JPO (Japan)	64%	2.71	74%	2.77
USPTO (U.S.A.)	37%	2.30	54%	2.56
KIPO (Republic of Korea)	48%	2.43	18%	2.00
SIPO (China)	36%	2.29	19%	1.85

Analysing the answers by the size of the respondent's firm, the main difference is that the SMEs seem to appreciate the European system, the KIPO and the SIPO more than the large companies. The JPO received a similar appreciation, both from large companies and SMEs, even if the share of "positive" respondents is higher for SMEs, meaning that when assessing the quality of the JPO large companies more often selected the values 3 and 2 - approximating the middle rating. Finally, it is interesting to note that the USPTO received a remarkably higher appreciation from SMEs than from large firms.

Table 10 shows the variation in the ratings of each PO, according to the importance the respondent assigned to each option proposed in defining the quality of the patent system. The "overall" column reports the values of Table 9, whereas columns (A), (B) and (C) refer to those respondents that expressed a clear preference on each of the following aspects of the quality of the system:

(A) Timeliness [a patent is granted within three years from the filing];
(B) Strong compliance with the legal requirements for patentability [legal security];
(C) Cost effectiveness [affordable procedural fees].

The most interesting evidences are:

- Respondents ranking "Timeliness" as the first or the second most important characteristic for the quality of the patent system gave the European Patent System a higher score. This might to some extent reflect an appreciation by patent users for the relatively small backlog of the EPO, as compared to the other POs.

- The incidence of companies giving a high valuation to the USPTO decrease from 43% to 39% when focusing on the subsample of firms mostly concerned with compliance with legal requirements for patentability.

Table 10 Perceived quality of the European patent system and of the four most relevant patent offices. “Overall” rating and breakdown on the base of which aspect of the quality of the patent system is preferred: (A) Timeliness: (B) Strong compliance with the legal requirements for patentability or (C) Cost effectiveness

	Overall		(A)		(B)		(C)	
Answer Options	% of 3 and 4	Rating Average	% of 3 and 4	Rating Average	% of 3 and 4	Rating Average	% of 3 and 4	Rating Average
European Patent System	77%	2.90	81%	2.93	77%	2.88	75%	2.88
USPTO (U.S.A.)	44%	2.40	51%	2.49	41%	2.36	46%	2.45
JPO (Japan)	68%	2.74	72%	2.74	63%	2.71	69%	2.74
SIPO (China)	33%	2.19	26%	2.11	37%	2.23	30%	2.17
KIPO (Republic of Korea)	39%	2.33	38%	2.35	452%	2.37	36%	2.30

In the survey, we asked patent holders who had developed some innovations but, although patentable, had decided not to apply for patents to protect it, to explain the motives underlying their decisions. The overall results seem to point out that the difficulties and costs of monitoring the market and enforcing granted patents against imitators are considered the most relevant reasons for adopting other measures to protect innovations.
Interestingly, such motives have a higher impact than possible uncertainty on the validity on granted patents, stressing once more how effectiveness and quality of the patent system as a whole is influenced by additional factors beyond the goodness of the examination process. This is especially true for SMEs.
The cost of patenting, in terms of fees, enforcement or patent attorneys, is indicated by a large share of respondents. The differences between the responses of SMEs and large companies are highlighted in the second part of the following table.

Table 11 The most important motives for the decision not to patent innovations.

Answer Options	%
Patents are not effective in preventing imitation of the company's products or services	38.7%
The fees for patent application, validation and renewal are too high	33.8%
The current cost for enforcing patents is too high for the company	30.3%
The actual validity of granted patents is uncertain	24.6%
The cost of patent attorneys to manage the application of patents in the European system is too high	23.2%
The duration of the granting process is too long compared to the lifecycle of the technology	17.6%
The company exports to countries with limited IPR protection	9.9%
The industry of the company is overcrowded with patents	9.2%
The company had bad past experiences with the patent system, such as litigations	1.4%

Company size: employees (more/less than 250)	Large companies	SMEs
Answer Options	%	%
The duration of the granting process is too long compared to the lifecycle of the technology	21.5%	12.9%
Patents are not effective in preventing imitation of the company's products or services	50.6%	24.2%
The current cost for enforcing patents is too high for the company	22.8%	40.3%
The cost of patent attorneys to manage the application of patents in the European system is too high	12.7%	37.1%
The fees for patent application, validation and renewal are too high	21.5%	50.0%
The actual validity of granted patents is uncertain	32.9%	12.9%
The company exports to countries with limited IPR protection	15.2%	3.2%
The industry of the company is overcrowded with patents	10.1%	8.1%
The company had bad past experiences with the patent system, such as litigations	0.0%	1.6%

A more detailed analysis of the results has been carried out keeping into consideration the standard classification of company size. Table 12 reports the percentages for all the groups of firms and each motive not to patent innovations. The results highlight the high relevance of cost issues for smaller companies. Limited efficacy in preventing imitation is the most recurrent motive for large companies.

Table 12 The most important motives for the decision not to patent innovations: responses broken down by company size.

Company size (number of employees)	Micro (<10)	Small (<50)	Medium (<250)	Large
Observations	18	25	20	100
Answer Options	%	%	%	%
The duration of the granting process is too long compared to the lifecycle of the technology	16.7%	12.0%	10.5%	21.5%
Patents are not effective in preventing imitation of the company's products or services	22.2%	24.0%	26.3%	50.6%
The current cost for enforcing patents is too high for the company	55.6%	36.0%	31.6%	22.8%
The cost of patent attorneys to manage the application of patents in the European system is too high	55.6%	32.0%	26.3%	12.7%
The fees for patent application, validation and renewal are too high	38.9%	60.0%	47.4%	21.5%
The actual validity of granted patents is uncertain	0.0%	12.0%	26.3%	32.9%
The company exports to countries with limited IPR protection	0.0%	4.0%	5.3%	15.2%
The industry of the company is overcrowded with patents	0.0%	8.0%	15.8%	10.1%
The company had bad past experiences with the patent system, such as litigations	0.0%	0.0%	5.3%	0.0%

2.4.3 Filing strategies in Europe

The current design of the European patent system allows innovators to follow different routes for patent applications at the EPO. In the survey, we have investigated the frequency of usage of specific routes and related rationales.

The most frequent filing strategy (45.1%) is to file first at a National PO and then at the EPO (more than 55% for SMEs), followed by first filing through PCT procedure (24.1%).

The reasons companies indicated more often to explain the first filing at a National PO are the following:

- "Obtain an early priority and postpone the application to the EPO while collecting data on the technological and market value of the patented innovation"
- "Obtain an early priority and postpone the translation costs and other fees at the EPO".

Large companies also considered to be very relevant the option to "Obtain a search report / preliminary assessment of patentability from the National Patent Office at a lower cost than the EPO". Hence, most of the companies seem to attribute an option value to the rationale for applying first at a National PO.

The average number of European countries (EU27) in which respondents' EPO patents have been validated and renewed for at least one year is between 3 and 5 for 46.1% of the sample.

However, it is worth noting that we have a subsample of respondents (9.7%) that validate their EPO-granted patents in more than 20 countries.

2.4.4 Relevance of patent costs

The European patent system is characterised by patent costs that are significantly higher than those in other systems. In the survey, we have analysed in detail the impact of such a specific structure of costs. In particular, two questions focus on the cost of patent activities in terms of **procedural fees** and **translation costs**. Respondents were requested to evaluate different items/statements by providing their level of agreement (or disagreement).

55% of the sample considers the current structure complex and fragmented. For 78% of SMEs the amount of fees until the grant of patents represents a significant financial burden.

Concerning the costs for validation across European countries, we investigated their impacts using a threshold of four countries (which corresponds to the average number of validated countries). Results clearly indicate the non-negligible impact of marginal additional validation costs. **In 41% of the cases, maintenance fees for validated patents are a large obstacle for the company, when considering less than four validated countries**. The percentage increases dramatically to 76% (93% in the case of SMEs) when considering more than four countries.

Companies were also asked to express their opinions on the impact on average patent quality of the introduction of incremental fees based on the number of pages and claims. Different studies have shown that in recent years there has been an increase in the average voluminosity of patents in Europe, in terms of pages and number of claims, with the risk of a negative impact on the workload for granting authorities. Both large companies and SMEs do not seem to envisage an improvement of patent quality from the possible introduction of this type of fee structure.

Table 13 Level of agreement on statements concerning the current structure of the fees to be paid from the original application to the validation and renewal of EPO patents (Rating scale: 1 = strongly disagree – 4 = strongly agree)

Answer Options	% of 3 and 4	Rating Average
The current structure of the fees for patent examination, publication, validation is complex and too much fragmented.	55%	2.73
The amount of fees until the grant of the patent represents a significant obstacle for the company	52%	2.66
The amount of maintenance fees for patents validated in more than four countries represents a significant obstacle for the company	76%	3.07
The amount of maintenance fees for patents validated in less than four designated countries represents a significant obstacle for the company	41%	2.35
The introduction of incremental fees based on the number of pages and claims improves the quality of the patent system	40%	2.22

Company size: employees (more/less than 250)	Large companies		SMEs	
Answer Options	% 3-4	Rat. Avg	% 3-4	Rat. Avg
The current structure of the fees for patent examination, publication, validation is complex and too much fragmented.	43%	2.51	73%	3.07
The amount of fees until the grant of the patent represents a significant obstacle for the company	36%	2.35	78%	3.15
The amount of maintenance fees for patents validated in more than four countries represents a significant obstacle for the company	65%	2.83	93%	3.47
The amount of maintenance fees for patents validated in less than four designated countries represents a significant obstacle for the company	29%	2.08	61%	2.81
The introduction of incremental fees based on the number of pages and claims improves the quality of the patent system	40%	2.20	35%	2.22

The difference in costs between the European patent system and other systems is mostly due to translation requirements. The data presented in Table 14 clearly confirm this point**: translation costs represent a heavy financial burden for 77% of respondents**, and there is an unanimous agreement on the fact that the EU "Community" Patent should provide a significant reduction beyond the current benefits generated by the London Agreement.

Table 14 Level of agreement on statements concerning the cost of the translation of description and claims for EPO patents before validation in each designated country (Rating scale: 1 = strongly disagree – 4 = strongly agree)

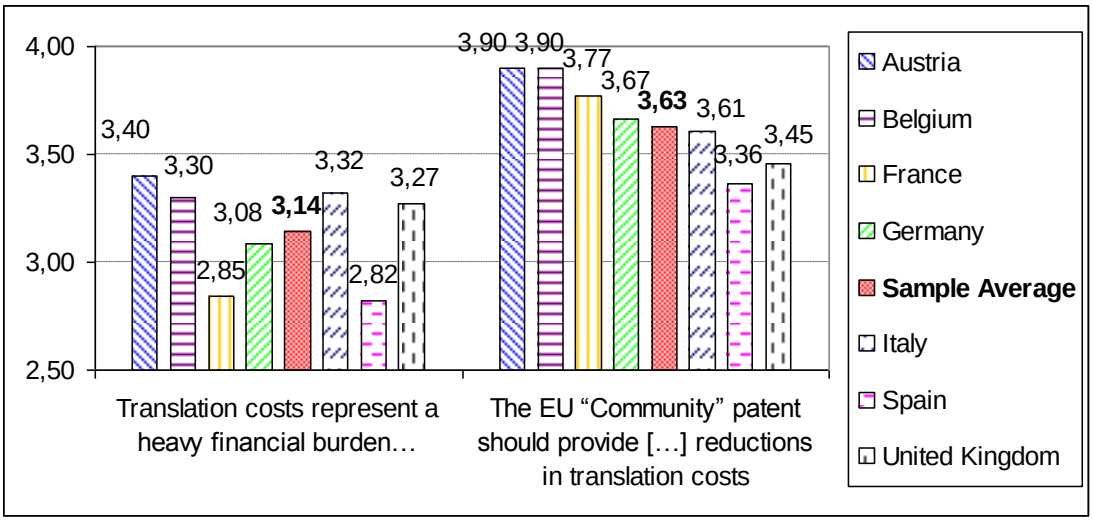
Answer Options	% of 3 and 4	Rating Average
Translation costs represent a heavy financial burden for the company, that harms the use of the patent system.	77%	3.14
Translation of claims increases the uncertainty of granted patents and expose the patentee to higher risk of ex-post infringement.	46%	2.48
The London Agreement, in its current status of application, has sufficiently mitigated the problems of translation	51%	2.54
The EU "Community" patent should provide significant further reductions in translation costs	94%	3.63

Company size: employees (more/less than 250)	Large companies		SMEs	
Answer Options	% 3-4	Rat. Avg	% 3-4	Rat. Avg
Translation costs represent a heavy financial burden for the company, that harms the use of the patent system.	74%	3.09	81%	3.21
Translation of claims increases the uncertainty of granted patents and expose the patentee to higher risk of ex-post infringement.	41%	2.35	53%	2.68
The London Agreement, in its current status of application, has sufficiently mitigated the problems of translation	59%	2.61	34%	2.37
The EU "Community" patent should provide significant further reductions in translation costs	93%	3.62	97%	3.67

A high level of agreement has been expressed by firms with more than 100 patents for the item "Translation costs represent a heavy financial burden for the company, that harms the use of the patent system". The result should be interpreted considering that all such patent owners reported to file applications in more than 3 European countries on average (and 19% of them declared to validate patents on average in 10 or more EU countries).

A further analysis has been carried out by considering the respondents' nationalities for the countries from which a sufficiently large number of replies have been received, namely Austria, Belgium, France, Germany, Italy, Spain and United Kingdom. The following figure reports the resulting averages compared with that of the whole sample.

Figure 9 Relevance of the items "Translation costs represent a heavy financial burden for the company, that harms the use of the patent system" and "The EU "Community" patent should provide significant further reductions in translation costs" by respondents country.



2.4.5 The quality of the patent system – the search and examination process

The comparison among the selected POs on the satisfaction on substantive examination services is reported in Table 15. The EPO obtained the highest rating (3.07 out of 4.00). The JPO and the average European National PO[15] are above the value of 2.5: the median user is on average satisfied about their substantive examination services.

Table 15 Comparative evaluation of respondents' satisfaction with the substantive examination services in selected patent offices: (Rating scale: 1 = very poor – 4 = very good)

Answer Options	% of 3 and 4	Sub. Exam. Rating Avg.	Overall eval. Rating Avg.
National patent office (country of your company)	56%	2.57	Na
EPO (European Patent Office)	84%	3.07	2.90
USPTO (U.S.A.)	46%	2.44	2.40
JPO (Japan)	60%	2.66	2.74
KIPO (Republic of Korea)	45%	2.34	2.33
SIPO (China)	32%	2.21	2.19

Concerning the specific components of the **examination process at the EPO**, respondents expressed a largely positive evaluation on the clarity of the corresponding search report. **63% of the sample considered the timing in providing the search report to be adequate.**
The communication with the examiner and the provision of guidance from the examiner in drafting and adjusting the contents of the patent are areas that, according to the evaluation of the users, might be improved. In general, we observe dissatisfaction with the duration of the substantive examination until the grant. However, it is worth recalling that in previous

[15] The average rating for the National POs is the result of the aggregation among all the NPOs.

questions, the respondents ranked "timing" as a less relevant component of quality with respect to cost effectiveness and compliance with patentability criteria.

Table 16 Level of agreement on statements, when the company applies for a patent at the EPO (Rating scale: 1 = strongly disagree – 4 = strongly agree)

Answer Options	% of 3 and 4	Rating Average
The search report of the patent examiner was clear and satisfactory	81%	3.00
The prior art reported by the patent examiner was accurate and complete	68%	2.73
The timing in providing the search report was adequate	63%	2.71
The duration of the substantive examination process was adequate (until the grant)	34%	2.19
The communication with the examiner was effective and fast	58%	2.64
The examiner provided useful guidance in drafting and adjusting the contents of the patent	47%	2.39
The final patent document was satisfactory in terms of scope	78%	2.86

Company size: employees (more/less than 250)	Large companies		SMEs	
Answer Options	% 3-4	Rat. Avg	% 3-4	Rat. Avg
The search report of the patent examiner was clear and satisfactory	85%	3.06	74%	2.89
The prior art reported by the patent examiner was accurate and complete	78%	2.88	49%	2.47
The timing in providing the search report was adequate	62%	2.68	64%	2.75
The duration of the substantive examination process was adequate (until the grant)	25%	2.04	48%	2.43
The communication with the examiner was effective and fast	59%	2.61	56%	2.67
The examiner provided useful guidance in drafting and adjusting the contents of the patent	47%	2.42	46%	2.35
The final patent document was satisfactory in terms of scope	83%	2.93	68%	2.74

It is interesting to note (Table 17) that just half the respondents declare that the examination process has been similar and standardised across the different EPO applications. Such evidence stresses the importance of implementing appropriate tools for controlling the patent process and examination activities. Respondents do not have a unanimous perception of an upward or downward trend in the quality of the examination process at the EPO in recent years.

Table 17 Level of agreement on statements on the quality of the examination process (Rating scale: 1 = strongly disagree – 4 = strongly agree)

Answer Options	% of 3 and 4	Rating Average
The quality of the examination process has been similar and standardized across the different applications made by the company.	49%	2.47
In recent years the quality of the examination process has been increasing	48%	2.44
In recent years the speed of the examination process has been increasing	37%	2.25

Company size: employees (more/less than 250)	Large companies		SMEs	
Answer Options	% 3-4	Rat. Avg	% 3-4	Rat. Avg
The quality of the examination process has been similar and standardized across the different applications made by the company.	46%	2.45	54%	2.52
In recent years the quality of the examination process has been increasing	52%	2.47	38%	2.36
In recent years the speed of the examination process has been increasing	39%	2.26	34%	2.24

2.4.6 The quality of the patent system – the enforcement of granted patents

A section of the survey has been devoted to analysing the issue of patent enforcement. The data reported in Table 18 highlights that most frequent typology of infringement for surveyed companies is an infringement from an imitator in Europe, North America or Japan. Thus less relevant than infringements from pure imitators, the case of infringement originated from products covered by two or more overlapping patents belonging to different patentees is not negligible. In principle, such cases might originate from improperly granted, overlapping patents. Interestingly, the share of SMEs declaring to have incurred this type of infringement is significantly higher (50%) than the share of large companies (40%).

Table 18 Ratings of the relevance of different patent infringement typologies for respondents' companies (Rating scale: 1 = high relevance – 4 = no relevance)

Answer Options	% of 3 and 4	Rating Average
Infringement from an imitator from Europe, North America or Japan	75%	3.08
Infringement from an imitator from other countries	63%	2.80
Infringement caused by a product covered by two overlapping patents belonging to two patentees	43%	2.26

Company size: employees (more/less than 250)	Large companies		SMEs	
Answer Options	% 3-4	Rat. Avg	% 3-4	Rat. Avg
Infringement from an imitator from Europe, North America or Japan	78%	3.16	69%	2.94
Infringement from an imitator from other countries	69%	3.00	57%	2.459

Company size: employees (more/less than 250)	Large companies		SMEs	
Answer Options	% 3-4	Rat. Avg	% 3-4	Rat. Avg
Infringement caused by a product covered by two overlapping patents belonging to two patentees	40%	2.17	50%	2.45

The analysis of the perceptions on the efficacy of the European litigation system by the European firms shows some clear results (Table 19). First, the current **fragmentation across different jurisdictions generates excessively high legal costs and excessive uncertainty** on the actual enforceability of patents, eventually harming patenting incentives. Second, the expected costs to access patent courts are so high that they discourage patent owners from filing law suits. Third, the risk of diverging outcomes from infringement proceedings at different European national courts is perceived of strong negative relevance on the incentives for patenting. Finally, more than two thirds of surveyed companies strongly agree on the fact that the lack of technically trained judges in some European national courts is a major obstacle to enforceability. It is worth stressing that the themes addressed in this question received one of the most unanimous and highest average levels of agreement by respondents across the whole questionnaire. This points to the extreme relevance of any policy initiative at national or international levels aimed at providing better enforcement power to European innovative companies.

Table 19 Level of agreement on statements about the enforcement of granted patents in Europe: (Rating scale: 1 = strongly disagree – 4 = strongly agree)

Answer Options	% of 3 and 4	Rating Average
The fragmentation of the European patent system across different jurisdictions generates too high legal costs due to the duplications of infringement proceedings.	96%	3.64
The risk of diverging outcomes from infringement proceedings at different European Courts has a strong negative impact on the incentives for patenting.	85%	3.23
The current costs to access patent Courts discourages patent owners from filing suits for patent infringement.	87%	3.27
The cost of translation during infringement proceedings in the different European jurisdictions strongly reduces the enforceability of patented innovations.	67%	2.92
The lack of technically trained judges in some European Courts is a major obstacle to enforceability.	78%	3.15
Since most of the patent disputes are resolved through settlements, the characteristics of the current European patent litigation system has a limited impact on patent activities.	50%	2.38

Company size: employees (more/less than 250)	Large companies		SMEs	
Answer Options	% 3-4	Rat. Avg	% 3-4	Rat. Avg
The fragmentation of the European patent system across different jurisdictions generates too high legal costs due to the duplications of infringement proceedings.	96%	3.65	96%	3.65
The risk of diverging outcomes from infringement proceedings at different European Courts has a strong negative impact on the incentives for patenting.	81%	3.14	91%	3.35
The current costs to access patent Courts discourages patent owners from filing suits for patent infringement.	81%	3.15	96%	3.49
The cost of translation during infringement proceedings in the different European jurisdictions strongly reduces the enforceability of patented innovations.	57%	2.70	81%	3.28

Company size: employees (more/less than 250)	Large companies		SMEs	
Answer Options	% 3-4	Rat. Avg	% 3-4	Rat. Avg
The lack of technically trained judges in some European Courts is a major obstacle to enforceability.	76%	3.11	83%	3.22
Since most of the patent disputes are resolved through settlements, the characteristics of the current European patent litigation system has a limited impact on patent activities.	47%	2.28	55%	2.58

2.4.7 Proposal for the improvement of the quality of the European patent system

In this section, respondents are asked to express their level of agreement on a set of statements that relate to important policy initiatives that are expected to have a strong impact on the quality of the European patent system.

The first question is devoted to the prospective introduction of the EU Patent. Companies are not directly asked to express their views on the opportunity to introduce the EU patent or not but rather to communicate their expectations on a set of features of the EU Patent. From this perspective, the reported results represent the point of view of European patent users and do not take into account all the costs and trade-offs of implementing such features. Nevertheless, the relative importance attributed to different properties of the EU patent can provide useful guidance for policymakers.

Nearly all the surveyed **companies agree on the fact that the EU Patent should provide a very high level of legal certainty**. Beyond this point, large relevance is assigned to the cost factor, in terms of a **strong reduction of both translation costs and administrative costs** related to validation procedure.

Table 20 Ratings of issues related to the establishment of the EU Patent according to their relevance: (Rating scale: 1 = no relevance – 4 = high relevance)

Answer Options	% of 3 and 4	Rating Average
The EU Patent should raise the effectiveness of the fight against import of counterfeited and infringing goods across all EU borders.	82%	3.22
The EU patent should reduce translation costs.	92%	3.60
The EU patent should reduce the administrative burden by reducing the current procedural complexity.	86%	3.45
The EU patent should reduce administrative costs by having fewer validation procedures.	90%	3.46
The EU patent should provide for a very high level of legal certainty.	95%	3.59
The EU patent should be accompanied by free automated translations into different EU languages to improve access to patent documentation.	68%	2.93

Company size: employees (more/less than 250)	Large companies		SMEs	
Answer Options	% 3-4	Rat. Avg	% 3-4	Rat. Avg
The EU Patent should raise the effectiveness of the fight against import of counterfeited and infringing goods across all EU borders.	82%	3.16	83%	3.31

Company size: employees (more/less than 250)	Large companies		SMEs	
Answer Options	% 3-4	Rat. Avg	% 3-4	Rat. Avg
The EU patent should reduce translation costs.	90%	3.60	96%	3.64
The EU patent should reduce the administrative burden by reducing the current procedural complexity.	82%	3.34	93%	3.64
The EU patent should reduce administrative costs by having fewer validation procedures.	89%	3.44	91%	3.52
The EU patent should provide for a very high level of legal certainty.	94%	3.57	98%	3.66
The EU patent should be accompanied by free automated translations into different EU languages to improve access to patent documentation.	63%	2.80	75%	3.14

The second and third questions of this section address initiatives to improve the quality of patents at the level of the examination process. In particular, companies are asked to express their views on the likely effect on quality of raising the minimum requirements for inventive step, allowing a more direct interaction with patent examiners, allowing examination deferrals and introducing the possibility to pay for additional in-depth patent searches.

As reported in Table 21, among these initiatives the improvement of the interaction with patent examiners received a nearly unanimous agreement. Companies seem to suggest that this will significantly speed up the examination process and improve the clarity of granted patents. The need for better communication with the examiner is perceived to be very relevant, even though it is currently considered satisfactory by 58% of respondents.
On the contrary, examination deferral does not seem to have a positive impact on quality, especially according to the view of large companies.

Table 21 Level of agreement on possible initiatives to raise patent quality: (Rating scale: 1 = strongly disagree – 4 = strongly agree)

Answer Options	% of 3 and 4	Rating Average
Raising the minimum required inventive step for granting a patent will improve the quality of the patent system.	63%	2.83
The possibility to interact with the patent examiners in a more direct and fast way (e.g. through emails or telephone calls) will significantly speed up the examination process and improve the clarity of the granted patent.	91%	3.39
The possibility to pay for additional optional in-depth patent searches will improve the quality of the patent system.	59%	2.72
The possibility to defer the examination will improve the quality of the patent system.	34%	2.08

Company size: employees (more/less than 250)	Large companies		SMEs	
Answer Options	% 3-4	Rat. Avg	% 3-4	Rat. Avg
Raising the minimum required inventive step for granting a patent will improve the quality of the patent system.	59%	2.78	68%	2.90
The possibility to interact with the patent examiners in a more direct and fast way (e.g. through emails or telephone calls) will significantly speed up the examination process and improve the clarity of the granted patent.	91%	3.35	91%	3.41

Company size: employees (more/less than 250)	Large companies		SMEs	
Answer Options	% 3-4	Rat. Avg	% 3-4	Rat. Avg
The possibility to pay for additional optional in-depth patent searches will improve the quality of the patent system.	**57%**	**2.63**	**64%**	**2.83**
The possibility to defer the examination will improve the quality of the patent system.	**24%**	**1.89**	**50%**	**2.37**

Finally, we have explored the level of awareness and the evaluation of a recent initiative tried in the U.S. and Australia to improve the patent examination process by means of third party reviews, namely, the peer-to-patent review. In Chapter 4 of the study we will analyse in detail the costs and benefits of this type of initiative for patent quality. Two thirds of respondents are unaware of the peer-to-patent review, and approximately 51% do not consider it a useful tool to improve patent quality. In fact, only approximately 30% are in favour of this initiative, whereas the remaining 19% preferred to comment on the question with further details: most of these comments express doubts on the usefulness of such a review and advise a more effective role for the existing instruments.

2.5 Results from the survey to Universities and Public Research Organisations

The following paragraphs present general statistics about the sample of respondent Universities and PROs. Although exchanges and interactions between science and industry have always occurred, perhaps in a less visible way, only in the latest years the policies of universities for the transfer of technology have become deliberate. The creation of dedicated units for technology transfer is just the most visible of the actions taken in this direction.
In the USA, the creation of dedicated TTOs internal to research universities has became more and more common during the 1970s and 1980s and after the Bayh–Dole Act, as opposed to the previous period, when the management of Intellectual Property Rights (IPRs) was mostly delegated to external institutions, acting on behalf of many different universities, such as the Research Corporation (Sampat & Nelson, 1999). In Europe, a considerable attention was given to the commercial activities of universities by the national and local governments, which sow technology transfer as a way to sustain the competitiveness of national industries.

TTOs acts as an intermediary between the Faculty members, which are expected to produce inventions and disclose them, and the firms or other potential investors in the high-tech market, which are interested in acquiring the technological assets. The job of TTOs ranges from the receipt of disclosures to the commercialization of technological assets and normally consists of screening of prior-art, filing patent applications, licensing, procurement of research sponsorships or other research agreements with firms, and sometimes comprises the creation of spin-off companies and their incubation or early growth, including taking equity positions.

The work of TTOs and licensing offices of universities to some extent differs from that of a company that manages a patent portfolio. First, for universities it is often harder to assess the market value of a technological asset: for technologies with a strong knowledge-base, especially those that have been developed outside the commercial sector, the market applications may not easily be found. The inventors themselves fail in seeing potential applications or find it hard to communicate them to the investors (Martin & Scott, 2000). Second, academic inventions are often science-based and lie at the frontiers of knowledge. In principle, the more advanced a technology is with regard to the state-of-art, the higher is the preparation require to the examiners. Third, universities are more interested at licensing out or selling their inventions, after they are being patented, and this exposes them to considerable responsibility in case a patent is later deemed as invalid. Forth, academic inventors may more urgently feel the need to disclose their inventions quickly for scientific

purposes and are therefore more sensitive to the time required by patent procedures. Finally, universities often pursue several objectives at the same time: they are interested at licensing and cashing-in from their inventions, but at the same time they pursue a general commitment to the good of the society.

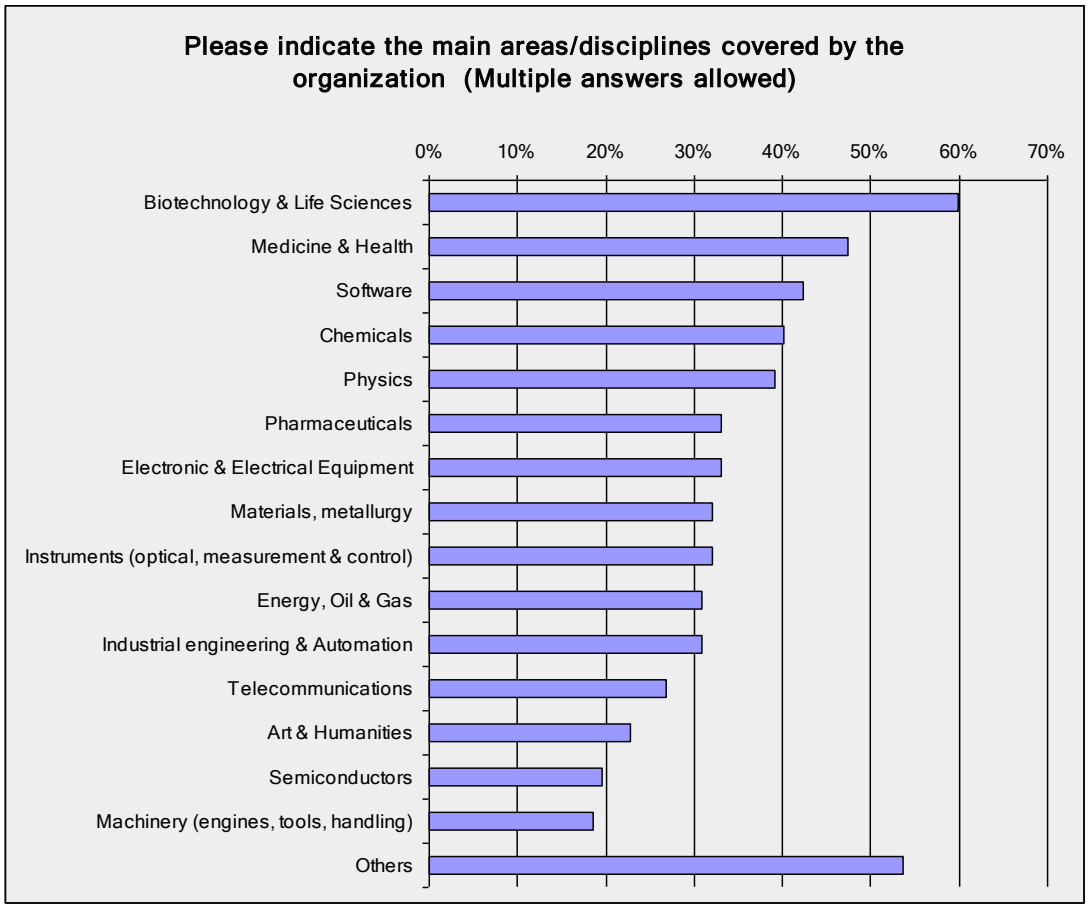
For these reasons, the retrieved data require caution in their interpretation, especially in light of the generalisation of obtained results. To this purpose, the comments on the results from the survey on universities and PROs will mostly focus on the comparison with the corresponding data that emerged from the questionnaire for companies.

2.5.1 The characteristics of the sample of respondents

The questionnaire was addressed to different types of possible respondents: universities (43%), public research centres (58%) and government agencies (3%).

The respondent organisations are active across many **scientific disciplines,** as it can be seen in Figure 10.The most represented technology fields are life sciences and medicine, followed by software and physics. Note that these are the fields of activity of surveyed organisations and not the technology areas of their patent portfolios.

Figure 10 Areas/disciplines covered by the organisations

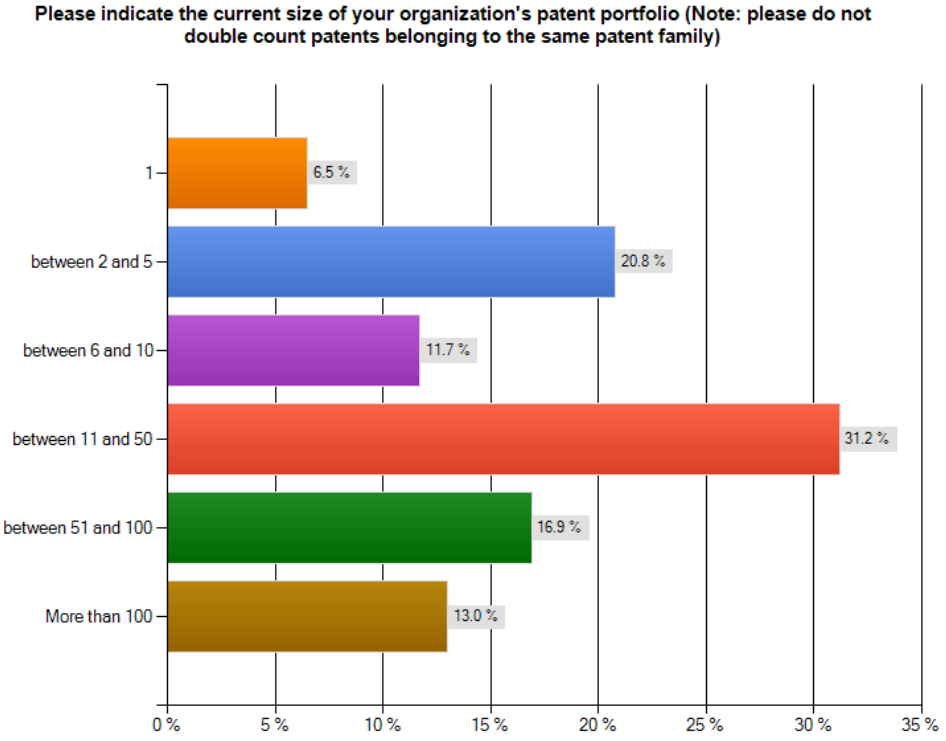


One third of the respondent organisations stated they employ 1,000 – 5,000 persons (these are mostly the universities); approximately 38% of the sample consists of institutions with a staff between 10 and 500 persons (typically public research centres focusing on a subset of scientific fields). Approximately 85% of respondents have less than 10 employees fully dedicated to the management of IPRs.

Answers were collected from **20 countries** of the EU27 members. The five most represented countries are Germany, Italy, the Netherlands, Spain, and the United Kingdom, which accounts for circa 50% of the respondents.

As expected, the **patent portfolios** (Figure 11) of universities and PROs are smaller than those reported on average by the sample of companies. Nevertheless, 30% of respondents have more than 50 patents, whereas 39% less than 10.

Figure 11 Size of patent portfolios for universities and PROs



2.5.2 Usage of the patent system - The determinants of patent quality

The results obtained from universities and PROs on the definition of the relevance of the different components of patent quality provided some interesting insights. The item with the highest rating is the “high inventive step” option (Table 22), which, on the contrary, was the last in the corresponding question answered by companies.

Table 22 Ratings of the importance of items related to legal compliance for assessing the quality of a patent (Rating scale: 1 = low importance – 4 = high importance)

Answer Options	% of 3 and 4	Rating Average
A high quality patent has a very high inventive step	**79%**	**3.16**
A high quality patent has an optimal balance between scope and legal certainty	**78%**	**3.13**
A high quality patent has a very clear disclosure of innovative contents	**76%**	**3.10**

The following Table 23 shows the ranking of the relative importance of three different measures of the quality of the patent system. The most relevant one for universities and PROs is “Cost effectiveness”: as it will be confirmed in the following questions, the issue of costs and fees is perceived as particularly significant for this type of respondent.

Table 23 Rankings of items according to their relative importance for the quality of the patent system (Ranking scale: 4th place / lower importance / rate 1 – 1st place / higher importance / rate 4). Note: the 4th option "Other (please specify)" received very few answers and it is not included here

Answer Options	% of rank 1st or 2nd	Rating Average	Overall Rank
Cost effectiveness [affordable procedural fees]	76%	3.10	1st
Timeliness [a patent is granted within 3 years from the filing]	65%	2.92	2nd
Strong compliance with the legal requirements for patentability [legal security]	59%	2.79	3rd

Similarly to the previous question, the final ranking of the items proposed to describe the quality of the patent system (Table 24) is very different from the one that emerged from firms' questionnaires. The "minimised fees" option obtained the highest average rating. Less relevance is attributed to the "disclosure" and "enforcement" options. Generally, we observe a smaller variance in the ratings with respect to what is observed for companies. This might be related to the fact that surveyed organisations have less experience with patent litigation and perceive a relatively lower risk of infringement. Indeed, firms ranked legal certainty and strong enforcement tools as the most important items.

Table 24 Rankings of items according to their relative importance for the quality of the patent system (Ranking scale: 6th place / lower importance / rate 1 – 1st place / higher importance / rate 1). Note: the 6th option "Other (please specify)" received very few answers and it is not included here

Answer Options	% of rank 1st, 2nd or 3rd	Rating Average	Overall Rank
Minimised fees for obtaining and handling patents	69%	4.18	1st
Timely grant of patents	65%	4.08	2nd
High legal certainty concerning patentable subject matter	63%	3.99	3rd
Strong enforcement tools and easy access to justice	58%	3.90	4th
Complete and clear disclosure of inventions	51%	3.82	5th

Based on the answers provided to the previous questions, respondents were then required to rate their perceptions of the quality of the European patent system and of the four most important POs in the world (Table 25). We asked organisations to provide an evaluation of non-European offices only if they have significant past experience with them. As expected, the number of responses for non-European offices are very low and, in particular, for the three Asian POs the results should be read with caution. It is worth noting that only one respondent answered "Very Low" about the quality of the European Patent System.

Table 25 Perception of the current quality of the European Patent System and of selected patent offices on the basis of previous answers on the components of patent quality (Rating scale: 1 = very low quality – 4 = very high quality)

Answer Options	% of 3 and 4	Rating Average
European Patent System	**80%**	**2.93**
JPO (Japan)	**(80%)**	**(3.00)**
USPTO (U.S.A.)	**65%**	**2.72**
KIPO (Republic of Korea)	**(18%)**	**(1.90)**
SIPO (China)	**(13%)**	**(1.73)**

2.5.3 Filing strategies in Europe

The average number of European countries (EU27) in which respondents' EPO patents have been validated and renewed for at least one year is between 3 and 5 for 37% of the sample. The differences with the sample of firms are evident: a larger share of universities and PROs choose to validate patents in just one country (15%) and two thirds of respondents in less than seven countries. Taking into account that universities and PROs are expected to develop radical innovations with a global impact and a potentially wide market, the evidence on validated countries probably reflects again the relevance of the cost factor for the surveyed organisations.

The most frequent filing strategy (50.7%) is to file first at a National PO and then at the EPO, followed by first filing through the PCT procedure (23.3%).
The reasons universities and PROs indicated more often to explain the first filing at a National PO are the following:

- "Obtain an early priority and postpone the application to the EPO while collecting data on the technological and market value of the patented innovation"
- "Obtain an early priority and postpone the translation costs and other fees at the EPO"

The percentages are very similar to what companies indicated.

2.5.4 Relevance of patent costs

The detailed analysis of the perceived impact of patent costs confirms that they actually represent a non-negligible burden for universities and PROs (Table 26 and Table 27). In particular, 90% of respondents consider the amount of maintenance fees for patents validated in more than four countries a significant obstacle. In addition, translation costs represent a factor potentially harming the patent system for more than 80% of respondents.

Table 26 Level of agreement on statements concerning the current structure of the fees to be paid from the original application to the renewal of EPO patents (Rating scale: 1 = strongly disagree – 4 = strongly agree)

Answer Options	% of 3 and 4	Rating Average
The current structure of the fees for patent examination, publication, validation is complex and too much fragmented.	60%	2.83
The amount of fees until the grant of the patent represents a significant obstacle for the organisation	77%	3.26
The amount of maintenance fees for patents validated in more than four countries represents a significant obstacle for the organisation	90%	3.49
The amount of maintenance fees for patents validated in less than four designated countries represents a significant obstacle for the organisation	54%	2.77
The introduction of incremental fees based on the number of pages and claims improves the quality of the patent system	40%	2.44

Table 27 Level of agreement on statements concerning the cost of the translation of description and claims for EPO patents before validation in each designated country (Rating scale: 1 = strongly disagree – 4 = strongly agree)

Answer Options	% of 3 and 4	Rating Average
Translation costs represent a heavy financial burden for the organization, that harms the use of the patent system.	82%	3.26
Translation of claims increases the uncertainty of granted patents and expose the patentee to higher risk of ex-post infringement.	48%	2.48
The London Agreement, in its current status of application, has sufficiently mitigated the problems of translation	50%	2.40
The EU "Community" patent should provide significant further reductions in translation costs	92%	3.59

2.5.5 The quality of the patent system – the search and examination process

The data obtained for the evaluation of the quality of the examination process at the EPO are very similar to those observed for firms, suggesting the absence of relevant biases between the two groups of respondents (Table 28 and Table 29). Also in the case of Universities and PROs we observe a good level of satisfaction with the search report provided by the EPO and the prior art analysis.

Table 28 Level of agreement on statements, when your organisation applies for a patent at the EPO (Rating scale: 1 = strongly disagree – 4 = strongly agree)

Answer Options	% of 3 and 4	Rating Average
The search report of the patent examiner was clear and satisfactory	79%	2.94
The prior art reported by the patent examiner was accurate and complete	69%	2.74
The timing in providing the search report was adequate	58%	2.65
The duration of the substantive examination process was adequate (until the grant)	48%	2.40
The communication with the examiner was effective and fast	60%	2.60
The examiner provided useful guidance in drafting and adjusting the contents of the patent	55%	2.51
The final patent document was satisfactory in terms of scope	79%	2.95

Table 29 Level of agreement on statements on the quality of the examination process (Rating scale: 1 = strongly disagree – 4 = strongly agree)

Answer Options	% of 3 and 4	Rating Average
The quality of the examination process has been similar and standardized across the different applications made by the organization.	68%	2.75
In recent years the quality of the examination process has been increasing	50%	2.54
In recent years the speed of the examination process has been increasing	40%	2.40

2.5.6 The quality of the patent system – the enforcement of granted patents

In the following tables (Table 30 and Table 31), we present the evidence collected across universities and PROs on the potential criticalities of the European litigation system.
As expected, the data reveal a generally lower importance of patent infringement for the respondent organisations compared to companies. However, there is strong agreement on the fact that the current average litigation costs can indeed discourage patent owners from filing suits and that the fragmentation of the European patent system across different jurisdictions contributes to generate very high legal costs.

Table 30 Ratings of the relevance of different patent infringement typologies for the organisation (Rating scale: 1 = high relevance – 4 = no relevance)

Answer Options	% of 3 and 4	Rating Average
Infringement from an imitator from Europe, North America or Japan	58%	2.44
Infringement from an imitator from other countries	41%	2.67
Infringement caused by a product covered by two overlapping patents belonging to two patentees	29%	2.95

Table 31 Please provide your level of agreement on the following statements about the enforcement of granted patents in Europe: (Rating scale: 1 = strongly disagree – 4 = strongly agree)

Answer Options	% of 3 and 4	Rating Average
The fragmentation of the European patent system across different jurisdictions generates too high legal costs due to the duplications of infringement proceedings.	92%	3.45
The risk of diverging outcomes from infringement proceedings at different European Courts has a strong negative impact on the incentives for patenting.	81%	3.17
The current costs to access patent Courts discourages patent owners from filing suits for patent infringement.	91%	3.38
The cost of translation during infringement proceedings in the different European jurisdictions strongly reduces the enforceability of patented innovations.	75%	3.00
The lack of technically trained judges in some European Courts is a major obstacle to enforceability.	75%	3.08
Since most of the patent disputes are resolved through settlements, the characteristics of the current European patent litigation system has a limited impact on patent activities.	56%	2.58

2.5.7 Proposal for the improvement of the quality of the European patent system

Concerning the expectations from the introduction of the EU Patent, universities and PROs generally express the same level of consensus indicated by companies on legal certainty and costs. However, a relatively higher relevance is attributed to the item that states “the EU Patent should reduce the administrative burden by reducing the current procedural complexity”. This probably reflects the fact that surveyed organisations have to bear non-negligible costs to deal with patent management activities.

Table 32 Please rate the following issues related to the establishment of the EU Patent according to their relevance: (Rating scale: 1 = no relevance – 4 = high relevance)

Answer Options	% of 3 and 4	Rating Average
The EU Patent should raise the effectiveness of the fight against import of counterfeited and infringing goods across all EU borders.	87%	3.40
The EU patent should reduce translation costs.	88%	3.54
The EU patent should reduce the administrative burden by reducing the current procedural complexity.	95%	3.60
The EU patent should reduce administrative costs by having fewer validation procedures.	89%	3.51
The EU patent should provide for a very high level of legal certainty.	94%	3.52
The EU patent should be accompanied by free automated translations into different EU languages to improve access to patent documentation.	74%	3.06

Table 33 Please provide your level of agreement on the following possible initiatives to raise patent quality: (Rating scale: 1 = strongly disagree – 4 = strongly agree)

Answer Options	% of 3 and 4	Rating Average
Raising the minimum required inventive step for granting a patent will improve the quality of the patent system.	**62%**	**2.93**
The possibility to interact with the patent examiners in a more direct and fast way (e.g. through emails or telephone calls) will significantly speed up the examination process and improve the clarity of the granted patent.	**91%**	**3.39**
The possibility to pay for additional optional in-depth patent searches will improve the quality of the patent system.	**69%**	**2.83**
The possibility to defer the examination will improve the quality of the patent system.	**48%**	**2.45**

2.6 Summary of findings

In this section, we summaries the most important and clear results that emerged from the two surveys. For the sake of clarity, the evidence is organised along the main themes addressed in the questionnaire.

Understanding the notion of patent quality

- Among three different options to assess the quality of a patent ("optimal balance between scope and legal certainty", "clear disclosure", and "high inventive step"), companies largely indicated "optimal balance" and "clear disclosure" as the most significant measures of quality, regardless of firm size; universities and PROs, in contrast, assigned to "inventive step" the highest importance. We argue that companies are well aware that quality builds on a balancing process in which strict legal compliance is just one component.

- Among the options to assess the quality of a patent system ("strong compliance with legal requirements for patentability", "cost effectiveness" and "timeliness"), large companies definitely consider legal certainty the most important requisite. SMEs, on the contrary, express a preference for cost effectiveness and only secondarily legal security, whereas they are almost unconcerned with timing. This result suggests that the effectiveness of the patent system in terms of procedural features depends to a higher extent on the pecuniary costs incurred for obtaining patents, rather than the speed.

- When asked to rank different items to indicate their relative importance for the quality of the patent system, "High legal certainty concerning patentable subject matter" ranked first, both for large companies and SMEs. SMEs, universities and PROs considered "Minimised fees for obtaining and handling patents" very important. The results suggest that companies consider a clear and secure definition of the boundaries of patentable subject matter to be extremely relevant for patent quality. This consideration might imply that companies perceive uncertainty on patentable subject matter as a potential driver of low quality patents.

- The difficulties and costs for monitoring the market and enforcing granted patents against imitators are considered the most relevant reasons for adopting other measures to protect innovations. Interestingly, such motives have a higher impact than possible uncertainty on the validity on granted patents, stressing once more how effectiveness and quality of the patent system as a whole is influenced by additional

factors beyond the goodness of the examination process. This is especially true for SMEs. The cost of patenting, in terms of fees, enforcement or patent attorneys, is indicated by a large share of respondents. Motives related to costs are much more relevant for SMEs than for large companies.

The perceived quality of different patent systems

- Companies assigned the European patent system the highest overall rating (2.90); the JPO received a positive evaluation too (2.74), whereas the rating averages of KIPO, USPTO and SIPO are below the middle value of 2.5.

- The European patent system received a higher rating average from respondents that ranked “Timeliness” as the first or the second most important characteristic for the quality of the pre-grant patent system. This might to some extent reflect an appreciation by patent users of the relatively small backlog of the EPO, as compared to the other POs.

The search and examination process

- The search report of the EPO patent examiner was considered clear and satisfactory by approximately 80% of the respondents

- 78% of the respondents are satisfied by the final EPO patent document in terms of scope.

- On average surveyed companies state a positive valuation of the completeness and quality of prior art retrieved by patent examiners at the EPO.

- The communication with and the provision of guidance from the examiner in drafting and adjusting the contents of the patent are areas that, according to the evaluation of the users, might be improved.

- Only half of the respondents declare that the examination process has been similar and standardised across the different EPO applications, confirming the presence of significant heterogeneity at the level of the examiner and of management of patent documents inside the EPO. Such evidence stresses the importance of implementing appropriate tools for controlling the patent process and examination activities. Respondents do not have a unanimous perception of an upward or downward trend in the quality of the examination process at the EPO in recent years.

Relevance of patent costs

- 55% of the sample of companies considers the current structure of fees complex and fragmented. For 78% of SMEs the amount of fees until the grant of patents represents a significant financial burden. Results clearly indicate the non-negligible impact of marginal additional validation costs. Maintenance fees for validated patents are a high obstacle for the company in 41% of the cases when considering less than four designated countries. Such percentage increases dramatically to 76% (93% in the case of SMEs) when considering more than four countries.

- Translation costs represent a heavy financial burden for 77% of respondents, and there is an unanimous agreement that the EU Patent should provide a significant reduction beyond the current benefits generated by the London Agreement.

Enforcement of granted patents

- The most relevant typology of infringement for surveyed companies is an infringement from an imitator in Europe, North America or Japan (71%), higher than that from an imitator located in other countries (63%).

- 96% of respondents agree on the fact that the current fragmentation across different jurisdictions generates excessively high legal costs and excessive uncertainty on the enforceability of patents, eventually harming patenting incentives.

- The expected costs of accessing patent courts are so high that they discourage patent owners from filing suits for 87% of surveyed companies.

- The risk of diverging outcomes from infringement proceedings at different European national courts has a strong negative impact on the incentives for patenting for more than 80% of respondents.

- More than two thirds of surveyed companies strongly agree on the fact that the lack of technically trained judges in some European courts is a relevant obstacle to enforceability.

Proposals for the improvement of the quality of the European patent system

- Nearly all of the surveyed companies agree on the fact that the EU Patent should provide a very high level of legal certainty. Moreover, large relevance is assigned to the cost factor, in terms of a strong reduction of both translation costs and administrative costs related to the validation procedure.

- Among the proposed initiatives, the improvement of the interaction with patent examiners received a nearly unanimous agreement. Respondents seem to suggest that this will significantly speed up the examination process and improve the clarity of granted patents.

Universities and PROs

- The component of patent quality which received the highest rating is the “high inventive step” option, which, on the contrary, was the last in the corresponding question answered by companies. Universities and PROs seem to give a particular relevance to the level of innovativeness of patents, even when all the options report high rating averages.

- the perceived impact of patent costs confirms that they actually represent a non-negligible burden for universities and PROs. In particular, 90% of respondents consider the amount of maintenance fees for patents validated in more than four countries a significant obstacle. In addition, translation costs represent a factor potentially harming the patent system for more than 80% of respondents.

- the data reveal a generally lower importance of patent infringement for the respondent organisations compared to companies. However, there is strong agreement on the fact that the current average litigation costs can indeed discourage patent owners from filing suits and that the fragmentation of the European patent system across different jurisdictions contributes to generate very high legal costs.

- Concerning the expectations from the introduction of the EU Patent, universities and PROs generally express the same level of consensus indicated by companies on legal certainty and costs. However, a relatively higher relevance is attributed to the item that states “the EU Patent should reduce the administrative burden by reducing the current procedural complexity”. This probably reflects the fact that surveyed organisations have to bear non-negligible costs to deal with patent management activities.

3 An empirical assessment of EPO patent quality through an analysis of opposition cases

3.1 Introduction

In this section, we conduct an empirical analysis based on European patent data that is expected to provide complementary quantitative information to the evidence collected through the surveys. In particular, we analyse a large sample of patent opposition cases that took place from 2000 to 2008. A patent opposition is a peculiar procedure of the EPO that allows third parties to question the actual validity of a granted patent during the first nine months after the grant date. Oppositions are not filed randomly, but they usually involve patents presenting certain characteristics (in terms of strategic value and technological relevance).
The observation of the incidence of EPO opposed patents and of the outcomes of the opposition proceedings can provide additional evidence on the quality of the patent examination process. However, we are aware of the fact that only a small fraction of patents are subject to opposition. Hence results cannot be fully extended to draw results on the quality for the "average" patent. Furthermore, it is clear that during opposition appeal proceedings the basis on which a patent is analysed may differ from that underlying the examination. Such important caveats are taken into consideration in the interpretation of results.

3.2 The opposition procedure

The opposition procedure and the appeals process are regulated by the European Patent Convention (EPC) in Parts V and VI, respectively. An opposition notice has to be filed within nine months of the grant of the patent by the EPO (art. 99, EPC). The patent may be opposed by third parties (for example the applicant's competitors) if they believe that it should not have been granted. The main reason for opposing a patent is that it does not meet conventional patentability criteria: novelty, inventive step and industrial applicability. Other admissible reasons for an opposition are that disclosure of the invention is not sufficiently clear and complete to enable other people skilled in the art to perform the invention and that the scope of the patent as granted extends beyond that of the original application (art. 100, EPC). The opponent will have to substantiate the opposition by presenting evidence that the above prerequisites for patentability are not fulfilled.

The notice of opposition is examined by the Opposition Division at EPO. The Opposition Division consists of three experienced examiners, one of whom may have been involved in the examination phase. Once the opposition has been filed, settlement options between the opponent and the patent holder are restricted (rule 60, Implementing Regulations to the Convention on the Grant of European patents). This feature differentiates the EPO's centralised opposition procedure from ordinary litigation before civil courts. In fact, if opposed parties and opponents decide to settle their case after the opposition has been filed, and the opponent, for example, withdraws its attack, the EPO may still continue to decide on the case.

The conclusion of the opposition proceedings can lead to the following outcomes: the opposition is rejected and consequently the patent is upheld without amendments, the patent is revoked, or the patent is amended (art. 101, EPC). In this last case, a new modified version of the granted patent is published by the EPO. Normally, an amendment results in a reduction of the "breadth" of the patent: the patent is narrowed by modifying the claims that delimit the area in which exclusive rights are sought. According to Harhoff et al. (2007), to sort out an opposition case takes on average 1.9 years. The opposition procedure takes approximately 2.2 years if the patent is revoked and approximately four years if the patent is amended. Undoubtedly, the longer the process to sort out an opposition case, the worse the effects on patent holders and competing firms. Whereas patent holders will have to delay the exploitation not only of the granted patent but also possibly of other patents if the extent of legal protection against imitators is unclear, competitors will also be refrained from investing further in the invention under assessment.

Any decision made by the Opposition Division can be subsequently appealed (art 106, EPC). Therefore, both patent holders and opponents may file an appeal against the outcome of the opposition procedures. The appeal has to be filed within two months from the decision of the Opposition Division and it has to be sustained within an additional two months. The median duration for appeal cases is two years. The Boards of Appeal is the body in charge of the final decision on the validity of the contested EPO patent. In case the Board of Appeal supports the decision taken by the Opposition Division, opponents can lastly try to attack the succeeding national patents in each designated state in which the patent is valid. However, aside from the high costs implied, the probability of winning a validity suit in a country after having lost at the European level is very low because the arguments brought forth in previous trials are usually exploited by national judges. Of course, after being granted, a European patent can be attacked by third parties through legal means allowed for by the respective national legislations in which the patent is valid. In this case, if a patent is invalidated in one country, this outcome will not affect the other jurisdictions in which the patent is in place. The opponent will have to sue the patent holder in all of the states in which patent protection is sought. To attack the patent in all of the designated states is, however, very expensive, and differences in the national patent jurisdictions may make patent validity suits complicated and uncertain. Costs for litigation in any one of the national courts have been estimated to be between 50,000 and 500,000 Euros, depending on the complexity of the case (Harhoff and Reitzig, 2004). On the other hand, the central opposition procedure implies lower costs and the decision on the opposition has force in all designated EPC countries. The costs of opposition and appeal are borne in general by each of the parties involved. Harhoff et al. (2007) report, based on interviews with patent attorneys, that the cost per instance and per party for an opposition is in the range of 15,000-25,000 Euros. Approximately the same amount is due for an appeal against the outcome of the opposition proceedings.

3.3 Previous studies of patent oppositions and research setting

The criticism recently raised by different scholars in the United States against the poor quality of USPTO patents is actually based on the analysis of the growing phenomenon of patent disputes (Bessen and Meurer, 2008). Scholars are questioning whether or not the direct and indirect costs associated with enforcing patent rights in legal cases due to poor ex-ante quality of granted patents are imposing an implicit tax on innovation in vital segments of the economy (Jaffe & Lerner, 2004; Hall and Ziedonis, 2001). Many claim that the United States can benefit substantially from adopting an administrative post-grant patent review, provided that the post-grant mechanism is not too costly (Graham and Harhoff, 2006). In fact, the adoption in the US of a centralised post-grant opposition system, similar to the one present in Europe, may lower litigation costs and favour speediness in the resolution of patent disputes.

Whereas the economic literature has largely focused on patent litigation issues in the US, only a few studies have examined EPO patent opposition cases (Harhoff et al., 2003; Harhoff and Reitzig, 2004; Calderini and Scellato, 2004; Graham and Harhoff, 2006; Hall et al. 2003;

Burke and Reitzig, 2007; Hall et al., 2009). Because legal mechanisms and institutions to challenge patent validity differ significantly between the US and Europe, it is clear that results based on the US context cannot be easily transferred to the European one, and that greater evidence on European procedures is needed.

Harhoff et al. (2007) document that a total of 7.2% of all granted patents were opposed between 1980 and 2005, and roughly one third of these cases were then continued by an appeal. Existing studies have shown that, on average, approximately 30% of opposed patents are eventually amended or revoked after an opposition (Harhoff and Reitzig, 2004; Calderini and Scellato, 2004; Harhoff et al., 2007).

These studies generally find that particularly valuable patents are more likely to be opposed, that patents in fields with technical and market uncertainty or patents with immediate market impact are attacked more frequently and that large incumbents are more likely to attack smaller firms (Harhoff et al., 2003; Harhoff and Reitzig, 2004; Calderini and Scellato, 2004).

Although extant studies on oppositions are so far still limited, they can be grouped into two main strands of literature. The first one examines the correlation between measures of patent value/quality and the opposition event and the strategic implications underlying the decision to file an opposition. Typically, firms challenge more valuable patents. Harhoff et al. (2003) show that patents that survived opposition are on average 10 times more valuable than comparable patents that were not attacked. In a subsequent paper on patent oppositions in the area of biotechnology and pharmaceuticals, Harhoff and Reitzig (2004) apply citation and classification analysis on a large sample of over 13,000 European patents granted between 1979 and 1996, of which 8.6 percent had been subject to opposition. The authors find that high quality patents are more likely to be opposed and that the probability of opposition is positively correlated to the number of designated states, a proxy for the economic relevance of the patent.

These results are confirmed by Hall et al. (2009), who analyse how the main characteristics of financial patents impact the probability of receiving an opposition. The analysis shows that patent-level characteristics, including family size, forward citations and XY-type backward citations have a significant predictive power. Hence, more valuable financial patents are more likely to be opposed than relatively low-value ones. Calderini and Scellato (2004) provide evidence on patent oppositions at the EPO in the telecommunications sector. Their analysis suggests that larger firms are acting collusively. In fact, major patentees in the telecommunications industry appear as opponents in 48% of the whole population of examined legal cases, but only 14% of the oppositions jointly involve two of them. This evidence points to a possible strategic conduct of large firms, which tend to settle patent disputes among each other, while attacking smaller companies. Harhoff and Hall (2002) also find that in the Cosmetics sector, opposition takes place repeatedly amongst larger players.

A second strand of literature examines the quality of patent office services, in light of the current debate on decreasing patent quality. It is a widespread concern that patent offices are not able to correctly assess patent validity at various stages of a patent's life, especially in emerging technological areas, such as software, biotechnology or nanotechnology. Therefore, frontier technologies or emerging technological areas are more subject to opposition. Harhoff and Hall (2002) document that the probability that a patent will be subject to opposition is proportional to the degree of informational uncertainty concerning the technology covered by the patent. They show that the opposition rate for patent grants in the field of Cosmetics is twice the average rate of other fields. Graham et al. (2002) focus on inter-institutional consistency by comparing the behaviour of European and US patent offices in their opposition and re-examination procedures, respectively, on a selection of patents with identical priorities. It emerges that European and US rule differently in similar cases. Burke and Reitzig (2007) study the concordance of the EPO's granting and opposition decisions for biotech patents granted in the 1980s to investigate which level of assessment quality patent offices can provide. They show, based on bibliographic indicators, that the EPO's decision-making on a patent's technological quality during granting and opposition phases is inconsistent, and that EPO seems to assess patent-quality related information differently in the grant and opposition stages.

3.4 Data sources

Data on patent oppositions and patent characteristics have been drawn from Thomson Innovation, a dataset provided by Thomson Reuters. Thomson Innovation provides worldwide patent coverage and a broad collection of scientific literature, as well as information on patent oppositions. For the sub-sample of opposition cases that we want to investigate in detail, we will also search ESPACE LEGAL, the dataset provided by EPO that collects the legal texts of patent opposition disputes.

The data presented in this study were extracted in January 2010 and were restricted to patents issued by the European Patent Office (EPO) reporting a publication date between 2000 and 2008. Therefore, oppositions were downloaded based on the publication date of the granted patent to which they refer to and not on the filing date of the opposition itself. [16]
Nearly a half million patents were granted in the time span considered[17]. For each granted patent, we collected information on:

- priority (priority date and priority country)
- application (application date)
- publication (publication date)
- inventors (number of inventors)
- assignee (names and number of assignees)
- IPC classes
- patent citations (number of forward and backward citations)
- non patent citations (number of cited references-non patent)
- claims (number of claims)
- oppositions (name of the opponent, opposition filing date)
- INPADOC legal status (to infer information on the outcome of oppositions)

3.5 Analysis of opposition trends and characteristics

3.5.1 Opposition trends in the years 2000-2008

The mechanism of opposing patents seems to be a frequently used one in Europe. Harhoff et al. (2007) analyse the frequency of oppositions since 1980. They report that a total of 9.26% of all granted patents were opposed between 1980 and 2000. We complemented their study by analysing the years not considered by the authors, namely, from 2000 to 2008.
In the following table, we show the frequency of oppositions for all patent grants occurring between 2000 and 2008. The number of granted patents has significantly increased over the years, reaching a peak in 2006. The number of oppositions has followed the trend registered in the patent-granting process. The number of oppositions reaches a peak in 2006, which is in line with the increase in the number of granted patents in that year. However, the opposition rate slightly decreases over the years. According to our data, on average, a total of 5.28% of all granted patents were opposed between 2000-2008.

[16] EPO patents are typically re-published at different stages of the patenting procedure. Hence, there can be multiple publications associated with a given patent. Publications of the same patent are differentiated by a code, which consists of a letter (typically A or B) followed by a number. B codes (e.g., B1, B2) are used for issued patents. In this study, we refer only to B1 codes.
[17] We also searched data for year 2009, but these data are partial when considering oppositions because opposition notices can be filed within the nine months following the grant of the patent by the EPO. Therefore, the majority of opposition proceedings referring to patents granted in 2009 have appeared after january 2010. Moreover, because the dataset updated retrospectively, it might also be the case that important patent information is missing for the year 2009. For these reasons, in the empirical analysis we will focus on the period 2000-2008.

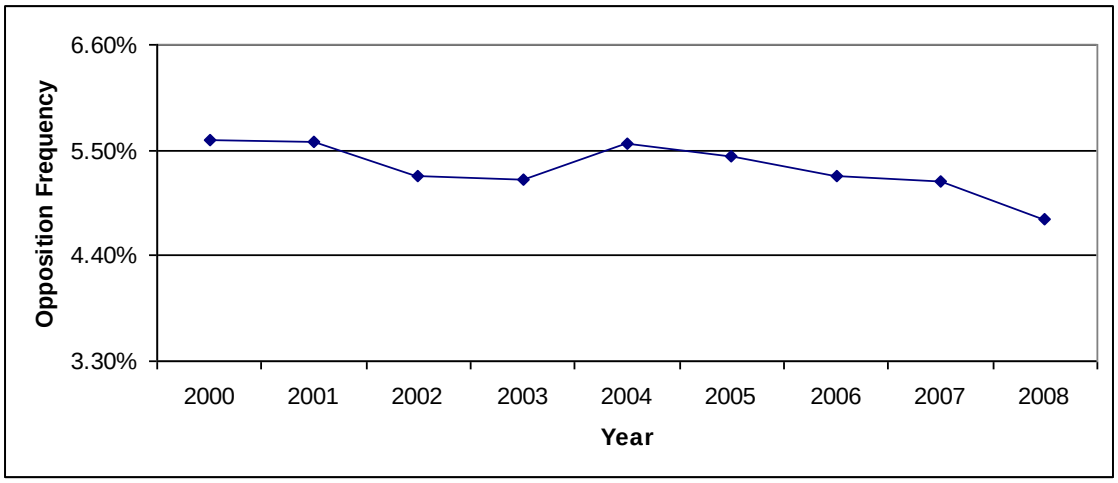
Different explanations have been given to the decreasing trend in the percentage of newly patented innovations subject to opposition (see Harhoff (2006)).
A first straightforward explanation is that the examination process at the EPO has improved, leading to a reduction in the number of granted patents whose actual validity is challenged by third parties. In this sense, the decreasing trend might be considered a signal of relative inter-temporal improvements in patent quality.

However, the observed trend might also be influenced by additional factors. First, the rate of opposition might have decreased because a greater number of marginal patents, which are not damaging for competitors and have a lower economic value, have been granted. Second, it might be the case that an increasing "free riding" phenomenon among potential plaintiffs has contributed to the decrease in opposition rates. If a "doubtful" patent has a negative impact on multiple companies, this can lead individual firms to refrain from opposing, waiting for other firms to attack first without bearing the costs of opposition, while reaping the social benefits. Third, companies might have incentives to settle patent disputes outside of patent offices.

Table 34 EPO patent grants and oppositions (years 2000-2008)

Publication year	Opposition rate
2000	5.61%
2001	5.59%
2002	5.24%
2003	5.19%
2004	5.56%
2005	5.44%
2006	5.23%
2007	5.17%
2008	4.79%
Total	5.28%

Figure 12 Opposition frequency (years 2000-2008)



Note: Opposition frequency is computed as the number of patents opposed divided by the number of all patents granted in a given year.

3.5.2 Sectoral differences in opposition trends

To single out differences in patent opposition trends across different industrial sectors, we examined the share of opposed patents across different technology fields and industrial sectors within the period considered. To identify industrial sectors, we mapped sample patents according to the main IPC class (International Patent Classification). During the EPO examination process, patents are assigned up to nine-digit IPC codes. Patents can belong to different technological fields, and thus they can be assigned several IPC codes. We used the IPC Technology Concordance Table, released by the WIPO (WIPO, World Patent Report: a statistical overview, 2008), which classifies IPC classes into 35 technology areas that can be further aggregated into six macro areas (Electrical Engineering, Instruments, Chemistry, Mechanical Engineering, and Other Fields). According to this classification, each patent is associated with a field of technology and a macro-sector. The analysis is cross-industry, covering the macro fields and most of the sub-fields reported by the IPC Technology Concordance Table.

Table 35 reports the number of patent grants and oppositions filed, as well as the opposition rate, across different technology areas during the years 2000-2008. Pharmaceuticals, transport, medical technology and other special machines are those sectors with the highest number of oppositions filed in absolute terms. However, if we consider the opposition rate heterogeneous patterns can be appreciated. In particular ICT related fields show lower average opposition rates compared to other areas such as basic materials chemistry (10.12%), materials, pharmaceuticals (8.71%), surface technology, coating (8.62%) and macromolecular chemistry, polymers (8.49%).

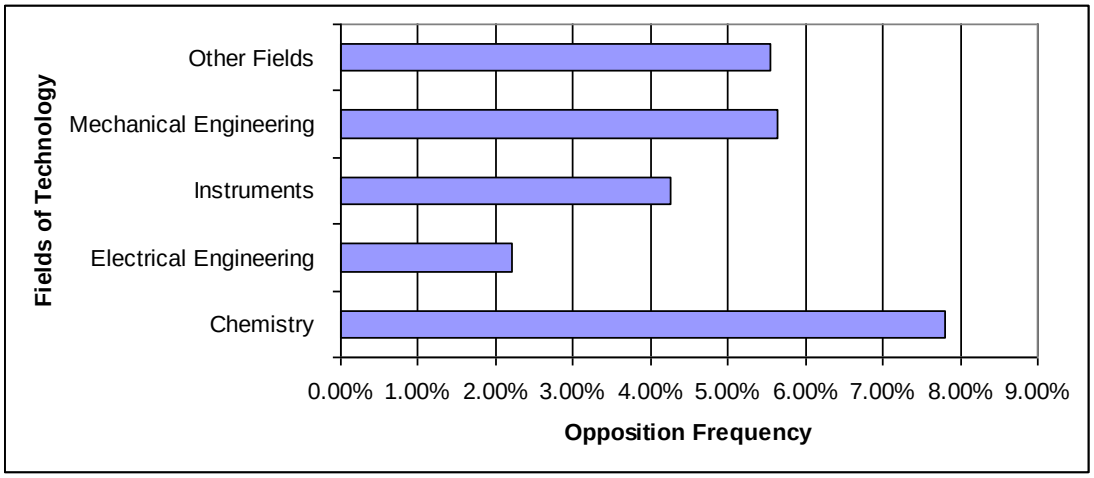
Table 35 EPO patent granted and oppositions across different technology fields (years 2000 - 2008)

Technology fields	% of granted patents	% of oppositions	Opposition rate
Audio-visual technology	3.09	1.45	2.48%
Basic communication processes	1.19	0.17	0.73%
Basic materials chemistry	2.44	4.69	10.12%
Biotechnology	2.39	3.06	6.75%
Chemical engineering	2.7	3.82	7.47%
Civil engineering	3.05	3	5.19%
Computer technology	4.57	1.65	1.90%
Control	1.32	1.57	6.25%
Digital communication	2.01	0.52	1.37%
Electrical machinery, apparatus, energy	4.7	3.16	3.55%
Engines, pumps, turbines	3.73	2.85	4.03%
Environmental technology	2.28	2.17	5.02%
Food chemistry	1.26	3.36	14.02%
Furniture, games	2.15	1.91	4.67%

Technology fields	% of granted patents	% of oppositions	Opposition rate
Handling	3.83	4.27	5.87%
IT methods for management	0.14	0.17	6.58%
Machine tools	3.61	4.42	6.45%
Macromolecular chemistry, polymers	2.58	4.15	8.49%
Materials, metallurgy	2.13	3.63	9.01%
Measurement	4.98	3.48	3.68%
Mechanical elements	3.54	2.86	4.26%
Medical technology	5.71	6.22	5.74%
Micro-structural and nano-technology	0.09	0.02	0.97%
Optics	3.41	1.19	1.84%
Organic fine chemistry	2.9	2.23	4.05%
Other consumer goods	2.07	2.61	6.64%
Other special machines	4.27	6.14	7.58%
Pharmaceuticals	4.99	8.25	8.71%
Semiconductors	1.28	0.3	1.24%
Surface technology, coating	1.73	2.82	8.62%
Telecommunications	3.49	1.12	1.69%
Textile and paper machines	3.81	4.66	6.46%
Thermal processes and apparatus	1.15	1.16	5.30%
Transport	6.96	6.76	5.12%
Organic fine chemistry	0.45	0.22	2.57%
Total	100	100	5.28%

If we aggregate technology fields into macro-sectors, the highest opposition frequency is registered for the macro-sector Chemistry (7.80%). Mechanical engineering ranks second (5.65%). The residual category Other Fields shows a relatively high opposition rate, which might be due to incidence of the categories Other Consumer goods and Civil engineering, reporting, respectively, 6.64% and 5.14% of opposition frequency. The lowest incidence of oppositions filed is recorded in the Electrical Engineering sector.

Figure 13 Opposition frequency across macro-sectors (years 2000-2008)



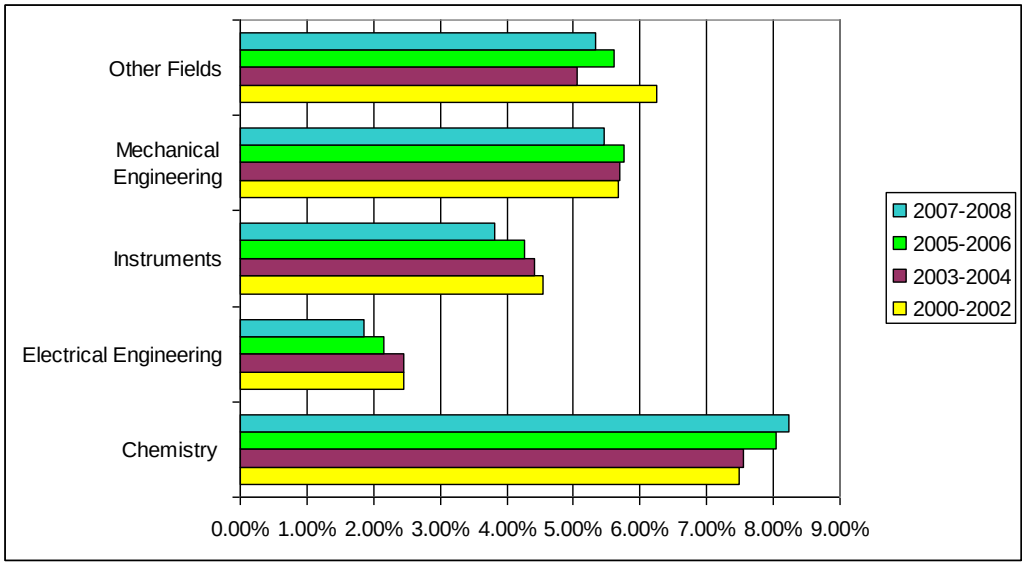
It is interesting to investigate whether or not intra-sectoral sectoral variations in opposition frequency can be envisaged across the years analysed. describes the propensity to oppose patents in the different sectors across periods of two or three years (2000-2002; 2003-2004; 2005-2006; 2007-2008). **While intra-sectoral opposition rates are rather constant in the considered years, we observe significant growth in the number of granted patents in the electrical engineering area, which is characterised by low opposition rates. This, in turn, has a "positive" impact on aggregated opposition rates** (without being related to any change in the quality of the examination).

Table 36 EPO patent grants and oppositions across different technology fields and time frames

Field of Technology	Opposition rate %
Chemistry	
2000-2002	7.49%
2003-2004	7.55%
2005-2006	8.04%
2007-2008	8.23%
Electrical Engineering	
2000-2002	2.46%
2003-2004	2.45%
2005-2006	2.16%
2007-2008	1.86%
Instruments	
2000-2002	4.55%
2003-2004	4.41%
2005-2006	4.27%
2007-2008	3.81%
Mechanical Engineering	
2000-2002	5.67%
2003-2004	5.69%

Field of Technology	Opposition rate %
2005-2006	5.77%
2007-2008	5.46%
Other Fields	
2000-2002	6.24%
2003-2004	5.05%
2005-2006	5.61%
2007-2008	5.33%
Total	5.28%

Figure 14 Opposition frequency across macro-sectors and periods



3.5.3 Characteristics of opposed patents

It is generally argued that opposed patents are more valuable that unopposed ones (Harhoff et al., 2003). To test this hypothesis, we provide a few descriptive statistics comparing the sample of opposed and unopposed patents. Table 37 reports the mean, median, standard deviation and minimum-maximum values for the following variables: backward and forward citations, references to the non-patent literature and patent claims. Forward citations show a mean value that is higher for the group of opposed patents. This means that patents subject to an opposition process are more likely to receive citations from other patents. This evidence is actually in line with previous studies finding that opposed patents are more valuable (Harhoff et al., 2003; Harhoff and Reitzig, 2004; Hall et al., 2009). The mean number of references to the patent and non-patent literature and of claims is higher for the sub-sample of opposed patents.

Table 37 Descriptive statistics on the number of backward and forward citations, references to the non-patent literature, number of claims (entire sample, sub-samples of opposed and unopposed patents)

	Entire sample	Opposition=1	Opposition=0
Number of references to patents (backward citations)			
Mean	4.62	5.57	4.56
Median	4	5	4
St.Deviation	3.21	3.84	3.17
Min-Max	0-152	0-99	0-152
Number of references to the non patent literature			
Mean	1.47	1.77	1.45
Median	1	1	1
St.Deviation	2.18	3.01	2.12
Min-Max	0-105	0-105	0-75
Number of citing patents (forward citations)			
Mean	0.09	0.23	0.08
Median	0	0	0
St.Deviation	0.62	1.00	0.59
Min-Max	0-67	0-31	0-67
Number of claims			
Mean	12.71	14.37	12.62
Median	10	12	10
St.Deviation	9.09	10.35	9.01
Min-Max	1-247	1-147	1-247

Table 38 displays the mean values of the previously analysed dimensions across different priority countries. Table 39 gathers priority countries into European and non-European priorities. We present these statistics for the total number of patents in the sample, and separately for the sub-sample of opposed and unopposed patents. Again, it appears that opposed patents are also more cited than unopposed ones when the priority country differs. The gap seems to be more pronounced when the first priority is filed in Germany, US and at the EPO. The average value of forward citations for opposed patents exceeds that of unopposed patents in the other countries as well, although the difference is lower (less than 13%). Opposed patents with a European priority show a higher mean number of forward citations than those with a non-European priority.

Concerning the number of references to patents and to the non-patent literature, results point to an overall higher mean value for the opposition group of patents across the different countries in which the first priority was filed. The average number of references to patents and to the non-patent literature is higher for patents with a non-European priority, in both sub-samples. The highest average number of claims is found in those patents where the USA is the priority country, followed by UK and France. The number of claims is, on average, larger for opposed patents than for the sub-sample of unopposed patents, and the largest difference is recorded in France and US. The opposite evidence is found for Japan. Overall, patents with a non-European priority have a higher number of claims than those patents where the priority was first filed in a European country. This effect is stable for both samples of opposed and unopposed patents.

Table 38 Mean number of backward and forward citations, references to the non-patent literature, number of claims (entire sample, sub-samples of opposed and unopposed patents) by first priority countries.

	Entire sample	Opposition=1	Opposition=0
Number of references to patents (backward citations)			
USA	4.59	5.63	4.54
Germany	4.56	5.41	4.50
Japan	5.04	6.32	5.00
EPO	4.54	5.53	4.48
France	4.64	5.84	4.38
Great Britain	4.31	5.43	4.24
Italy	4.56	5.26	4.52
Number of references to the non patent literature			
USA	1.77	2.44	1.73
Germany	1.06	1.21	1.05
Japan	1.66	1.87	1.65
EPO	1.44	1.67	1.42
France	1.23	1.56	1.21
Great Britain	1.70	2.18	1.66
Italy	0.96	1.15	0.95
Number of citing patents (forward citations)			
USA	0.09	0.22	0.08
Germany	0.11	0.27	0.10
Japan	0.06	0.16	0.06
EPO	0.08	0.22	0.07
France	0.07	0.19	0.06
Great Britain	0.09	0.19	0.09
Italy	0.07	0.12	0.07
Number of claims			
USA	15.60	18.03	15.47
Germany	11.38	12.47	11.30
Japan	10.20	10.17	10.20
EPO	12.39	13.40	12.33
France	12.35	15.41	12.19
Great Britain	15.05	16.18	14.97
Italy	11.26	12.26	11.20

Table 39 Mean number of backward and forward citations, references to the non-patent literature, number of claims (entire sample, sub-samples of opposed and unopposed patents) across European and non-European priorities.

	Entire sample	Opposition=1	Opposition=0
Number of references to patents (backward citations)			
European	4.47	5.40	4.40
Not-European	4.73	5.76	4.69
Number of references to the non patent literature			
European	1.19	1.44	1.17
Not-European	1.68	2.14	1.65
Number of citing patents (forward citations)			
European	0.10	0.24	0.09
Not-European	0.08	0.21	0.07
Number of claims			
European	12.06	13.57	11.96
Not-European	13.21	15.27	13.12

As it is evident from Table 40, the incidence of opposed patents increases with the number of forward citations. The group of patents receiving from seven to nine citations is attacked in 22.66% of the cases, more than four times more than the patents that were not cited at all. This probability slightly decreases to 16.04% when forward citations exceed the number of 9. It is therefore clear that patents are attacked far less frequently if they receive few or no forward citations, namely, if they are less valuable.

The Table reveals that there is also a significant relationship between the likelihood for a patent to be opposed and the number of backward citations, although it appears to be weaker than in the case of forward references. Patents that are attacked most frequently, in 10.47% of the cases, display a number of backward citations larger than 9.

Two possible explanations for this evidence can be raised: first, the higher the number of backward citations included by the examiner, the higher the likelihood that the innovative contents of the patent under examination rely on previous innovations and hence, the actual inventive step is more questionable. Second, more backward citations to the previous patent literature increase the probability that the owners of cited patents become aware of the newly granted patent and decide to file an opposition.

Table 40 Descriptive statistics on the number (and percentage incidence) by number of forward and backward citations

	Number of granted patents	Number of opposed patents	Incidence of opposed patents
Number of forward citations			
0	435,794	21,540	4.94%
1-3	21,363	2,360	11.05%
4-6	1,242	207	16.67%
7-9	278	63	22.66%
>9	293	47	16.04%
Number of backward citations			
0	14,092	351	2.49%
1-3	165,156	6,848	4.15%
4-6	191,293	10,052	5.25%
7-9	61,850	4,184	6.76%
>9	26,579	2,782	10.47%

3.5.4 Oppositions and priority countries

To examine if patents with a European priority are more or less likely to be opposed than those with a non-European priority, we made a few descriptive statistics on opposition rates by priority country across the windows of time considered. From Table 41 it results that Denmark ranks first in terms of opposition frequency across the years. The Netherlands, Germany and Sweden follow, respectively ranking second, third and fourth. It must be noted that differences in opposition rates may be due also to different patent-sectoral affiliations. We will be able to separate industry effects from country effects only when running the multivariate analysis. The incidence of opposition frequency does not seem to face variations along the years in the different countries where the first priority was filed. The data clearly highlight a below average incidence of oppositions in case of patents with a JPO priority.

Table 41 Opposition rates across different priority countries and years.

	Opposition rate				
First priority country	2000-2008	2000-2002	2003-2004	2005-2006	2007-2008
Germany	6.87%	6.73%	6.87%	6.95%	6.93%
USA	5.06%	5.09%	5.06%	5.25%	4.84%
EPO	5.77%	6.21%	6.51%	5.60%	5.20%
Japan	2.72%	3.17%	2.99%	2.51%	2.23%
France	4.93%	5.35%	4.94%	4.98%	4.40%
Great Britain	6.11%	5.75%	5.70%	6.50%	6.63%
Italy	5.29%	5.57%	4.90%	5.12%	5.65%
Sweden	6.47%	6.64%	6.56%	6.48%	6.13%
Netherlands	9.87%	10.55%	8.83%	11.54%	8.55%
Denmark	11.54%	11.04%	9.63%	12.66%	13.14%

3.5.5 Oppositions and duration of the patent granting process

To examine whether or not the patent-granting process takes longer for patents that are later subject to an opposition, we calculated the time lag (in days) that occurs between the date of the application at the EPO and the granting date of the patents in our sample (Table 42). Unopposed patents show on average a longer duration of the granting process relative to opposed ones. However, differences in absolute terms seem to be rather small. The average time lag between the date of the first application and the granting date is 19 days longer for unopposed patents, and the median value is 47 days. A longer time lag between the date of the first application and the granting date occurs among unopposed patents in Electrical Engineering and Other Fields, and this difference is significant at the 5% level. However, it seems that the duration of the granting process is higher for opposed patents in Chemistry and Instruments, respectively at 10% and 5% levels of significance. In the Mechanical Engineering sector, we do not find statistical evidence of a difference in the durations.

Table 42 Descriptive statistics on the difference in the time lag (in days) that occurs between the date of the first application and the granting date across the sub-samples of opposed and unopposed patents.

	Δ days (not opposed-opposed) 2000-2008	Δ days (not opposed-opposed) 2006-2008
Mean	19.31	21.46
Median	47	28.5
10th centile	6	1
25th centile	16	2
75th centile	29	59.25
90th centile	-3	1

The overall evidence collected on the duration of the examination can be interpreted as follows:

- The differentials in the durations are rather small, hence **the opposition event cannot be attributed to a too fast examination by the examiner**
- **It does not seem that a strategy aimed at stretching the duration of the examination is pursued by patent holders aware of having presented patent applications of dubious validity** and hence, that are potentially subject to oppositions.

3.6 Analysis of opposition outcomes

3.6.1 Trends in opposition outcomes in the years 2000-2008

An opposition may result in different outcomes: it may be rejected or the opposed patent may be revoked or amended (narrowed). In other cases, the opposition proceeding is closed either because the patent-holder let the patent lapse by not paying the renewal fees or by a withdrawal of the opposition by the opponent. The Thomson Innovation database does not provide explicit information on the outcome of the opposition. However, the final outcome can be inferred from INPADOC Legal Status codes. INPADOC, which stands for International Patent Documentation Centre, is a database maintained by the European Patent Office that contains legal status information on patents issued by the EPO. For all granted patents in the period 2000-2008, we retrieved the INPADOC legal status as of 31st January 2010, from the

INPADOC Patent Gazette. There are some INPADOC codes that can enable us to retrieve information on the outcome of opposition proceedings:

- EP27A (amended). The patent is maintained as amended, given the amendments made by the proprietor during the opposition proceedings.
- EP27W (revocation). In the case that the Opposition Division is of the opinion that the grounds for opposition mentioned in Art. 100 EPC do prejudice the maintenance of the patent, it revokes the European patent, taking effect in all contracting states.
- EP27O (opposition rejected). In the case that the Opposition Division is of the opinion that the grounds for opposition mentioned in Art. 100 EPC do not prejudice the maintenance of the patent unamended, it rejects the opposition. The European patent remains in force in its original form from the date of grant.
- EP27C (termination of the opposition procedure). In case of surrender or lapse in all contracting states of a European patent for which opposition proceedings are pending, within two months of the notification date, the opponent may file a request for the continuation of the proceedings. If no such a request is made, the opposition proceedings are automatically terminated.

In the dataset, there are also oppositions for which we do not have evidence of any of the three outcomes discussed above. This residual category mainly includes cases in which the opposition is still pending.

Table 43 reports the number and percentage of incidence of the outcome of the oppositions for the sub-sample of opposed patents across the years. We do not consider the last two years (2007-2008) because the incidence of still pending cases is too high. It turns out that 20% of opposed patents have been amended, whereas 25% have been revoked. In 14% of the cases, oppositions have been rejected. The residual category accounts for 35% of the cases[18].

Table 43 Outcome of the opposition process over time (2000-2006), by year of granting of the opposed patents

Outcome (%)	2000-2006	2000-2002	2003-2004	2005-2006
amended	19.45	31.3	20.14	9.41
rejected	14.05	19.94	14.38	8.02
revoked	24.92	32.91	26.94	15.13
terminated	7.11	7.66	7.39	6.29
residual	34.47	10.36	31.16	61
Total	100	100	100	100

In the following table we report a modified version of the previous table in which incidence of different cases are computed conditional on a patent showing an outcome. This representation discounts the presence of the residual category consisting of still pending cases. The data suggest a relative stability along time of the typologies of outcome. There is a tendency toward the increase of cases ending with termination requested by the opponent and a reduction of the incidence of cases ending with a patent amendment. Data for more recent years might be affected by the fact that those cases ending with a specific outcome (e.g. amendment) imply on average an higher (o lower) duration of the proceedings. Also taking into consideration such caveat, the **data do not seem to suggest a significant increase in the incidence of cases of revocation of patents previously granted by the EPO.**

[18] The share of residual pending cases increases through time since the collected data represent a snapshot of the current situation at the EPO.

Table 44 Outcome of the oppositions over time (2000-2006), by year of granting of the opposed patents, without taking into consideration pending cases.

Outcome	2000 - 2002	2003 - 2004	2005 - 2006
Amended	34.92	29.26	24.13
Rejected	22.24	20.89	20.56
Revoked	36.71	39.13	38.79
Terminated	8.55	10.74	16.13

Table 45 reports the distribution of the outcomes by priority area. It distinguishes between patents with a European first priority and patents with a non-European first priority. Nearly 20% of patents with a non-EU priority are amended, and this percentage is virtually equivalent to the one (19.07%) for patents with a European priority. Twenty six percent of patents with a non-EU priority are revoked, whereas this percentage is approximately 24% for patents with a European priority.

Table 45 Outcome of the opposition process by priority (European versus non-European priority) over time.

	2000-2006		2000-2002		2003-2004		2005-2006	
Outcome (%)	EU priority	NON EU priority	EU priority	NON EU priority	EU priority	NON EU priority	EU priority	NON EU priority
amended	19.07%	19.88%	28.41%	29.98%	19.74%	20.57%	9.10%	9.75%
rejected	15.19%	12.73%	20.86%	18.87%	15.25%	13.38%	9.50%	6.37%
revoked	23.83%	26.15%	31.78%	34.24%	26.05%	27.93%	13.63%	16.80%
terminated	7.97%	6.12%	8.89%	6.20%	8.30%	6.38%	6.71%	5.82%
residual	33.93%	35.10%	10.06%	10.71%	30.65%	31.74%	61.06%	61.26%

A closer look at the distribution of opposition outcomes across different priority countries indicates that amended patents are the most common outcome in all of the reported countries. However, this situation is strongest in the case of patents with a first priority in Japan, which shows the highest incidence of amended patents (22.65%). The USA and Great Britain show an average percentage of revoked patents of 28%.

Table 46 Outcome of the opposition process by priority country (2000-2006)

	amended	rejected	revoked	terminated	residual
USA	19.51%	11.15%	28.56%	6.14%	34.64%
Germany	19.95%	15.77%	22.41%	8.92%	32.95%
Japan	22.65%	15.02%	21.90%	4.47%	35.95%
EPO	17.26%	14.22%	23.76%	6.67%	38.09%
France	19.79%	14.86%	24.72%	5.74%	34.89%
Great Britain	17.65%	10.68%	29.74%	5.56%	36.36%
Italy	17.08%	17.85%	25.72%	7.29%	32.05%

The distribution of the outcomes of opposition processes by macro-sectors is reported inTable 47. The majority of revocations occur in Chemistry. Overall, the data on the outcomes of the

opposition procedures seem to suggest that there has not been a significant increase in the incidence of cases ending with a revocation or amendment.

The observed composition of amended and revoked patents can be due to differentials in the duration of the proceedings for cases eventually leading to such different outcomes. **Even if for recent years little can be said due to the large number of pending cases, we do not find any robust evidence in favour of an average deterioration of the quality of granted patents**.

Table 47 Outcome of the opposition process by macro-sector

	amended	rejected	Revoked	terminated	residual
Chemistry	19.36%	12.41%	27.06%	5.87%	35.29%
Electrical Engineering	16.37%	13.98%	24.36%	8.70%	36.60%
Instruments	20.15%	12.45%	25.02%	6.20%	36.18%
Mechanical Engineering	19.80%	15.96%	23.26%	7.49%	33.49%
Other Fields	20.53%	16.48%	22.06%	11.10%	29.83%

3.7 Econometric analysis

The econometric analysis was based on three different sets of models. Firstly, we investigated the determinants of opposition to EPO patent grants between 2000-2008. In particular, we examined to what extent the likelihood of observing an opposition is affected by patent characteristics. To do so, we exploited the entire dataset on granted patents that we have created and applied a multivariate probit specification to examine which variables affect the probability to observe (or not) an opposition. For that purpose, we created a binary variable to distinguish between patents that were opposed from those that were not opposed (OPPOSITION).

Secondly, we performed another set of probit models which investigate the impact of the same variables on the probability that a specific opposition outcome occurs. In particular, we tested the impact of our variables on the probability that the opposition ends up respectively with an amendment or with a revocation. To this aim, we created two binary variables to distinguish between opposed patents that have been amended or not (AMENDMENT) and revoked or not (REVOCATION).

For all the considered models we made some robustness checks to see if results hold, for example, by considering different industry effects. Finally, in order to single out what determines the likelihood of having a pending case, we tested the effect of the characteristics of patents on the probability that the outcome of an opposition is pending. In doing so, we controlled for the patent technology field, its priority country and we included time dummies in all the regressions.

Explanatory variables have been identified among those that we assume can reasonably affect the likelihood of facing an opposition and that can consequently influence its final outcome. To capture phenomena relating to patent value, we use bibliographic indicators, which have been widely validated by previous literature as being good proxies of a patent's economic value (see Reitzig, 2004). The variables we employ in the analysis are reported below and summarised in Table 48.

- **The number of citing patents (forward citations).** The higher the number of citations a patents receive, the more the patent has contributed to the state of the art, and thus the more valuable it is. Earlier studies have found that forward citations are positively correlated with the monetary value of patents (see Lanjouw and Schankerman, 2001; Haroff et al. 2003). We therefore expect the likelihood of opposition to increase with the number of citations received from subsequent patents.

- **The number of references to patents and to the non-patent literature.** This variable relates to references to the state of art relevant for the patentability of the application that are cited by the inventor and the patent examiners.

- **The number of claims.** This variable is a potential determinant of oppositions. As the number of claims increases, the complexity of a patent increases as well, and it is more likely that an opposition will be filed (Harhoff and Reitzig, 2004).

- **The number of IPC classifications.** This variable relates to the broadness of the patent in terms of technological fields, which can affect the likelihood of opposition. It might be the case that the broader the relevance of the patent, the more potential opponents it may have. In this situation, the number of IPCs may be positively correlated with the likelihood of opposition.

- **The grant lag** (in days), namely the lag between the date of the first application and the grant decision. The grant lag can be seen as a further measure of complexity of the exam.

- **Number of inventors and assignees**.

- **PCT application**. The binary PCT application variable indicates that patent applicants are interested in extending patent protection beyond the EPC member states. Because this procedure implies additional costs, it signals the intention of patent holders to commercialise the invention in a higher number of national markets and hence, that the patent has higher market potential. However, a PCT application also allows applicants to postpone decisions regarding the scope of international protection for up to 30 months, and this might reveal an uncertainty about the patent's commercial value.

- **Number of opponents**. A greater number of opponents can be a signal of the fact that the reasons behind the filing of an opposition are particularly relevant.

Table 48 Variables used in the econometric analysis

Variable	Definition
OPPOSITION	Dummy variable that is equal to 1 if the patent was opposed and 0 otherwise
AMENDMENT	Dummy variable that is equal to 1 if the patent was amended and 0 otherwise
REVOCATION	Dummy variable that is equal to 1 if the patent was revoked and 0 otherwise
PENDING	Dummy variable that is equal to 1 if the patent was pending and 0 otherwise
Forward_citations	Number of citing patents (logarithm)
Backward_citations	Number of references to the patent literature (logarithm)
References_not patent	Number of references to the non patent literature (logarithm)
Claims	Number of claims (logarithm)
N_IPC	Number of IPC assignments (logarithm)
Grant lag	It refers to the lag (in days) that occurs between the date of the application and the granting date (logarithm).
Non_EU_priority	Dummy variable that is equal to 1 if the patent has a non-European priority (excluding also Japan and US) and 0 otherwise
N_assignees	Number of assignees (logarithm)
N_inventors	Number of inventors (logarithm)
N_opponents	Number of opponents (logarithm)
PCT application	Dummy variable that is equal to 1 if the patent application was designated as a PCT application and 0 otherwise
US_priority	Dummy variable that is equal to 1 if the patent has a US priority and 0 otherwise
Japan_priority	Dummy variable that is equal to 1 if the patent has a Japan priority and 0 otherwise
Sector_dummies	Dummy variables, each of them equal to 1 if the patent belongs to the corresponding technology field and 0 otherwise: Audio-visual technology, Basic communication processes, Basic materials chemistry, Biotechnology, Chemical engineering, Civil engineering, Computer technology, Control, Digital communication, Electrical machinery, apparatus, energy, Engines, pumps, turbines, Environmental technology, Food chemistry, Furniture, games, Handling, IT methods for management, Machine tools, Macromolecular chemistry, polymers, Materials, metallurgy, Measurement, Mechanical elements, Medical technology, Micro-structural and nano-technology, Optics, Organic fine chemistry, Other consumer goods, Other special machines, Pharmaceuticals, Semiconductors, Surface technology, coating, Telecommunications, Textile and paper machines, Thermal processes and apparatus, Transport, Organic fine chemistry.
Macro_sector_dummies	Dummy variables which are equal to 1 if the patent belongs to the following macro sectors and 0 otherwise: Chemistry, Electrical Engineering, Instruments, Mechanical Engineering, Other Fields.
Year_dummies	Dummy variables which are equal to 1 for the years 2000 to 2008 and 0 otherwise.

The following tables report the results from our multivariate probit specifications[19].
Table 49 refers to the probit model where the dependent variable is the dummy OPPOSITION. The baseline model, in which we include measures of patent value, is presented in the first column. Both backward and forward citations are strongly associated with the probability to face an opposition, pointing to the interpretation that high valuable patents are more likely to be opposed. The number of claims, which captures to some extent the degree of complexity of a patent, is also positively and significantly correlated with the likelihood of oppositions. These figures are constant in all of the different model specifications.

[19] Probit models are used to analyze the relationship between a set of independent explanatory variables and a dependent variable which can take the value of either 0 or 1. In our case the dependent variable represents a category: for example the fact that a patent is opposed or not (i.e. 1 if the patent is opposed and 0 if the patent is not opposed). The model provides results on the effects of each explanatory variable (e.g. number of citations, number of claims, etc.) on the likelihood that the dependent variable will be take the value 1. As an example, with reference to the following table, the estimated parameter for "forward_citations" in model 1 (i.e. 0.419***) means that an increase in the number of forward citations generates a increase in the probability that a patent will be subject to an opposition, and such effect is statistically robust with a confidence level equal to 95%. From model 4 in the following table we derive that patents with a US priority have a lower probability of facing an opposition.

Table 49 Probit model: probability for a patent of being opposed. Dependent variable: OPPOSITION

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Forward_citations	0.419***	0.417***	0.415***	0.403***	0.402***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Backward_citations	0.272***	0.272***	0.246***	0.266***	0.264***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
References_not patent	0.090***	0.073***	0.067***	0.085***	0.092***
	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)
Claims	0.117***	0.108***	0.105***	0.087***	0.088***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
N_IPC		0.068***	0.019***	0.033***	0.034***
		(0.006)	(0.006)	(0.006)	(0.006)
N_inventors		0.068***	0.044***	0.088***	0.088***
		(0.007)	(0.008)	(0.008)	(0.008)
N_assignees		-0.071**	-0.154***	-0.151***	-0.150***
		(0.029)	(0.029)	(0.030)	(0.030)
Japan_priority				-0.395***	-0.402***
				(0.011)	(0.011)
US_priority				-0.163***	-0.163***
				(0.008)	(0.008)
Non_EU_priority				-0.094***	-0.096***
				(0.010)	(0.010)
PCT application					-0.021***
					(0.007)
Sector_dummies			YES	YES	YES
Constant	-2.439***	-2.473***	-2.251***	-3.034***	-3.031***
	(0.016)	(0.026)	(0.084)	(0.195)	(0.195)
Obs.	458,469	458,469	458,469	458,292	458,292
Chi2	4599.304	4854.911	9908.917	11426.449	11434.599
LogLik	-92392.068	-92264.264	-89737.261	-88951.575	-88947.499

* significant at 10% level; ** significant at 5% level, ***significant at 1% level

In the second model, we include other independent variables such as the number of IPC classifications, the number of inventors and assignees. The number of IPC classifications, which relates to the broadness of the patent in terms of technological fields, is positively correlated with the probability of being opposed, supporting the hypothesis that the broader the technological relevance of the patent, the higher the probability that the patent is opposed. The probability of facing an opposition is instead inversely correlated with the number of assignees.

In the models 3, 4 and 5 of Table 49 sectoral dummies are included as an additional control: the results appear robust. In particular, In the fourth model, we added some key controls on patent priorities: the presence of a priority from Japan, the U.S. and other non-European countries is inversely related to the probability of receiving an opposition. Hence, a patent showing a European priority is significantly more subject to being attacked than a patent with a non-European priority. Model 5 includes the dummy variable PCT application, which controls for the correlation between the probability of being opposed and the decision to file the patent under the PCT procedure: making a PCT application negatively affects the probability of facing an opposition, and this evidence might be in favour of the interpretation that a PCT application choice reveals a certain degree of uncertainty about the commercial value of the patent.

In the following Tables we move to the analysis of the outcomes of the opposition procedures.

In Table 50, we tested the correlations between the probability of an opposition ending with the patent being revoked and the proposed variables measuring patent value. In this case, the number of received citations is negatively correlated with the probability of being revoked in case of opposition, suggesting that among the set of patents which are disputed those actually rejected receive less citations and can therefore be assumed to be less valuable.

Similarly, the number of claims is inversely related to the probability of revocation: a higher complexity and scope (positively correlated to patent value) determine a lower probability of a revocation outcome in case of opposition. Models 2 and 3 include controls on patent priorities: the presence of a priority from Japan and from the U.S. are respectively negatively and positively related to revocation: Japan-original priority opposed patents are less likely to end with a revocation outcome, while U.S.- original priority opposed patents are more likely. Finally, as expected, an higher number of opponents leads to a higher probability of revocation. The difference in amendment and revocation likelihood of patents with an original priority in the US or Japan might well be caused by structural differences between this two systems (e.g. in terms of average number of claims).

Table 50 Probit regression: probability for a patent of being revoked in case of opposition. Dependent variable: REVOCATION.

Variable	Model 1	Model 2	Model 3
Forward_citations	-0.198***	-0.198***	-0.198***
	(0.033)	(0.033)	(0.033)
Claims	-0.105***	-0.127***	-0.126***
	(0.021)	(0.022)	(0.022)
Grant lag	0.156***	0.130***	0.129***
	(0.039)	(0.041)	(0.041)
Japan_priority		-0.108**	-0.109**
		(0.050)	(0.050)
US_priority		0.128***	0.129***
		(0.036)	(0.037)
Non_EU_priority		0.005	0.005
		(0.045)	(0.045)
N_opponents	0.726***	0.714***	0.714***
	(0.061)	(0.061)	(0.061)
PCT_dummy			-0.004
			(0.029)
Sector_dummies	YES	YES	YES
Constant	-2.339***	-1.699***	-2.099***
	(0.538)	(0.433)	(0.545)
Obs.	9,063	9,063	9,063
Chi2	284.336	306.588	306.604
LogLik	-5534.497	-5523.371	-5523.363
PseudoR2	0.025	0.027	0.027

* significant at 10% level; ** significant at 5% level, ***significant at 1% level

Table 51 reports regression results on the probability of patent amendment in case of opposition. The number of forward citations and the number of claims are positively correlated with the probability of amendment. Models 2 and 3 include controls on patent priorities: only for Japanese priorities regression results show a significant positive coefficient. On the contrary it does not appear any significant effect when the priority is the U.S. or any other non-European country. Finally, the number of opponents is inversely correlated to the probability of patent amendment.

Table 51 Probit regression: probability for a patent of being amended in case of opposition. Dependent variable: AMENDMENT.

Variable	Model 1	Model 2	Model 3
Forward_citations	0.063**	0.064**	0.064**
	(0.032)	(0.032)	(0.032)
Claims	0.162***	0.177***	0.176***
	(0.022)	(0.023)	(0.023)
Grant lag	-0.079**	-0.095**	-0.093**
	(0.040)	(0.042)	(0.042)
Japan_priority		0.220***	0.225***
		(0.049)	(0.050)
US_priority		-0.009	-0.011
		(0.038)	(0.038)
Non_EU_priority		0.000	0.001
		(0.047)	(0.047)
N_opponents	-0.363***	-0.349***	-0.349***
	(0.068)	(0.068)	(0.068)
PCT_dummy			0.015
			(0.030)
Constant	-0.168	0.339	-0.112
	(0.514)	(0.432)	(0.522)
Sector_dummies	YES	YES	YES
Obs.	9,063	9,063	9,063
Chi2	142.871	164.800	165.038
LogLik	-5216.618	-5205.653	-5205.534
PseudoR2	0.014	0.016	0.016

* significant at 10% level; ** significant at 5% level, ***significant at 1% level

Table 52 reports regression results on the probability of an opposed patent of being in a pending status. The final decision on opposed patent tends to take longer, leaving the document in pending status in case the patent is particularly complex (many claims) and valuable (many received citations). Moreover, the presence of many opponents is directly proportional to the probability of not reaching a final outcome from the opposition procedure. In all model specifications we controlled for time effects. In models 2 to 6 we analysed possible industry specificities by considering industry dummies and three macro-sectors (Chemistry, Electrical and Mechanical Engineering). Patents belonging to Chemistry and Electrical Engineering fields are more likely to be in pending status than those in Mechanical Engineering. The last model includes controls on patent priorities: Japanese priorities are apparently more likely to be in pending status.

It is important to recall that the duration of the proceedings can be affected by numerous and diverse factors including the characteristics and the amount of new evidence proffered by the parties. In this respect, we stress that although we have identified some factors that seem to show a positive - but rather weak - correlation to the duration of the proceedings, **what really matters is the average non negligible duration of such proceedings that generates a**

prolonged period of uncertainty for both the patent owner and the other companies. Any reform and intervention aimed at reducing the average duration of such uncertainty period would have a positive impact on the quality of the system as a whole.

Table 52 Probit regression: probability for an opposition of being in pending status. Dependent variable: PENDING.

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Forward_citations	0.131***	0.133***	0.137***	0.135***	0.137***	0.136***
	(0.028)	(0.028)	(0.028)	(0.028)	(0.028)	(0.028)
Claims	0.104***	0.101***	0.103***	0.104***	0.101***	0.120***
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Grant lag	0.058**	0.043*	0.055**	0.056**	0.049**	0.051*
	(0.024)	(0.025)	(0.024)	(0.024)	(0.024)	(0.026)
Number of opponents	0.669***	0.679***	0.659***	0.667***	0.658***	0.687***
	(0.045)	(0.046)	(0.045)	(0.045)	(0.045)	(0.046)
Japan_priority						0.147***
						(0.036)
US_priority						-0.074***
						(0.026)
Non_EU_priority						-0.026
						(0.031)
Year dummies	YES	YES	YES	YES	YES	YES
Industry dummies		YES				YES
Macro sector: Chemistry			0.025			
			(0.020)			
Macro sector: Electrical Engineering				0.084**		
				(0.035)		
Macro sector: Mechanical Engineering					-0.045**	
					(0.021)	
Constant	-2.918***	-2.993***	-2.892***	-2.906***	-2.823***	-2.738***
	(0.190)	(0.317)	(0.191)	(0.191)	(0.195)	(0.318)
Obs.	24,185	24,185	24,048	24,048	24,048	24,179
Chi2	12011.730	12148.240	11906.421	11910.587	11909.407	12172.093
LogLik	-10749.510	-10681.255	-10709.884	-10707.801	-10708.390	-10665.009
PseudoR2	0.358	0.363	0.357	0.357	0.357	0.363

* significant at 10% level; ** significant at 5% level, ***significant at 1% level

3.8 Conclusions

In this part of the study we have carried out a comprehensive analysis of opposition cases involving EPO patents granted between year 2000 and year 2008. We are aware of the fact that only a small fraction of patents are subject to opposition and for such reason results cannot be fully extended to draw results on the quality for the "average" patent. However, we claim that the observation of the incidence of EPO opposed patents and of the outcomes of the opposition proceedings can provide some additional evidence at least on the trends in quality of granted patents in recent years.

The data highlight that the opposition rate slightly decreases over observed the years. A first straightforward explanation is that the examination process at the EPO has improved, leading to a reduction in the number of granted patents whose actual validity is questioned by third parties. However, it has to be stressed that the aggregated reduction of the opposition rate can be partly due to a significant growth in the number of granted patents in technological areas that are characterised by low opposition rates. In fact we found that intra-sectoral opposition rates keep rather constant in the considered years.
When comparing opposed and non opposed patents we found robust evidence supporting the fact that opposed patents have on average higher economic and technological relevance, as captured for example by the number of citations received.
One might argue that the likelihood of observing an opposition can show a significant correlation with the duration of the substantive examination process. Our analyses did not lead us to conclude that there is any actual significant correlation. This can interpreted along different perspectives: i) the opposition event cannot be attributed to a too fast examination by the examiner; ii) it does not seem that a strategy aimed at stretching the duration of the examination is pursued by patent holders aware of having presented patent applications of dubious validity.

Concerning the geographical dimension of the phenomenon, we have investigated the impact of original priorities on the likelihood of observing an opposition. The data clearly highlight a below average incidence of oppositions in case of patents with a JPO priority.
An opposition may result in different outcomes: it may be rejected or the opposed patent may be revoked or amended (narrowed). In other cases, the opposition proceeding is closed either because the patent-holder let the patent lapse by not paying the renewal fees or by a withdrawal of the opposition by the opponent. Our elaboration suggest a relative stability along time of the typologies of outcome. There is a tendency toward the increase of cases ending with termination requested by the opponent and a reduction of the incidence of cases ending with a patent amendment. Data for more recent years might be affected by the fact that those cases ending with a specific outcome (e.g. amendment) imply on average an higher (o lower) duration of the proceedings. Also taking into consideration such caveat, the data do not seem to suggest a significant increase in the incidence of cases of revocation of patents previously granted by the EPO. In the last part of the chapter we have shown results from a set of econometric analysis that aim at testing the robustness of previous summary evidence by jointly controlling for country specific and sector specific effects. The estimates confirm the positive correlation between patent value and likelihood of opposition. We have identified some factors (including number of claims, number of forward citations, number of opponents, the fact of having a Japanese priority) that seem to show a positive - but rather weak - correlation to the duration of the proceedings.

According to the data elaboration that we have performed we did not find any robust evidence in favour of an average deterioration of the quality of granted patents.
However, the joint evidence on the effects of patent value and on the elevated incidence of opposition cases filed in recent years and still pending lead us to stress that a key issues is the average non negligible duration of opposition proceedings. This can generate a prolonged period of uncertainty for both the patent owner and the other companies. Any reform and

intervention aimed at reducing the average duration of such uncertainty period would have a positive impact on the quality of the system as a whole. Such consideration is particularly relevant in light of the fact that many scholars in the patent field have stressed the importance and effectiveness of post-grant patent review at a cost that can be an order of magnitude lower than the proceedings at national courts.

4 Cost-benefit analysis of the international initiatives to improve patent quality

4.1 Introduction and Objectives

This Chapter focuses on the most relevant initiatives to improve patent quality that have been promoted by National Patent Offices outside the European Union, as well as by other stakeholders that are not patent-granting institutions. It is intended to be complementary to the next Chapter, which screens the initiatives and best practices undertaken internally to the European Community Member States.

The chapter offers a background of the perceptions and debates on patent quality being raised internationally. It provides a brief account of the major topics of discussion and of the best practices that are currently being tested outside the EU.
The objectives of this section are twofold: first, providing an account of the most relevant initiatives that have been undertaken either internationally or outside the EU in matters of patent quality improvement; second, describing and assessing the costs and benefits of the most relevant initiatives to improve patent quality for which enough evidence is available.

A vibrant debate on patent quality has emerged internationally during the last decade. Overall, there is a large consensus that patent quality raises concerns inside as well as outside of Europe, and especially in the USA. Outside Europe, discomfort with the quality of patents being issued has risen, especially in the USA and Japan. In the USA, where a major patent law reform is under discussion at the Congress, the debate has extensively focused on initiatives comprising amendment of legal provisions, as well as implementation and interpretation of existing principles and norms. In Japan, where a problem of growing backlog emerged, the debate has focused more directly, although not exclusively, on technical and procedural aspects of the patent process to help ensure timely issuance.
Commonly cited causes of poor patent quality referred to by experts and scholars are as follows: budgetary constraints of the patent offices, rapidly evolving fields of technology that make the knowledge of examiners obsolete, problems with language translation, particularly for documents from Asian countries, information asymmetries between applicants and patent examiners, with the consequent retention of potentially relevant information, and strategic behaviours of the applicants, such as the "patent trolls"[20].
Areas of improvement that can be screened in search of better and more efficient mechanisms to improve patent quality pertain to the following: legal provisions, reforms of certain procedural aspects of patent granting and cooperation among NPOs, and creation of new mechanisms to improve the circulation of information. These mechanisms and the advantages and disadvantages they are expected to bring will be analysed in detail in the following sections.

[20] For a summary of critical problems and major challenges see, for example, National Research Council of the National Academies. 2004. "A Patent System for the 21st Century", The National Academies

4.2 Methodology

The work has been divided into three tasks:

1. Information has been retrieved from multiple channels, to identify a comprehensive set of potentially interesting initiatives.
2. The identified initiatives have been screened and selected against a set of criteria, to narrow down the analysis to the relevant initiatives
3. A cost and benefit analysis has been performed to appreciate the efficacy and efficiency of the selected initiatives.

With regard to the first task, the search for potentially relevant initiatives was conducted by using multiple parallel channels to ensure a broad comprehensive coverage. We conducted informal interviews with field experts and performed a widely targeted search on public sources, such as policy proposals (draft proposals to the EU, WTO and US Congress), scholarly contributions, non-EU patent office initiatives and documents, communities of practices and stakeholders associations (societies of inventors, examiners, assignees, and university technology transfer offices). We also made use of the information, comments and opinions on several initiatives deemed important to support patent quality, collected as part of the PatQual survey to EU companies and PROs and of the survey to the NPOs presented in this report. Finally, an extensive web search was performed.

The screening highlighted six initiatives that are worth considering: Strengthening the Duty of Disclosure and Codes of Conduct (this is a class of several alternative or complementary initiatives), the IP5 Work Sharing Initiative (IP5 –WSI), the Patent Prosecution Highway (PPH), the shift from a "First-to-invent" to a "First-to-file" regime, the Peer-to-Patent: Community Patent Review, and the first training provided by the US Patent Training Academy.

With regard to the second task, a screening and a consequent selection of a set of relevant initiatives was made, by assessing each initiative identified at the previous stage against three basic criteria. The three criteria applied are the following:

1. Fitness. The initiative is mainly and directly aimed at patent quality improvement. This criterion excludes from the analysis all initiatives that can indirectly affect the quality of perceived patents but whose main and direct scope is not related to patent quality improvement. This requirement is aimed at focusing only on those initiatives that would potentially have a strong, direct impact on patent quality.
2. Advanced stage of development The initiative has reached a sufficiently advanced stage of development to allow a comprehensive understanding of its intended aim and of the operations it will entail. This criterion excludes from the analysis all initiatives that are currently underdeveloped or at a preliminary stage of development. For example, it excludes proposals that have been suggested or discussed but that have not (or not yet) been implemented, at least for some limited area, time, or place. The completion of a pilot test is considered here as a sufficiently advanced stage of development. The requirement is aimed at focusing only on those initiatives for which there is enough clarity on the way they would be set, organised and implemented in real practice.
3. Evidence of results The initiative has been implemented at least in a limited area, for a sufficient period, or for a pilot study, and the results are now available on its actual functioning.

The following table shows the selection criteria applied to the six initiatives. In the next section, we provide a brief overview of the initiatives that did not meet either of the first two criteria, i.e., fitness to the scope and advanced stage of development. These are initiatives whose direct aim is not on quality, and/or that otherwise may prove to have a direct beneficial impact on quality improvement, but whose early stage of implementation does not allow a thoughtful appraisal. In the final section of this chapter, we give a more in-depth account of

the Peer-to-Patent: Community Patent Review. For the former, we will be able to discuss the implications of the evidence resulting from the US pilot study.

Table 53 Potentially relevant initiatives: selection

Initiative	Main aim	Fitness	Stage of development	Evidence of results
Codes of conduct	Improve the disclosure of information from patent applicants	Yes	Not implemented	No
IP5 - WSI	Harmonise and reduce examination burden in the 5 major patent offices	No	Begin of pilot	No
Patent Prosecution Highway	Reduce patent backlog, simplify international extension	No	Yes	No
Peer-to-Patent: Community Patent Review	Improve prior art retrieval and screening	Yes	Yes	Yes
Shift from First-to-invent to First-to-file	eliminating the disputes on who should be the legitimate claimant	No	Yes	Yes
US Patent Training Academy	Providing improved quality training to new patent examiners	Yes	Yes	No

4.3 International Initiatives to Improve Patent Quality

This section reports a brief description of four initiatives being proposed or undertaken either internationally or outside the EU member states and that stood out for potentially benefiting patent quality. This section does not aim at providing a complete account of these initiatives but rather to mention and remind that patent quality may potentially be affected by a system of provisions and circumstances that directly or indirectly contribute to it. Whenever possible, we report and comment on the feedback from the results of the PatQual survey, presented in Chapter 2 and on the survey to the NPOs presented in Chapter 5.

4.3.1 Strengthening the Duty of Disclosure and Codes of Conduct

In terms of legal provisions, the US debate has focused extensively on readjusting the balance of private interests (obtaining a proprietary exclusive right on an invention) and public interests (disclosing the invention for future use, after expiry and limiting the monopoly power in scope) by strengthening the former. Several proposals have been suggested in this direction by scholars and practitioners. Although at present none of these proposals have been implemented, it is worth recalling them here.

Public interests require that the applicants disclose information on their inventions under a duty of candour. In common practice, such duty has traditionally been limited to requiring that the applicants provide an exhaustive description of the inventions that would make them replicable to an expert. It does not require that the applicants refrain from retaining information on relevant prior art or omit all potentially relevant information in their possession. Several cases in which patent trolls and clear abuses of the system have occurred in recent years, especially in the USA, have shown that the applicants in bad faith can take advantage of the mild enforcement of the duty of disclosure. The case has been extensively reported and

discussed by both the scholarly literature and the popular press[21]. By filing applications for inventions that are too general, or vaguely described, or, again, by choosing non-standard lexicon for their description, they deceived the examiners. The patents they obtained later created huge problems of litigation that harmed both the honest inventors and society-at-large. The problem is that, although the examiner is aware of potential abuse, they often cannot lawfully reject an application on the grounds of poor disclosure, except in extreme cases. The system is then exposed to being exploited by people in bad faith, with negative consequences mostly upon those that acted lawfully. Despite these limitations, in 2009 it was estimated that 26.4% of the US courts' judgments on the validity of patents were discussed on grounds of insufficient disclosure. Of these, 53% resulted in a confirmation of the patent and 47% in a finding of invalidity[22]. Duties of disclosure are currently limited to providing only the information already in the applicant's possession and do not include relevancy statements, i.e., information that should help the examiner understand the relevance of the information disclosed in the context of the claimed invention, and assess materiality[23].

The doctrine has extensively speculated on **the current narrowness of the duty of disclosure** to which patent filers are subjected. Further and more severe requirements –they maintain- would limit the opportunity of abusing the system by applicant in bad faith, thus discouraging deceptive behaviour. Several scholars have argued in favour of extending the duty of disclosure to comprise additional information, for example, by providing a number of standard semantics to serve as keywords to patent examiners and in future searches, or by drafting the patent in a more exhaustive fashion that comprises an account of the prior art and a clear statement of how the invention improves it. Additional information provided under a duty of candour would help the examiner to perform a more effective and rapid screening and would make the patent more easily retrievable in future searches by examiners and applicants. As stated before, in practice, none of these proposals have been implemented and it is hard to foresee what would be the real benefits and costs associated to their practice.

In terms of enforceability, an expansion of the duty of disclosure can be obtained in several ways. First, the obligations to which applicants and/or the patent attorneys are subjected while applying for a patent can be expanded. These obligations, such as, for example, prescribing the description in the patent application of the prior art, the field of art to which the claimed invention pertains, and the problems that the claimed invention helps to solve, can be required in procedural manuals like the Manual of Patent Examining Procedure and/or in Codes of Conduct. These practices are prescribed by several NPO manuals, and widely used in practice. However, at present, compliance to these practices is not required under penalty of the rejection of the application[24]. Several proposed solutions have been suggested to sustain the use of such codes. For example, a fast examination of maximum duration of one year can be ensured to those applicants that voluntarily offer an extended disclosure, in exchange for their contribution to an easier examination[25]. Another possibility is to ensure the presumption of validity only to those patent applications that offer extended disclosure, whereas the other patents will only be a registration at a certain date, but the burden to prove their validity will remain upon the assignee[26]. Some proposals go further and suggest forms of sanctions for those that do not comply with the extended disclosure. For example, this would include a one-way fee in case the patent is later judged invalid in litigation, on grounds of an

[21] Lemley, M.A., Shapiro, C. 1991. "Patent Holdup and Royalty Stacking", Texas Law Review, 85. Golden, J.M. 2007. "'Patent Trolls' and Patent Remedies", Texas Law Review, 85:2111. Barker, D.G. 2005 "Troll or no Troll? Policing Patent Usage with an Open Post-Grant Review", Duke Law & Technology Review, 9.
[22] Johnson, J. et al., "Patstats: U.S. Patents Litigation Statistics", University of Huston Law Centre's Institute for Intellectual Property and Information Law, www.patstats.org, 2010.
[23] Cotropia, C.A. 2009. "Modernizing Patent Law's Inequitable Conduct Doctrine". 24 Berkeley Tech. L.J. 723.
[24] Miller, J.S. 2005. "Enhancing patent disclosure for faithful claim construction". 9 Lewis & Clark L. Rev. 177.
[25] Osenga, K. 2005. "Entrance Ramps, Toll, and Express Lanes – Proposal for Decreasing Patent Congestion in the Patent Office", 33 Florida State University Law Review, 148.
[26] Kesan, J.J. 2002. "Carrots and Sticks to Create a Better Patent System, 17 Berkeley Technology Law Journal, 763:766.

omitted prior art that would have been avoided with ordinary diligence[27], or a system of bounties in case a relevant prior art is later found[28].

Advocates in favour of expanding the duty of disclosure have also highlighted the set of problems that arise from the choice of wording and lexicon in patent applications (including the strategic use, or hiding of words). They have proposed to require additional disclosures that would assist claim construction and make patents a more informative document. For example, scholars have proposed that the application should be required to provide a more complete lexicon that eliminates the search for implicit special definitions, along with a list of objective reference sources on which third parties can rely for evidence of ordinary meaning[29]. This would enable easier searches of documents both to the patent examiners and to third parties.

A second means to require a stronger duty of disclosure is through interpretation. In court, the judgment of omitted disclosure of relevant information can be enforced through the provisions against the duty of candour and good faith. In the US law, the situation in which a patent applicant breaches her duty of candour and good faith to the US Patent and Trademark Office when filing a patent can lead to a judgment of inequitable conduct. Judgments of inequitable conduct, for example, have occurred for: (a) failure to submit material prior art known to the applicant; (b) failure to explain references in a foreign language or to submit pre-existing translations of the references; (c) misstatements of fact, including misstatements in affidavits concerning patentability; and (d) mis-description of inventorship.
It has been estimated that during 2000-2004, 834 court decisions in the USA have involved inequitable conduct, and 20% of them resulted in a finding[30]. In terms of consequences, a finding of inequitable conduct involves unenforceability of the patent for the rest of the term, even when the inequitable conduct was found only in relation to one claim and the unenforceability can sometimes be extended to related patents.

Those in favour of this interpretation maintain that the applicants often have information on prior art that they gather prior to applying and can hence disclose it at little or no cost. At the same time, they would benefit from a more certain right and a lower probability of infringement and litigation later on.

There are several arguments against extending the duty of disclosure. First, many contest that applicants should not be required to produce excess information or bear the burden of proof when this harms or constraints their private rights. Second, more information required is equal to increasing the indirect cost of patenting that the applicant has to bear. This would discourage patenting mostly from individual inventors and from SMEs, whose decisions are typically more cost-sensitive. Third, attorneys and professionals maintain that they can only be required to act in the interest of their customers, whereas it is the NPO's duty to act in the public interest. Finally, proving what information is in possession of an applicant is often unfeasible.

In terms of users' perspectives, respondents to the PatQual survey to the patent users seem to agree that there should be a strong correspondence between patent quality and disclosure. In particular, 78% of the firm respondents and 76% of the university respondents regarded as very important or important the fact that "[a] high quality patent has a very clear disclosure of innovative contents". Among the open text comments to the question, some respondents went on by saying that "a high quality patent clearly distinguishes the inventive step and its advantages over the state of the art", and highlighted the importance that the disclosure enables the actions against the infringement and gives exemplifications of its use.

[27] Kesan, Id.
[28] Thomas, J.R. 2001. "Collusion and Collective Action in the Patent System: A Proposal for Patent Bounties", University of Illinois Law Review:305-318.
[29] Cotropia, Id.
[30] Mack, K. 2006. "Reforming Inequitable Conduct to Improve Patent Quality: Cleansing Unclean Hands". 21 Berkeley Tech. L.J. 147.

Nonetheless, one respondent indicated that establishing a clear contribution to the art is relevant, although this should not involve further compliance with formality issues that would make the process too bureaucratic.
Respondents also agree that monitoring patent activities by third parties is crucial for wise management of their patent portfolios, which hints at the relevance of being able to scan the patent databases for relevant documents. For example, the 76% of companies' respondents indicated as very important or important the monitoring of complementary and potentially blocking patents, and 69% agreed on the importance of monitoring newly granted patents. The benefit of an easier search can then potentially outweigh the burden of requiring a more complete lexical disclosure.

4.3.2 IP5 Work-Sharing Initiative

The IP5 is a working group comprised of the world's five largest patent-granting offices, namely, the JPO, USPTO, EPO, KIPO and SIPO. Every year, these five offices account for the large majority of the patents being granted worldwide[31]. Furthermore, it is estimated that approximately half or more of the patents that each of these offices grant every year is based on a patent application that was also filed and examined in either one of the other four offices. Because each patent application involves a new examination (with the exception of a bilateral agreement that allows for a fast examination, such as the Patent Prosecution Highways that will be considered in the next paragraph), an important part of the work of the largest offices implies the usage of similar documents, similar sets of data, and prior art screening, among others. These circumstances have inspired the establishment of a framework to facilitate the cooperation among the countries and **share the costs of tools and procedures** for common uses of the offices.

Since the autumn of 2008, the IP5 have agreed on a set of priorities and and have engaged themselves in ten collaboration projects, the so-called "Foundation Projects". The vision of the IP5 is aimed at "[t]he elimination of unnecessary duplication of work among the offices, enhancement of patent examination efficiency and quality, and guarantee of the stability of patent right"[32].
Each office has taken the project leadership of two projects, as indicated in the following list, with leader office in brackets: Common Hybrid Classification (EPO), Common Documentation (EPO), Common Application Format (JPO), Common Access to Search and Examination Results (JPO), Common Training Policy (KIPO), Mutual Machine Translation (KIPO), Common Examination Practice Rules and Quality Management (SIPO), Common Statistical Parameter System for Examination (SIPO), Common Search and Examination Support Tools (USPTO), and Common Approach to Sharing and Documenting Search Strategies (USPTO).

In terms of potential to impact the quality of the patents issued, the IP5 – WSI seems promising as it is envisaged that the offices will share internal examination documentation to ease and speed up the examination of patent extensions. This is expected to increase the consistency of the decisions on claim amendments and final granting issued by the various IP5 offices. Increased consistency shall mean diminished uncertainty of rights and lower probability of infringement later on. The use of machine-translated documents and of common automated search strategies, documentation, classification and databases is expected to further support the consistency of the decisions on patentability.

At present, no result is yet available to assess the relevance of the initiative and its impact on the quality of the patents granted.

In terms of users' perceptions, the majority of European companies' respondents to the PatQual survey expressed a high or very high satisfaction with the substantive examinations

[31] In 2007 these five offices accounted for the 85% of all patents issued by their own residents and 66% of all patents issued worldwide by non-residents of these countries (WIPO. 2009, "World Intellectual Property Indicators. 2009 Edition", Genève.).
[32] EPO, "Blueprint Laid Out for Work-sharing among Five IP Offices", press release, Munich, [31] October 2008. http://www.epo.org/about-us/press/releases/archive/2008/20081031.html

of the EPO and JPO, whereas the satisfaction is low or very low for the majority of respondents concerning applications at the KIPO (52%), USPTO (55%) and, especially, the SIPO (66%). Although the results can be biased by the smaller number of applicants that have true, sound experience of extension at KIPO and SIPO, this is consistent with the idea of disparities in the examination process and of the need for some sort of harmonisation process.

From the results of the survey to the NPOs and EPO, we know that the offices in general agree that the exchange of information among patent examiners is beneficial to improving patent quality. At the same time, both the cooperation among patent offices and the mechanisms and tools ensuring common classification and machine-translated documents all were indicated to be beneficial and bring positive effects.

4.3.3 Patent Prosecution Highway (PPH)

The PPH is a scheme under which an applicant whose claims are determined to be patentable/allowable in the Office of first filing to have the corresponding application in the Office of second filing advanced out of turn in examination while at the same time allowing the Office of second filing to exploit the work results of the Office of first filing. The first PPH was established between the USPTO and the JPO in the spring of 2006. After the pilot study was initiated in 2006, the PPH between JPO and USPTO became permanent on January 4, 2008. Since then, a number of PPHs have been signed between other patent offices. The most active office has been the JPO, which has established bilateral agreements with the offices of South Korea (2007) and UK (2010), and has been running pilot projects with the offices of Germany (2008), Denmark (2008), Finland (2009), Russia (2009), Austria (2009), Singapore (2009), Hungary (2009), and Canada (2009), and with the EPO (2010) and the WIPO (2010). The USPTO has also established a permanent PPH with Korea (2009) and has started pilot projects with the offices of UK (2008), Australia (2008), Canada (2008), Finland (2008), Germany (2009), and Singapore (2009) and with the EPO (2008).

The aim of the PPH is to enhance the efficiency of the examination process by going into a fast-track examination, in the case where a patent application has already undergone a successful examination in the office of first application with which a PPH exists. This is possible because the examiner can use the work done during the previous examination before the office of first filing, which saves time and costs. To request the procedure, it is sufficient that at least one claim from the application was accepted as patentable in the other office. In some cases, the PPH can also be activated for PCT original filings that underwent the examination at the partner office.
The savings of time on behalf of the examiner are sizable, and this translates to a faster issuance. If the request of PPH is accepted and the patent is ready for examination, the patent will generally be examined in a few months. For example, at the USPTO, a PPH request that has been granted, generally takes two to three months to be examined. Two months are generally required for the request of PPH to be accepted. Therefore, the procedure generally completes faster than the Accelerated Examination (at the USPTO this takes 12 months) and is less expensive.
Since January 2010, the USPTO, under the PPH, has agreed that they will begin to accept machine-translated documents from the Japanese language to the English language, provided that the machine translation is done with a special tool developed by the JPO.

Most of the appeal of the PPH lies in the same rationale already discussed for the IP5 – WSI, i.e., that the offices can save time and costs on the examination of patent applications that arise from extensions. The gains in principle grow with the volume of the patents being extended between the two offices, when language barriers are high (the prior art is available only in a foreign language), and provided that the standards of quality of the examination are comparable.

Although the first aim of the PPH relates to improving the efficiency of the examination (costs savings) and to ensuring a faster service to the inventors in the extensions, the PPH can also be expected to bring side advantages for what concerns patent quality. In fact, when two

distinct offices perform the same examination separately, chances exist that, for example, the examiners will amend the claims differently, or that some of the relevant prior art is not found in one case, among other things. This is more likely when the relevant prior art is in a foreign language to that of the examiner. In that case, the examiner that can read the documents in its own national language can perform the examination more accurately and issue a better quality patent. Inconsistent decisions on similar claims are widely documented in practice[33] and they often create room for future litigations. **Reducing the inconsistencies** in two patents covering substantially the same invention in two distinct countries leads to more certainty of rights and lowers the likelihood of litigation. A second advantage that relates indirectly to quality is that the PPH should help the patent offices to reduce their backlog of pending examinations. If the many pilot projects currently started will transform into permanent ones, the gains in efficiency will become sizable for many offices. This should, in the long run, help to reduce the time to granting of both the PPHs and the normal patents and allow for more time to perform the examination, even without increasing the number of examiners.

The PPHs would in principle facilitate a smoother and faster extension of national patents to a foreign patent office. Nonetheless, certain risks of worsening, rather than improving quality, are to be taken into account if the PPH become widespread. The most important of such risks relates to the loss of direct control of the examination, and consequently of the patent quality that is associated to the examination waver. Such loss of control can be more or less risky, depending on the offices with which the PPH is being signed. In this respect, PPHs can be considered a reasonable solution only for carefully selected offices. Even in such cases, it is important: first, that the issue of patent quality insurance is explicitly discussed as part of the PPH agreement and that quality standards are agreed upon and made explicit. Clearly, each signing office has to ensure certain constant standard of quality of the examination. Second, the receiving office should monitor the actual quality of incoming extensions periodically. In principle, adoption of the PPH can also bring certain subtle effects. For example, if the PPH procedure becomes a standard, one can expect filers that seek international coverage to prefer filing at those NPOs from which PPH extensions are accepted, with the consequence of increasing, rather than decreasing, the workload of that office. According to the results of the PatQual survey to companies and PROs, at least in Europe, where applicants can choose the office of deposit, the choice of the office is shown to be highly variable. Furthermore, although at present there is no report of problems, it should, however, be noted that, in case the preferential routes will become common, scenarios of strategic behaviour can potentially open up. For example, offices that are known (or believed) to perform less accurate examination can be preferred by applicants in bad faith, in hope of a milder examination in subsequent extensions. Therefore, it is extremely important that the quality of the examination performed by the foreign office with which the PPH is signed is kept high.
Finally, every national office undergoes social and political pressures for sustaining the national technological edge in international competition, and therefore, the role of a substantive national examination remains crucial and cannot be fully abandoned.

4.3.4 Shift from First-to-Invent to First-to-File

The last decades have been characterized by extensive discussions on the most appropriate regime to grant rights to inventors. Under the “first-to-invent” regime the right to patent is granted to the person that first conceived and/or practiced the inventive idea. Conversely, under the “first-to-file” regime, the right to patent is granted to the person that first discloses the invention by filing a patent at a competent patent office. Although the former is the most ancient regime, the latter has been generally preferred, leading to a gradual and pervasive take over. At present, virtually all patent systems work under the “first-to-file” regime, with the exception of the USPTO and the Philippines. After Canada shifted from one to the other in 1989, the awaited reform of the US “Patent Act” is expected to eventually mark the adoption of the First-to-file regime by the USPTO. The rationales behind this change relate, from the

[33] Palangkaraya, A., Webster, E., Jensen, P. (2010), “Misclassification Between Patent Offices: Evidence from a Matched Sample of Patent Applications” forthcoming on the Review of Economics and Statistics.

one end, to the need of conforming to internationally widespread regulations, and, from the other end, to a simplifications of the procedures, with the elimination of the disputes on who should be the legitimate claimant (a procedure called commonly “interference”).

Among other things, the US shift from the first-to-invent to the first-to file is expected to bring several positive consequences on the side of patent quality. A detailed discussion of either systems would exceed the scope of this study. Here, we limit to recall what the expected implications of such shift are for patent quality issues.
There are two main reasons to advocate that the first-to-file regime is more supportive of high quality patents than the first-to-invent regime. The first one relates to a **greater certainty of rights** and the second one relates to the timing of the examination process.
In terms of the first one, the advantage of the “first-to-file” regime resides in the fact that the rights of the claimant begin at the filing date and this is recorded directly and with complete certainty by the national patent office. In this case, the date at which rights can be claimed over the invention is never (or very hardly) considered as arbitrary and cannot become the subject of disputes. The system fixes such date with considerable certainty in a non-subjective and inexpensive fashion. This is not the case in the first-to-invent regime, since a second filer, by means of a proceeding called “interference” (or “priority contest”), can later challenge the right given prima facie to the first filer. In case of multiple filers and interference, the office is called to determine, among other things, the date at which the initial right was formed, based on external proofs and subjective evaluations. Consequently, under the first-to-invent regime, the rights of the applicants are subject to greater uncertainty for the initial 12 months after filing, because other filers can show up at any time to challenge the priority. In the US the judgment of interference is not subjected to estoppel and can hence lead to further future litigations.
In terms of timing, the “first-to-file” regime enables a quicker examination, to the extent that the interference procedure is ruled-off *ab origine*. All other things being equal, a shift from the “first-to-invent” to a “first-to-file” regime should result in a simpler examination, and consequently to fewer backlogs and faster issuance of patents.

4.3.5 US Patent Training Academy

The quality of a patent depends heavily on the quality of the examination process, which in turn relies on the work of the examiners. In recent years, the quality of the examination has been challenged by the increasing backlogs, by the emergence of strategic behaviour on behalf of the applicants, as well as by the rapid growth and evolution of new technological domains. Many have claimed that coping with these new challenges can only be done if adequate investments are made on the human capital that works in the patent offices[34].

Today’s inventive activities have undergone radical changes, if compared to the inventive activities of firms and inventors of the end of the XIX Century, when the patent law was initially formulated. On the one hand, new technological domains have emerged, often challenging both the interpretation of the existing law and the efficacy of the procedure to ascertain prior art, such as in the case of software inventions. On the other hand, dramatic changes have occurred in the ways innovative activities are carried on at the shop floor. The emerging technological domains, such as those of the biotechnologies and nanotechnologies are all characterised by science-based inventions and complex cumulative construction. In these domains, inventions can hardly come from the stroke of genius of technicians and engineers with an empirical and practical experience in the field. They rather come from an in-depth scientific understanding of the principle and phenomena that govern the basic functioning of life and matter. Inventions are often systemic and built over a lengthy cumulative process.

[34] Burke, P.F., Reitzig, M. 2007 “Measuring patent assessment quality—Analyzing the degree and kind of (in)consistency in patent offices’ decision making”. 2007 36(9):1404-1429. van Pottelsberghe de la Potterie, B., François, D. 2009, “The cost factor in patent systems”, The Journal of Industry, Competition and Trade, 9(4), 329-355.

If looked at from the point of view of the patent offices that are called to examine the inventions, these changes bring forth considerable challenges for what concerns the recruiting and training of the examiners. First, the examiners should have a sound technical and scientific background to understand the content of the application and the documents relevant as a prior art. Second, technological domains blur, demanding interdisciplinary competences or work in teams. Third, the examiner often does not benefit from a direct experience on the field. Forth, knowledge and competences evolve very rapidly and demand continuous updates.
Further to this, examiners need a set of additional competencies, such as the knowledge of the legal issues in matters of IPRs, a strong in-depth knowledge of the patent procedure of their own office and of the other offices worldwide. They often need to know foreign languages (EPO examiners for example should know three languages), to be trained on the use of sophisticated databases and to be able to communicate with the applicant in written form. All this, coupled with the common requirement of citizenship in the country of the patent office, restrict considerably the range of good recruits. Once recruited, examiners need to undergo a heavy training, and it is critical that they continue to be trained, as the state of the art of their technological domain evolves.

To cope with these challenges, the USPTO has strongly revised their system of initial training of new examiners. In 2006, the USPTO invested in their internal training unit and established the Patent Training Academy (PTA). This is an institution located in the vicinity of the USPTO offices in charge of both the initial training and the continuous education of the USPTO personnel. Here, we describe the First Training program.

New hires of the USPTO are subject to 24 months of mandatory training program. Of these, the initial eight consecutive months are organised as full-time university-type training. During the subsequent 16 months the new employee starts to practice, and the program continues as a mix of activities involving fieldwork, laboratories and classroom training.
In the initial part of the program, participants attend eight consecutive months of training in the Training Patent Academy campus. Classes begin with large group lectures (around 160 new hires) and are then split into groups of approximately 16 new hires in a specific subfield of practice. Each lab receives specific tailored training, depending on the subfield specificity. Students have library and database privileges and are assisted by a tutor.
In addition to extensive lecture and lab training, attendees spend considerable time learning their jobs through the examination of real patent applications and are assigned for assistance to a senior patent examiner in their field. The eight-month curriculum comprises a number of mandatory subjects, including legal training, procedural training, automation, enhanced instructions on search tools and databases (e.g., query language). Training on soft skills is also mandatory. This includes personal development, such as time management, balancing quality and production, dealing with conflicts, and communication skills improvement.
During the 16-month program, the new hires is temporarily assigned to a unit and meanwhile continues professional development with on-the-job training, and with tailored technical or professional courses or assignments given by the PTA. The 24-month programs concludes with a graduation and the employee is then permanently assigned to a Technology Centre of the USPTO. The PTA training process has recently been ISO-9001 certified.

In terms of the appraisal of advantages and disadvantages, at present there is no publicly available report on the results produced by the new training program and by its impact on the quality of the examination. The program started in 2006, and only a minority of the examiners currently working has undergone the program. The program of the PTA is also expected to involve considerable costs, which we are not able to quantify. A critical issue related to giving a fully sponsored training relates to ensuring that the investment is not wasted in case the new hire decides to abandon the program prior to finishing or immediately after. Standard clauses of the employment contract can help in this respect.

All of the NPOs have their training programs, sometimes involving several months of full-time training. For example, the EPO has a 24-month program for the training of new examiners, including two to three months of full time training in small groups of 12 people at the beginning of the curriculum. After that, new hires are assigned to a coach and continue their on-job training within their unit for several years. Additionally, large patent offices have mutual

agreements for visiting programs of their employees. The information we have does not allow for comparative assessments on the costs and benefits of alternative training programs. There is no direct evidence that the US initial 8-months full-time program provides a better training to examiners. Nonetheless, the US Patent Training Academy eight-month training provides a useful opportunity for comparison and for continuous improvement of the NPOs training systems.

The reports from the PatQual survey show that 82% of firms and 93% of university technology transfer offices are satisfied or very satisfied with the substantive examination performed by the EPO. The examinations performed by the NPOs of the member states are also deemed as satisfactory or very satisfactory by the majority of respondents (58% of firms and 72% of universities), whereas satisfaction with the USPTO substantive examination is more dubious (45% of firms and 60% of universities are satisfied or very satisfied). Reports on the less satisfactory examination of the USPTO can be biased by the fact that our sample is made only by European companies and technology transfer offices. At the same time, it should not be used as evidence against the PTA, because the program has existed only since 2006.

In our survey to the NPOs, training has been reported as a critical mechanism to improve patent quality by several offices. Continuous training of examiners has been reported as having a strong positive impact on quality.

4.4 Cost and Benefit analysis of Peer-to-Patent: Community Patent Review

As stressed before, in recent years several examples of patents clearly issued by mistake by the patent offices worldwide have raised the attention of the public for the quality of the examination process. Many of these patents filed in bad faith, such as the so-called “patent sharks” upon closer inspection appear as overly broad inventions, whose scope limits are often unclear[35].

Statistics on litigated patents also point at clear problems. It is estimated that in 2005, 35.5% of patents that underwent a judgment of validly before a USA court resulted in a decision of invalidity, and in 2009 this percentage was 42.1%[36]. A judgment of invalidity means that the court does not confirm the result of the substantive examination initially undertaken by the office. A high error rate in the substantive examination creates a climate of uncertain rights and exposes the assignees to the risk of undertaking non-refundable investments or having to pay damages. It also does not adequately discourage unfair conduct.

Evidence shows that a very important determinant of the examination quality relates to searching and retrieving all of the relevant prior art for the correct assessment of novelty and obviousness. Briefly stated, these ensure that a patent can only be granted to an invention that was not already known or published or in use by other parties at the time of the deposit, and that the same invention should not be obvious to a person skilled in the matter. In practice, obviousness often also depends on the complete retrieval of the prior art because, in many cases, it resides in the trivial combination of two separate pieces of prior art. In the USA, in 2009, 36% of the court judgments of validity were raised on grounds of prior art and 31.5% on grounds of obviousness[37]. If the prior art is adequately scanned and retrieved, the examination ensures that the patent will only be issued for those inventive improvements that are at the same time novel with respect to the pre-existing knowledge and non-obvious to an expert in the matter. If a patent is issued despite being non-novel or non-trivial against the pre-existing prior art, a double damage is produced. The inventor receives (and pays for) a

[35] Reitzig, M., Henkel, J., Heath, C. (2007) “On sharks, trolls, and their patent prey—Unrealistic damage awards and firms’ strategies of “being infringed” Research Policy, 36, 1, 134-154

[36] Johnson, J. et al., “Patstats: U.S. Patents Litigation Statistics”, University of Huston Law Centre’s Institute for Intellectual Property and Information Law, www.patstats.org, 2010.

[37] Id.

patent that later on can be opposed in a court and declared null, without having the right to ask for damages. If the prior art was subject to exclusive property rights, for example, because a patent already existed to cover that content, chances are high that a litigation will occur with high costs on both sides. If the prior art was part of the public domain, i.e., was free of exclusive property rights and usable, the knowledge is improperly removed from the free disposal, at least until actions are being taken in a court to re-establish the truth.

We stated before that well-trained and prepared examiners are crucial. In practice, however, there are many reasons that make the task of finding the entire relevant prior art difficult even to a skilled examiner. Some of the most commonly reported problems are the following:

- Every month, a huge amount of new articles, reports, disclosures, books, and patent applications are published or reported at conferences and exhibitions and the amount of codified knowledge exceeds by far what a person can read
- Many documents and patents are available only in foreign languages and are not translated
- The innovation may refer to new fields of knowledge for which codified knowledge is not easily accessible
- Disclosures of new products and processes are sometimes known by people working in the field but not reported or codified, and the date of disclosure is often unclearly specified
- The channels available for disclosures are increasing as internet and web-based repositories are becoming common
- The internet has become an important source of documents, but the date of a disclosure is often unknown or uncertain and is often not usable for legal probation
- Search tools for the scanning of documents are limited and not always efficient
- The effectiveness of automatic search tools often varies depending on the choice of specific keywords and semantics

Reports have shown that, for example, in the US, the majority of cited references in a patent are composed by national patent literature, whereas only a minority is foreign patent literature, and even fewer are the references to non-patent literature. Whereas some of the proportions may reflect the real disclosure of relevant prior art, it is also clear that patent references, especially national ones, are more easily searchable and understandable, and patent literature in general is more suitable to determine anteriority. Nonetheless, a previous invention in use, a disclosure in non-patent literature, and a previously filed foreign patent all make equally strong arguments banning novelty and non-obviousness.

Several scholars and communities of users have proposed in recent years to improve the soundness of the examination by modifying the examination procedure to allow a more efficient use of the dispersed knowledge and competences. The underlying idea resides in the convergence of the communication platforms offered by internet applications, the emergence of collaborative communities that contribute voluntarily and at no cost to a common aim, and the legal requirement of publicity that applies to patent documents. Together, these open up the possibility to enlarge the burden of prior art screening and probation to a broader public to make the examination sounder and to better protect the public domain.
There are two categories of proposals that can be distinguished in this respect. A first proposal relates to organizing patent examinations in the peer-review mode, similarly to what is done in academia for publication of the scientific literature. A second proposal relates to enabling free contributions of third parties to the examination. This latter proposal has received considerably more credit and has undergone pilot tests. Here, we briefly review the first proposal and then focus on the second for a more in-depth screening.

Peer-review of patent applications in a scholarly fashion would imply that the patent application is revised, under a double blind process, at least by two independent referees knowledgeable in the matter[38]. A person in charge of acting as a reviewer (the patent examiner for example) is called to decide in case of inconsistent judgments. This proposal

[38] Walmsley Graf, S. 2007. “Improving patent quality through identification of relevant prior art: approaches to increase information flow to the patent office, Lewis & Clark Law Review, 495:519.

has not found substantial credit, on grounds of feasibility and potential effectiveness. Among the advocated advantages of this proposal are the following: the possibility of resorting by time to time to the clear experts in the subject, the sustainability of this model in science (referees are generally willing to do reviews for reasons of civil service, or prestige) and its (alleged) well functioning. In practice, a number of problems seem very likely to occur with this approach. For example, finding good referees is often reported as a real problem in academia, where referees are not compensated and often overloaded by teaching, research and fundraising. In academia, unlike for inventors, a shared system of long-lasting norms based on the civil service is diffused among the participants. Furthermore, the academic peer-review comes often in the form of advices, with no legal responsibility for potential mistakes on behalf of the referees. Additionally, conflicts of interests can emerge among referees and applicants and there is absolutely no guarantee that the peer-review examination would systematically perform better than the current system.

The second mechanism is generally referred to as the “community patent review”, or the “Peer-to-Patent: Community Patent Review”. The latter is the name chosen by the most complete and advanced experiment in the matter that has been performed under an agreement between the USPTO and the New York Law School (NYLS) Institute of Information, Law and Policy Community Patent Review Project, under the leadership of Prof. Beth Simone Noveck. This mechanism consists of a participated model of prior-art screening, based on a web platform and enabling third parties to contribute to the substantive examination process.
Under this mechanism, the patent office examiner remains ultimately in charge of performing a full examination, but he or she can **benefit from the contribution of external experts**. These are organised in a community of peers and can collectively signal relevant prior art. The suggestions of the community are non-binding and the examiner ultimately retains both control and responsibility for the final assessment.

To avoid loss of time for non-relevant submissions and to obtain the most from the knowledge distributed among the public, the suggestions of the external community are collected in an organised fashion and duly assessed by the same community. In practice, the process works in this way: the examination of a new patent application is opened and notice of this is posted to an online platform. Anybody can contribute to the community by registering in the platform. A registered user can contribute by posting a reference or notice of prior art that he or she deems as relevant in assessing a specific patent application. She can also contribute by expressing her opinion on the relevance of each prior art item posted by the community or discussing in open blogs. The identification of relevant prior art is made in two basic steps. First, participants post potentially relevant prior art; each item can be discussed, annotated and voted for its relevance to the specific patent application. Ultimately, the ten most voted items are selected and submitted for consideration to the patent examiner. The other items are filtered out and will not be submitted. Managers and facilitators support the process in several ways: they clean out the reference quotes, associate references to the pertinent claim, stimulate contributions and discussion, invite experts to contribute, and moderate and clear away inappropriate comments.

The first pilot study of Peer-to-Patent: Community Patent Review opened on June 15, 2007 for one year; it was subsequently extended for an additional year and closed on June 15, 2009. The project was managed by the NYLS group with the USPTO, and was developed under the auspices of several private companies, among which were many from the software industry, such as HP, IBM, Microsoft and RedHat. The exercise was limited to the discussion of those patent applications for which the applicant had given explicit consent, given that notice of the application had to be given in advance. The exercise was enabled by a web-based architecture available from the URL:http://www.peertopatent.org. The JPO has started a sister pilot program between June and December 2008. The UK patent office, the Canadian Patent Office and the Australian patent office later showed interest in the project, and the latter has announced the future opening of a similar pilot study.

Results of the 2 years of the pilot are overall encouraging[39]. In terms of participation, the project counted over 2,600 registered contributors, of which 505 (19%) are active. Many of the contributors indicated a corporate affiliation, whereas members with university domain emails accounted for approximately 18% in the first year of the pilot. IBM set up a joint program to stimulate participation of their employees and it is the most represented affiliation. Participation of applicants moderately successful in the first year, with only 40 patents submitted in the initial 11 months. However the number of applications posted for public review was grown to 187 in the second year of the pilot, although both figures are substantially smaller than the initial target of 400[40]. Among the applicants that participated are General Electrics, HP, IBM, Intel, International Characters, Microsoft, Oracle, Out of the Box Computing, Sun Microsystems, Red Hat and Xerox. Some of the applicants are among the largest filers of US patents and their participation is clearly important.

In terms of contribution, relevant prior art was retrieved and submitted for 36 of the 40 patent applications (90%) in year one. Overall, 173 prior art items were submitted in relation to the 40 patent applications (4.3 on average per patent), and 168 (97%) were posted to the examiners. Over 400 discussions were started and the suggested prior art pieces received 189 ratings by the registered participants.
The most encouraging reports came from the answers of the USPTO patent examiners that received the final reports. Reports confirm the usefulness of the prior-art retrieved: 53% of the examiners reported that prior art submitted was useful; 28% confirmed to have used it in the examination; 20% indicated that the prior-art piece did not turn up in their search and 12% said that the documents were inaccessible from the USPTO. Among the prior-art retrieved, 36% was non-patent literature. Of this, roughly a half resulted not to have been retrieved by the examiners.
These figures on effectiveness were slightly higher in the initial year or the pilot and appear to be compatible with the hypothesis that the effectiveness of the contribution decreases slightly as the participation of the public broadens to larger numbers and potentially embraces less-skilled contributors.
Finally, the good design of the pilot have been confirmed by satisfactory reports on the way the prior art submitted was clearly annotated and well-formatted.

Overall, the Peer-to-Patent: Community Patent Review is advocated to bring a number of advantages. First, it ensures a more complete screening of prior art. In terms of declared counterfactuals, nearly one fourth of the patent examinations would have been evaluated against an incomplete prior art. Benefits for companies that opted to have their applications peer-reviewed relate to receiving a more accurate examination in the same or a shorter time lag. This makes them more certain that their patents will not be invalidated in due course of future judgments. Second, it allows for improvements to the examination at little cost to the patent office, because it enables a more efficient use of the knowledge of third parties and external experts that temporarily lend their capabilities at no cost. Lastly, third parties (and the defendants of the public domain) are enabled to take concrete actions to prevent violations of their rights that occur when a patent is issued by mistake. Defence is enabled in this case before the patent is issued, thus saving time and at virtually no cost compared to those of future litigations, re-examination or opposition.
Overall, it seems plausible that a largely participated examination, with the help of the distributed knowledge of experts in the field can bring advantages.
Several critical issues and several potential disadvantages should nonetheless be considered.

In terms of **critical issues**, the Peer-to-Patent: Community Patent Review involves a considerable organisational effort on behalf of both the managers and facilitators of the community, especially if the exercise should be performed permanently and for all patent

[39] The Centre for Patent Innovation, 2007. “Patent To Patent. First Anniversary Report”, http://dotank.nyls.edu/communitypatent/P2Panniversaryreport.pdf. The Centre for Patent Innovation, 2007. “Patent To Patent. Second Anniversary Report”, http://dotank.nyls.edu/communitypatent/CPI_P2P_YearTwo_hi.pdf.
[40] New York Law School Institute for Information Law & Policy, 2007. “Community Patent Review Project Summary - February 2007”, http://dotank.nyls.edu/communitypatent

classes. On the other hand, it seems to be effective to the extent that a wide participation of contributors is achieved.

Among the issues perceived as critical are that of ensuring sufficient participation of experts in a wide range of subjects. The pilot study was initially performed only with respect to a limited number of patent classes in the area of software and office automation[41]. While this area is extremely interesting for the complexity and the cumulativeness of its innovations that make the examination very complex, it is also documented as an area where a rich and extended community of users-producers exists. This community is also easily reachable through the web and has a number of well-organised blogs and social networks that enable quick circulation of information. Although internet-based social networks are certainly going to grow in the future, not all domains of knowledge are equally big and well organised in web-based communities. Furthermore, as the studies on open source software have extensively documented, the community of software programmers and experts is characterised by strong ethical motivations and diffused commitment on mutual help. These ethical motivations are not equally documented in other domains. Participation of a relevant number of experts in other areas, particularly, if the Peer-to-Patent: Community Patent Review has to be permanently implemented for all patents would be certainly more complicated. With a simple simulation exercise based on the patents granted by the USPTO in 2009, we can envisage that the extension of the pilot to all patents in the five classes related to Electrical Computers and Digital Processing Systems, with the same participation rates as those of the pilot, would mean nearly 62,000 submissions of prior art and over 72,5000 submissions, if the methodology is extended to all utility patents classes. Figures would be even higher when one considers patents filed and not granted. Overall, these **figures indicate a huge collective effort that is hardly imaginable in all subjects and in the long run**. It also implies a massive and expensive organisational effort for the management and rating of the prior art submissions and their report to the related patent examiners.

With uneven participation, there are risks that the mechanism would mostly benefit large incumbents that have sufficient resources to monitor new applications and oppose prior art, rather than SMEs. For example, 32% of the companies that answered the PatQual questionnaire confirmed this fear and this proportion grows to 47% for university Technology Transfer Offices responses and to 51% if we consider only the responses of SMEs. The idea here is that there may be frequent misjudgements in the examiners work, but at least these mistakes should apply randomly to patent applications. Under uneven community participation, the examination can turn out to be more severe in certain technological domains or against certain classes of applicants (individual inventors, SMEs). Many respondents to the questionnaire indicate that they would prefer the patent offices to retain full control on the examination and appreciate their contribution as *super partes* experts specialised in evaluation.

Another perceived disadvantage of the Peer-to-Patent: Community Patent Review relates to requiring that the patent applications become freely accessible soon after the filing. At present, the prevailing rule is that the office publishes notice of patent pending 18 months after the initial filing. A participated contribution since the first examination would imply abandoning the 18-month secrecy period, a change that certainly many companies and inventors would oppose.

There are also alternative methods to obtain third party feedback, and the relevance of the Peer Patent Project in its current formulation has to be assessed against the comparative costs and benefits that this system would bring in comparison to alternative mechanisms.

First, official procedures enabling third parties to submit prior art exist already in several patent offices. For example, the European Patent Convention, under Art. 115 “Observations by third parties” enables the following: “In proceedings before the European Patent Office, following the publication of the European patent application, any third party may, in accordance with the Implementing Regulations, present observations concerning the patentability of the invention to which the application or patent relates. That person shall not be a party to the proceedings.”

[41] The continuation of the pilot was to be done in the area of Business Methods, although no evidence is yet available on the latter.

In practice, anybody can send to the EPO an observation, including prior art information, after the publication of the application (i.e., 18 months), by simply indicating the application number of reference. The submission is free of charge and the examiner should take it into account in the substantive exam. This article can be used to enable systematic contributions by organised communities wishing to improve the patent system, as well as by competitors. The most substantial difference with the Peer Community Patent initiative would be that the community would only be able to contribute after the official publication of a patent. It is unclear whether the enablement of third parties contributions before the publication of the patent should be preferable to enabling contributions after publications. Among the advantages to the applicant in case third party contributions are enabled before the publication of the application are that the substantive examination can be sought and paid for after the prior art is known with greater certainty. However, in this case, a disadvantage relates to the fact that the regime of publicity on the application should begin soon after the priority (while it currently begins after 18 months from the filing) and will then require to eliminate the initial secrecy period.
On the other hand, where the contributions by third parties are permitted only after the application has been published (i.e. after 18 months), the secrecy period is maintained, but the time window during which third parties are allowed to contribute depends on the speed of the final issuance. At the EPO, the minimum time required between an A1 and a B1 publication is of six months. Although the average lag is currently longer, this appears to be a quite small time frame for contribution of third parties.
Overall, the procedure offered by the Art.115 of the EPO appears to be a viable and good alternative to introducing a whole new process systematically implemented for all patents, like that of the Peer-to-Patent: Community Patent Review pilot. By coupling the two systems, you can combine the community screening with the third party contribution mechanisms and obtain the advantage of a largely participated screening, while saving on management costs, and simply exploiting a procedure already in place and functioning.

Second, the distributed participation can in principle be solicited by companies alone, with no strong need to have the process organised by the patent office. For example, companies can voluntarily post notice of their application to a dedicated community or website and solicit prior art knowledge that they can use to refine and improve the patent disclosure during the examination. This approach also offers the advantage of obtaining a sounder patent with the distributed participation of third parties, without incurring high costs of management or prior art screening.

Third, it should be mentioned here that other patent provisions also enable some forms of third party contributions, such as those of the *ex parte* patent re-examination (USA Patent Act, under Sec 301-307, 35 United States Code; Sec 311-318, 35 United States Code) or the patent opposition (art. 99 and subsequent, European Patent Convention). These procedures, already existent, can in principle be used for purposes similar to those of the Peer patent community but are activated after (rather than before or during) the substantive examination and require that the patent issuance is reconsidered, often with a new examination.
In the US, the *ex parte* patent re-examination request allows the possibility to a third party or group (also anonymous) to open a file on behalf of the public interest. Re-examination can be asked provided that a substantive question of patentability is being raised related to the prior art or a printed publication, and the same substantive question has not been already raised before the court. The acceptance of a request of re-examination demands that the patent is again re-examined in light of the new documents and the judgment can be a confirmation or cancellation of the patent or some of its claims. The *ex parte* patent re-examination is not subject to estoppel issues, except for requests on the same issue already raised. In terms of the success rate, it is estimated that 9,060 requests of re-examinations were filed between July 1, 1981 and December 31, 2007 (550 per year on average). Of these, 7,998 requests (92%) were granted and, 4,510 (50%) resulted in at least a partial cancellation[42]. Filing an *ex parte* request for re-examination, however, is expensive (the fee is around $2500 for each request, plus legal expenses that can be much more) and for this reason it is less suitable for participated review, where the interest for having the patent re-examined is distributed, rather

[42] Young, R. 2008. “Patents and the Public Domain”, Electronic Frontier Foundation, http://www.eff.org.

than private. Re-examination also occurs after a patent is issued, with imaginable disadvantages for both the patent assignee and the defendants of the public domain.
In this respect the Opposition procedure allows to raise arguments banning patentability immediately after the final granting decision. For this and other reasons, considerable attention has been devoted in the US to this procedure, and many scholars regard it as an international benchmark[43].

4.5 Conclusions

Patent quality improvement is a priority in all of the major patent offices worldwide. In the last decade, a rich debate on patent quality improvement has carried on, in both the academic and practitioner worlds. In this chapter, we have reviewed six initiatives and policy proposals that arose from this debate and were suggested or implemented either internationally or outside the EU Member States to promote the issuance of high quality patents.

The obligations to which applicants are subjected while applying for a patent can be expanded, for example by requiring a description of the prior-art and a clear statement on the advantage that the invention brings on the state of the art, or a more complete pool of lexicon to enable easier future searches by examiners and third parties. These obligations can be required in procedural manuals, or Codes of Conduct of the applicants and attorneys. Compliance to these manuals can either be required by law and enforced under the provisions against inequitable conduct, or can be supported by mechanisms that do not impose but rather give advantages to the applicants in exchange of a richer disclosure, such as a faster examination, or a presumption of validity.

The initial training of patent examiners, as well as retention and continuous updating, is critical for producing high quality examinations. Here, we have reviewed the initial training provided to new hires by the USPTO, under the Patent Training Academy established in 2006. This institution has created an eight-month, full-time, mandatory program in a university-type mode to improve the training of new personnel for what concerns legal, technical, procedural and automation skills, as well as for managerial and communication skills. There is no evidence to claim that this training in principle should be better than that provided by the EPO, which relies more on tutors and on-the-job training. However, we suggest that the US program can provide interesting opportunities of benchmark and comparison for continuous improvement.

Substantial reforms of the examination have also been proposed. The most advanced of these proposals concerns the systematic use of a participated model of peer review, where the public can contribute to retrieving prior art and suggest it to the examiner. A pilot study, known as Peer-to-Patent: Community Patent Review, conducted and completed in 2009 in partnership between the NYLS and the USPTO, showed that this model is doable and potentially effective if implemented by means of a web-based platform and community. Doubts are cast on the sustainability of the Peer-to-Patent: Community Patent Review in the long run and for all patents, for reasons of participation and managerial burden.

Problems may also concern changing the regime of publicity to which patent applications are currently subjected. A mechanism that resembles the principles of participated peer review can be implemented by making use of the provision for the observations of third parties. In the European Patent Convention, this mechanism already exists under Art.115 and can be activated during the substantive examination, after the patent application is published but before the patent is issued. Potential benefits for the improvement of patent quality can be substantial.

[43] Hall, B.H., Graham, S., Harhoff, D., Mowery, D.C. 2004. “Prospects for Improving U.S. Patent Quality via Postgrant Opposition”. Innovation Policy and the Economy, 4: 115-143.

5 An overview of initiatives and assessments to improve patent quality in Europe

5.1 Introduction

Mechanisms to achieve high-quality patents can follow the division of the legislative, executive and judicial functions of patent matters among separate and independent bodies. With respect to the fields of patent law making, mechanisms include the elimination or diminishment of the presumption of validity of patents. Regarding the patent judiciary (including administrative courts), mechanisms encompass the rejection of injunctive relief and the prosecution history estoppel. This Interim Report focuses on administrative mechanisms dealing with patent quality by patent offices.

Maintaining a check on the quality of patents is the most vital consideration for any office. The need becomes vital because knowledge is involved and room for a difference in view, representation and interpretation may exist. In such a scenario, it is useful to build processes. Not only does the operational side of a task become streamlined but also the finer nuances are highlighted, thus ensuring adequate attention to details. Further, an objective benchmark is set to determine efficiency and accuracy in a precise manner. Quality in niche and complex areas, such as patent searches and drafting, is also essentially maintained by engaging with specialised personnel who have expertise in their respective fields in terms of subject knowledge and experience therein. In this view, having robust mechanisms and processes to support workflow, accompanied by a rigorous quality check to ensure the elimination of fallacies and faults, also helps escalate the quality of processes and products (Clairvolex, 2010).

In some jurisdictions, substantive examination of patent applications is not routinely carried out. Instead, the validity of invention registrations is dealt with during any infringement action. In a “registration system”, patent quality can hardly be improved in the search and examination procedure. This Interim Report focuses on administrative mechanisms at jurisdictions where search and examination is the principal process for a patent application leading to a grant.

Concern for patent quality is not new, nor has it gone unaddressed by scholars (Burke and Reitzig, 2007; Cowan et al., 2006; Edfjäll, 2007; Elsmore, 2009; Graf, 2007; Merrill et al., 2004; Philipp, 2006; Shang, 2009; Singleton, 2005; van Pottelsberghe, 2009; Wagner, 2009; White, 2004) and policy-makers (Cowan et al., 2007; European Commission, 2008; European Patent Office, 2007, 2009a). However, there has been little analysis of the patent quality mechanisms used in patent offices.

Thus, the objective of this report is to undertake a general overview of the existing mechanisms that support patent quality enhancement in selected patent offices in Europe. The aim is to gather examples of practices at both the national and international level and assessments thereof. To this aim, we developed three main tasks: review of quality mechanisms according to academic scholars, collection of data on the current pro-quality mechanisms at the European Patent Office (EPO) and National Patent Offices (NPOs), and collection of data from a sample of patent authorities through an email survey. The first two tasks were performed to support the construction of the questionnaire and to highlight the most relevant themes for the survey.

The remainder of this report is organised as follows. Section 2 presents the review of the literature. Section 3 deals with the quality framework for international search and preliminary examination. Section 4 displays the landscape of patent quality mechanisms at the European level. Section 5 presents an illustration of mechanisms dealing with quality management and products, and collaboration at the national level. Section 6 shows the results of the survey on patent quality mechanisms. Section 7 describes a major facet of administrative mechanisms, drawn from a wealth of patent authorities, involving best practices. Section 8 draws some conclusions.

Regarding the several interpretations, views or perceptions, a caveat should be interposed here. The results of this study are not expected to support, defend or contest any of these mechanisms and assessments thereof but rather to analyse them realistically and to indicate to what extent they may cause a need for policy intervention. Indeed, different opinions exist about the level of policy intervention needed on the issues in question. In this respect, this study aims at providing a balanced view on how and why these problems are important.

5.2 Review Of Academic Studies On Tools For Enhancing Patent Quality

Currently, patent offices are challenged with an increasing number of patent applications and an "ambitious range of patentable subject matter" (Thomas, 2002), creating many concerns over the quality of patents. Scholars have responded to these challenges by providing different mechanisms that can be used by patent offices, examiners and applicants to foster the quality of patents. There is no one single method for higher patent quality, but scholarly debates lead to five broadly defined mechanisms that provide for an improved patentability environment: administrative changes, patent law changes, better patent information to patent applicants and examiners, better incentives to improve patent quality and more technical advancement for patent examiners.

5.2.1 Administrative Changes

Recent work by Wagner (2009) places administrative reforms and incentives at the centre of patent quality mechanisms that may be used by patent offices to reduce the incentive to defer the quality of patent claims during the prosecution. In particular, Wagner argues that to achieve effective administrative reforms, patent offices should introduce supportive means to increase the number of patent examiners, to provide for "concise and precise" claims, and to encourage feedback on low quality patents. In this respect, Cowan et al. (2006) and White (2004) add to this debate by asserting that supportive or financial means are also important for applicants to make their applications public and for patent offices to hire more examiners in specific technical fields. However, the analyses of Merrill (2004), Shang (2009), van Pottelsberghe (2009) and White (2004) move beyond these arguments by identifying other strategies for improving patent quality, central among these being the patent examination guidelines and processes. These scholars argue for an improved patent examination and pre-granting opposition process and for better quality assurance techniques (Cowan et al., 2006; White, 2004). By establishing an effective patent examination system, patent offices are able to evaluate the validity of patents (Shang, 2009) and to cancel wrongly issued patents that lead to costly litigation procedures. In this respect, Shang (2009) and Singleton (2009) contend that the inclusion of third parties (i.e. inter-partes re-examination an post-grant reviews) in the examination process provides an added value to the patent quality because parties (i.e. the patent owner, the challenger and the patent office) have better chances to assess the validity of questionable patents and new technology inventions. However, it would be wrong to think that administrative changes can function without substantive changes in patent law.

5.2.2 Patent Law And Organisational Changes

An increase in the number of patent applications, financial means, quality assurance techniques and validity claims cannot be achieved without substantive changes in patent law, which includes changes in patentability standards, subject matter, organisational structure, etc. Scholars (Cowan et al., 2006) claim that new technology developments have considerably challenged the ability of the current patent law and standards to produce an increasing number of valid patents. Therefore, patent offices need to reconsider their regulatory frameworks and provide for efficient legislative actions that encourage patent examiners to weaken the presumption of patent validity, to filter out and support high-quality inventions (Wagner, 2009) and to consistently assess patent applications (Burke and Reitzig, 2007). Regarding complex technologies, i.e. biotechnology and software inventions, Cowan et al. (2006), Elsmore (2009), Singleton (2005) and van Pottelsberghe (2009) suggest the improvement of the requirements for defining the patentable subject matter and the international harmonisation of patent examination procedures and standards (Merrill, 2004). Under these mechanisms, patent examiners and offices will be able to achieve mutual agreements about the patentability of new technology developments (Cowan et al., 2006). However, because patent law is a specialised field with many active players (Wagner, 2009), high-quality patents will be issued only if patent offices balance the interests of active and passive users (Elsmore, 2009) and legislate an “open review procedure” that allows third parties to challenge patents after their issuance. Additionally, patent offices should invest more in human capital and improve their management structure and accountability (Singleton, 2005). Finally, Edfjäll (2007) further suggests that a reformulated patent information policy also contributes to accountability issues.

5.2.3 Better Patent Information To Patent Applicants And Examiners

Academic literature on patent quality indicates that the quality of patents is most often associated with the clarity of information in patent claims and the examination procedure (Cowan et al., 2006; Edfjäll, 2007). Therefore, because everyone in the “chain of innovation” is affected by the “existing or the potentially granted patents” (Edfjäll, 2007), patent information is crucial to patent applicants, examiners or other parties. Patent information on patent claims provided by applicants contributes to the clarity of patents and leads to a more cost-effective examination process (Cowan et al., 2006). Further, Burke and Reitzig (2007) state that information is crucial to patent examiners, and patent offices should allocate additional resources to them and ensure ongoing deliberations on the patentability of various subject matters (Cowan et al., 2006; White, 2004). Other scholars state that patent examiners’ access to literature, i.e. scientific and patent literature (Elsmore, 2009) and collaboration with commercial patent information providers or other institutions specialised in protecting certain industries (Philipp, 2006; White 2004) provides for high-quality outcomes. Using these methods, patent examiners will have the opportunity to receive patent information and data from both the private and public sectors.

However, Wagner (2009), states that patent offices should facilitate the creation of high-quality patent applications and provide patent applicants with the right means to file for such applications (Edfjäll, 2007). In this respect, patent offices need to establish incentive-based strategies to encourage applicants to file high-quality patents (Burke and Reitzig (2007) and to conduct thorough claim-construction analyses. Singleton (2005), Burke and Reitzig (2007), Edfjäll (2007) and Pottelsberghe (2009) contribute to this debate and state that patent applicants will be able to conduct thorough claim-construction analyses only if patent offices disseminate all data collection to the public, publish all patents in force and encourage better co-operation among information providers and information users.

5.2.4 An Incentive-Based Approach To Improve Patent Quality

Perhaps the most complete conception of the incentive-based approach is set forth in Wagner’s *Understanding of Patent Quality Mechanisms*, who supports the argument that patent offices and examiners must draft appropriate incentives to encourage high-quality

patents. In the same line, Elsmore (2009) appears to agree with this argument and convincingly states that incentive mechanisms are of significance for the patent law to cope with new technology and innovation requirements. By clearly addressing the incentive structure that gives rise to high-quality patents, patent quality scholars argue that an incentive-based mechanism will encourage patent offices and officials to keep experienced examiners (van Pottelsberghe, 2009), to hire external expertise on technologies that pose problems (Elsmore, 2009; Merrill, 2004; Singleton, 2005; White, 2004) and to penalise patent holders, i.e. cash fines and "infectious invalidity" (Wagner, 2009), in time or costs (Elsmore, 2009). However, these proposals lead to a central question of how to assess priorities when applying these incentives. Merrill's contribution, *A Patent System for the 21st Century,* provides distinct answers suggesting that patent offices should create strong "multidisciplinary analytical capability" to assess management needs, changes and practices. This multidisciplinary analytical capability is developed effectively when patent offices encourage patent examiners to systematically assess the quality of their work outcomes, i.e. granted and non-granted patents (Burke and Reitzig, 2007).

5.2.5 Technical Advancement For Examiners

Patent quality scholars place the working performance of patent examiners at the centre of a study of patent quality improvement. Recent work by Bruno van Pottelsberghe (2009) indicates that backlogs and falling quality of patent applications can be easily reduced through training schemes that foster the performance of the patent examiners. If patent offices wish to foster innovation and respond to fast growing technology advancement, the education and the training of patent examiners should become a prime objective. In this respect, patent offices need to establish qualification mechanisms (i.e. tests, ongoing examinations and coaching services) (van Pottelsberghe, 2009; Philips, 2006; Burke and Reitzig, 2007) and recruit or promote examiners based on their relevant skills.

Taken together, these mechanisms and arguments suggest many issues that relate to patent quality that are too complex to be fixed with a single approach or method (Wagner, 2009). However, the scholarly debates on patent quality mechanisms provide us with more opportunities to understand how modest reforms can be made to encourage high technological quality and sustainable property rights (Burke and Reitzig, 2007).

In Table 54, we show a number of measures suggested by scholars to deal with patent quality issues.

Table 54 Patent quality measures suggested by academics

Measures	Source
• **assess patent applications systematically** • **adjust minimal conditions for patentability requirements to guarantee that inventors have a sufficient level of technological quality** • **improve human capital in patent offices through various strategies and provide additional examiner training** • **observe the quality of granted and non-granted patents (if possible, patent examiners should assess the impact of patent revoked/amended and patent maintained/granted**	**Burke and Reitzig, 2007**

Measures	Source
• allocate additional resources to examiners to better assess prior art • ensure ongoing deliberations on what is patentable and what is not and raise the standards for patentability • introduce measures to counter-balance the pressure to grant a patent (i.e. scientific publications) in a fast and comprehensive way • discourage the filing of lengthy and overly complex patent applications • involve third parties in the collection and evaluation of information on prior art • enforce quality management mechanisms to promote and monitor that consistent and predictable decisions are taken	Cowan et al., 2006
• remove any barriers that exist for those that need access to patent data • facilitate the drafting of high-quality patents • satisfy information and training/monitoring needs • provide patent applicants with the means to prepare patent applications with the best possible chance of making it through to grant • come to a common understanding that incomprehensible patent information is a danger to the system • hold more workshops, conferences and internet forums	Edfjäll, 2007
• raise awareness that patent quality should act as a balancing act, embracing active and passive user interests • access to patent and non-patent literature • improve assessment of the prior art and instil a more informed view of the possible impacts of the grant • add incentives or penalties (e.g. in time or costs) to reduce the number of pages and claims and/or enhance the transparency of applications. • support the Quality Management System established by the EPO • promote the EPO Best Practice Manual to receive clearer, better-placed applications • invest in external expertise on technologies, or at least in those areas that pose problems	Elsmore, 2009
• create a multidisciplinary analytical capability to assess management practices • establish other methods of determining the state of knowledge (i.e. Open Review Procedure) in an area where the common general knowledge of practitioners is not fully described in published literature • develop examination guidelines for new or newly patented technologies open to new technologies • allow somewhat different treatment of different technologies without formalising different standards • harmonise patent examination procedures and standards to reduce redundancy in search and examination, and achieve mutual recognition of the results	Merrill et al., 2004

Measures	Source
• index published patent abstracts and the sources from which they can be retrieved to improve the quality of patent applications • assure that patent examiners carefully determine whether innovation is well searched before it is filed • increase patent examiners' skills, qualifications and experience • invest in educating the public, especially the individual applicants with no company affiliation and with little or no professional assistance • offer more patent information advisory services and introduce pre-filing searches for a ''quick scan'' of the state of the art to gauge the chances of a potential application being granted, even before it has been drafted or filed • encourage collaboration between patent offices and commercial patent information providers	Philipp, 2006
• improve internal issues within the patent office (difficulties with pay and management structure) • hire more staff with technical savvy in new technological fields and outsource certain office functions • improve patent offices' technology, especially for prior art searches • improve accountability to external forces or expand post-grant review beyond current re-examinations • change standards of review in the courts by weakening the presumption of patent validity, or establishing a different standard of obviousness	Singleton, 2005
• establish a system of administrative re-examination of questionable patents • expand inter partes re-examination to all patent fields • switch more patent examiners from prosecution of normal patent applications to re-examination of important patents	Shang, 2009
• set open access to patent offices' search tools and databases • publish all patent applications after 18 months and patents available for licensing • forbid several generations of divisionals and/or continuation in parts • establish a pre-grant opposition process • increase training schemes to stay up-to-date with technological progress • create incentives to retain experienced examiners • establish recruitment policies and performance measurement based on relevant skills	van Pottelsberghe, 2009
• provide administrative early opinion on claim scope • increase the costs of patent portfolio strategies • limit the number of patents granted or applications filed by quotas or tradable rights • establish specialised courts, avoid centralisation • penalise bad patents randomly selected by imposing fines or infectious invalidity	Wagner, 2009

5.3 A Quality Framework For International Search And Preliminary Examination

Applicants can file separate patent applications at the same time in all of the countries in which they would like to protect their invention. For some countries, regional patents are available. In this respect, The European Patent Convention (EPC) provides a legal framework for the granting of European patents, via a single, harmonised procedure before the EPO. A single patent application may be filed at the EPO in Munich, The Hague, Berlin or at a national patent office of a contracting state, if allowed by national law.

Alternatively, applicants can file a patent application in a Paris Convention country and then file separate patent applications in other Paris Convention countries within 12 months from the filing date of that first patent application, giving applicants the benefit in all those countries of the filing date of the first application.

Apart from that, applicants can file an application under the Patent Co-operation Treaty (PCT). The PCT makes it possible to seek patent protection for an invention simultaneously in each of a large number of countries by filing a single "international" patent application instead of filing several separate national or regional patent applications. The granting of patents remains under the control of the national or regional patent offices, in what is called the "national phase".

A PCT international search is a high-quality search of the relevant patent documents and other technical literature. The high quality of the search is assured by the standards prescribed in the PCT for the documentation to be consulted and by the qualified staff and uniform search methods of the International Search Authorities (ISAs), which are all experienced patent offices. The international search is carried out in accordance with the International Search and Preliminary Examination Guidelines and results in an international search report and a written opinion of the ISAs on the potential patentability of your invention (World Intellectual Property Organisation, 2006).

Chapter 21 of the Guidelines for the Processing by International Searching and Preliminary Examining Authorities of International Applications under the PCT, entered in force in 2004, establishes the main features of a quality framework for international search and preliminary examination. It describes a minimum set of criteria that each office should use as a model for establishing their individual quality scheme. There are 17 ISAs, and six of them are based in Europe, viz. the Austrian Patent Office, the European Patent Office, the Spanish Patent and Trademark Office, the National Board of Patents and Registrations of Finland, the Swedish Patent and Registration Office and the Nordic Patent Institute[44]. Examples of quality management systems implemented by European ISAs are shown below, for the years 2006 to 2009.

Table 55 PCT quality mechanisms

Mechanism	Report
Establishment and maintenance of a Quality Management System **Offices should provide general background information relevant to the Quality Management System (QMS), such as ISO 9000 and an organigram showing the organisational units responsible for implementation of the QMS.**	**Austrian Patent Office, 2006; European Patent Office, 2006, 2007, 2008b; Spanish Patent and Trademark Office, 2006, 2007, 2008, 2009b; National Board of Patents and Registrations of Finland, 2006, 2007; Swedish Patent and Registration Office, 2006, 2007, 2008, 2009; Nordic Patent Institute, 2007, 2009**

[44] The Nordic Patent Institute acts as the International Searching Authority and International Preliminary Examining Authority for any international application filed with the Receiving Office of Denmark, Iceland and Norway.

Mechanism	Report
Offices should show that they have established and are maintaining a QMS that a. establishes basic requirements regarding resources, administrative procedures, feedback and communication channels required to underpin search and examination; and b. incorporates a quality assurance scheme for monitoring compliance with these basic requirements	Austrian Patent Office, 2006; European Patent Office, 2006, 2008b, 2009b; Spanish Patent and Trademark Office, 2006, 2008; National Board of Patents and Registrations of Finland, 2006, 2009; Nordic Patent Institute, 2006, 2007
Resources and infrastructure Offices should provide information about the QMS infrastructure that ensures a) an adequate quantity of search and examination (S&E) staff, including i) means for matching the quantity of S&E staff to the inflow of work; ii) means for ensuring that recruited S&E staff have the necessary technical qualifications; and iii) means for ensuring that S&E staff have language skills, or have access to supporting translation arrangements; b) adequate quantity and skills of administrative staff to support S&E; c) provision of appropriate equipment and facilities to support S&E; d) provision of the minimum documentation supporting S&E; e) provision of up-to-date work manuals. These must include explanations of i) quality criteria and standards; ii) descriptions of work procedures; and iii) instructions ensuring that the work procedures are adhered to; f) provision of an effective training and development programme for all staff involved in S&E, including means to ensure the acquisition and maintenance of the necessary experience, skills and familiarity with work manuals; and g) continuously monitoring and identifying resources, other than staff, required to deal with demand and comply with quality standards for S&E	Austrian Patent Office, 2006; European Patent Office, 2006, 2007, 2008b, 2009b; Spanish Patent and Trademark Office, 2006, 2008; National Board of Patents and Registrations of Finland, 2006; Swedish Patent and Registration Office, 2006, 2008, 2009; Nordic Patent Institute, 2006, 2007
Administration procedures Offices should provide information on those mechanisms that ensure a) timeliness of S&E to quality standards; and b) coping with fluctuations in demand and backlog management	Austrian Patent Office, 2006; European Patent Office, 2006, 2007, 2008b, 2009b; Spanish Patent and Trademark Office, 2006, 2008; National Board of Patents and Registrations of Finland, 2006; Swedish Patent and Registration Office, 2006, 2008; Nordic Patent Institute, 2006, 2007

Mechanism	Report
Quality Assurance Procedures Offices should provide information on procedures that ensure that S&E reports of a quality standard are issued. In particular, offices should provide information on a) activities related to verification, validation and monitoring; b) processes for measuring, recording, monitoring and analysing performance of the QMS; c) activities related to verifying the effectiveness of actions taken to deal with deficiencies, including i) those actions taken to eliminate, correct or authorise release of deficient S&E work that does not comply with the quality standards; and ii) those actions taken to eliminate the causes of deficient S&E work and prevent the deficiencies from recurring; d) activities ensuring the continuous improvement of established processes underpinning the issue of S&E reports	Austrian Patent Office, 2006; European Patent Office, 2006, 2007, 2008b, 2009b; Spanish Patent and Trademark Office, 2006, 2008, 2009; National Board of Patents and Registrations of Finland, 2006; Swedish Patent and Registration Office, 2006, 2008, 2009; Nordic Patent Institute, 2006, 2007, 2008, 2009
Feedback arrangements Offices should give information on arrangements to a) provide feedback to staff informing them of results of verification, validation and monitoring carried out to assess compliance of S&E work, so that i) deficient S&E work is corrected; ii) corrective action, i.e. action necessary to prevent recurrence, is identified and implemented; and iii) best practice is identified, disseminated and adopted; b) accommodate prompt feedback from other offices so that potential systemic issues, e.g. recurring deficiencies of S&E work, as identified by those offices, are evaluated and addressed	Austrian Patent Office, 2006; European Patent Office, 2006, 2007, 2008b, 2009b; Spanish Patent and Trademark Office, 2006, 2009; National Board of Patents and Registrations of Finland, 2006; Swedish Patent and Registration Office, 2006, 2007, 2008; Nordic Patent Institute, 2007
Communication, guidance and responses to users Offices should give information on arrangements to a) provide communication channels for dealing promptly with enquiries and enabling appropriate two-way communication between applicants and examiners; b) provide concise and comprehensive guidance and information to users (particularly unrepresented applicants) on the S&E process, using the website of your Authority, guidance literature, and other means; and c) monitor and react to user needs and feedback, including i) measuring user satisfaction and perception; ii) handling complaints; iii) correcting deficiencies identified by users; iv) taking corrective action, i.e. action to eliminate the cause of deficiencies, in response to recurring or systematic deficiencies identified by users; v) taking preventive action, i.e. action to eliminate the cause of potential deficiencies, in response to potential deficiencies or problems identified by users; and vi) ensuring needs and legitimate expectations of users are met	Austrian Patent Office, 2006; European Patent Office, 2006, 2007, 2008b, 2009b, 2010; Spanish Patent and Trademark Office, 2006, 2008, 2009; National Board of Patents and Registrations of Finland, 2006; Swedish Patent and Registration Office, 2006, 2008; Nordic Patent Institute, 2006, 2007

Mechanism	Report
Internal Review **Offices should show that arrangements are in place to ensure that** **a) an internal review is carried out to determine** **i) the extent to which a QMS complying with the model of Chapter 21 of the Guidelines for the Processing by International Searching and Preliminary Examining Authorities of International Applications under the PCT (PCT-Guidelines) is entered in force in 2004;** **ii) the extent to which the Authority complies with the requirements of its QMS; and** **iii) the extent to which the Authority complies with PCT;** **b) the internal review demonstrates whether or not the requirements of the QMS and PCT are being applied consistently and effectively; and** **c) the internal review takes place at least once a year**	**Austrian Patent Office, 2006; European Patent Office, 2006, 2007, 2008b, 2009b; Spanish Patent and Trademark Office, 2006; National Board of Patents and Registrations of Finland, 2006, 2009; Swedish Patent and Registration Office, 2006, 2007, 2008; Nordic Patent Institute, 2006, 2007, 2008, 2009**

As shown inTable 55, the six patent authorities conducting international searches for the PCT that are based in Europe do have administrative mechanisms to meet the requirements of Chapter 21. The reports detail the baseline of the quality system in place in each patent authority and subsequent changes.

5.4 Landscape Of EPO Patent Quality Mechanisms

In this section, we refer to a number of mechanisms dealing with patent quality at the European level as a second step to grasp the various dimensions for developing the survey questionnaire.

5.4.1 Raising The Bar At The EPO

The Board 28 is of the view that there is a need to ascertain clearly what is expected from the patent system in terms of the quality of patents and to reflect on ways to meet the expectations. The EPO has suggested that the approach might be a three-pronged one, involving three lines of actions, namely
a) changes to the current practice and procedures, not needing any amendments to the EPC;
b) proposals concerning ways in which applicants, their representatives and third parties can be involved to ensure that appropriate and redefined quality standards are adhered to; and
c) changes to the legal standards under the EPC, if necessary (European Patent Office, 2007).

Table 56 Suggested measures to deal with patent quality at the EPO (Source: European Patent Office, 2007)

Line	Measure

Line	Measure
Changes to the existing practices and procedures	**There are measures related to the EPO practices and procedures that can be undertaken within the existing legal framework to raise quality standards. Proposals to amend these substantive practices and procedures may include a reinforcement of the importance of the problem and a solution-based approach to the assessment of the inventive step. Other important patentability issues include:** **(i) investigate the application of the technical character requirement;** **(ii) consider how the evaluation of inventive step in the current search and examination guidelines could be modified by redefining the concept of "prompting" the skilled person.** **In recent years the above-mentioned issues have been thoroughly discussed. The main results can be interpreted along the following points: i) in actual patent cases, the technical character requirement is very seldom a real problem; in cases where it might be problematic, normally novelty or inventive step of the claimed invention are lacking too ii) redefining the "skilled person" has an impact on many patentabilty requirements other than inventive step, whereby raising the knowledge bar for one of those requirements would at the same time lower the knowledge bar for another requirement. Therefore only the current standards were more specifically explained in the Guidelines for examinaton.**
Contribution of applicants, their representatives and third parties	**The outcome of the granting process is also dependent on the quality of incoming applications, as well as on the role played by applicants and their representatives during prosecution. For example, failure to adapt first foreign filings to the requirements of the EPC has an impact on the efficiency of the search and examination procedures and makes the grant of a patent to the requisite standard difficult to achieve. Effective co-operation with the applicants and their representatives is important for obtaining this standard. Furthermore, third parties having a legitimate interest in the patent system also have a role to play. With this in mind, how the behaviour of applicants can be influenced and how third parties can be involved should be studied. Measures that can help improve the quality of applications are as follows:** **(i) strict application of the legal condition that only technical innovations can be protected by a patent;** **(ii) strictly enforce the "one independent claim per category" rule;** **(iii) introduction of incentives for applicants not to file unreasonable number of claims;** **(iv) encourage applicants to search (pre-filing) inventions;** **(v) agree to a Code of Practice with The Institute of Professional Representatives before the EPO;** **(vi) require applicants to explain the basis of amendments and their significance;** **(vii) require applicants to respond to the Extended European Search Report (EESR), European Search Opinion (ESOP) or Written Opinion of the International Searching Authority (WOISA) when entering the substantive examination phase.**
Changes in the legal standards under the EPC	**The major focus will be on the level of inventive step that is perceived as being too low. There may be various ways of achieving a higher standard by legislative changes. Legislative changes in this crucial area should only be undertaken if there is a compelling case for change. In addition, the impact of any unilateral change in Europe on the international patent system should be considered. In particular, it might be useful to** **(i) review the already existing proposals (e.g. through the broad consultation process carried out in the EPO for amending the EPC to "Raise the bar");** **(ii) investigate whether or not and how the existing definition of "a person skilled in the art" should be modified; and** **(iii) investigate whether or not a basis should be provided for amending an application prior to a search being conducted**

A first package of "Raising the Bar" measures entered into force on 1 April 2010, encompassing new rules concerning search and examination at the EPO and time limits for the filing of divisional applications. These mechanisms aim to
(i) support the EPO's practice with respect to assessment of patentability requirements;
(ii) enable patent examiners to ensure that the search is focused on the subject matter for which protection is sought;

(iii) place more emphasis on the search opinion and streamline the S&E process;
(iv) formalise the existing good practice of applicants identifying and indicating the basis of amendments; and
(v) restrict the filing of divisional applications to twenty-four months after the later of either the first communication of or a specific non-unity objection raised by the Examining Division for the first time (European Patent Office, 2010a).

In particular, the focus of activity with respect to the inventive step was directed at helping examiners to apply the current EPO standard in an efficient and consistent manner across all technical fields. To this end, the Guidelines for Examination and the Internal Instructions, which also entered into force on 1 April 2010, were also adapted to the more recent case law of the EPO's Boards of Appeal. Regarding changes to the EPC Rules, the new and amended rules relate to the filing of divisional applications, pre-search communication between examiner and applicant, obligatory response to the search opinion prior to entry into substantive examination, a requirement for applicants to identify and indicate the basis for amendments, and a clearer restriction of examination only to the subject matter searched. Regarding re-focusing examiners' work, EPO examiners are able to communicate with the applicant at the time of search to seek clarification of the invention. Not only does this enable examiners to focus the search better, increasing the relevance of the cited prior art and the quality of the search report, but it also enhances legal certainty for third parties and the public and has a positive effect on the quality of patent information. Regarding balancing interests, the interest of the applicant in obtaining adequate protection for their invention needs to be balanced with the EPO's goal of bringing the examination to a close in an efficient and timely manner. The EPO has also published an updated version of the Guidelines for Examination (European Patent Office, 2010a).

5.4.2 Enhancing Collaboration Within Europe

The European Patent Network (EPN) was conceived during the strategy debate in 2006 as a network among the national patent offices (NPOs) of the EPC contracting states and the EPO. The underlying concept of the EPN is that both the EPO and the NPOs should not act as competitors but as partners with complementary roles. During the strategy debate, the following pillars for the EPN were agreed to
(a) utilisation by the EPO as an office of second filing of the work of NPOs on first filings;
(b) the establishment of a European Quality System;
(c) a new co-operation policy based on partnership; and
(d) a user support service to be provided by NPOs, rather than by the EPO (European Patent Office, 2007).

Table 57 Pillars for co-operation within Europe (Source: European Patent Office, 2007)

Line	Measure

Line	Measure
Utilisation of search work from NPOs	The idea behind the utilisation concept within the EPN is to reuse work performed at an office of first filing in an EPC contracting state and, hence, to avoid unnecessary duplication of the work and to improve the efficiency and quality of the patenting process while ensuring that the examiners in the office of second filing continue to be fully responsible for the file. The concept of the EPO's utilisation of searches done by NPOs was tested in the Utilisation Pilot Project (UPP) in 2007. A major area of concern until now is the low number of applicants willing to participate in the UPP. It is worth noting that pilots at the international level, such as the Patent Prosecution Highway (PPH), also suffer from a low degree of participation by applicants. One of the issues that probably will have to be addressed is whether applicants should be encouraged or even forced to provide information on earlier work performed on a corresponding application filed with an NPO. The management of the EPO has identified various courses of action that can be followed to enhance the EPO's utilisation of work performed by NPOs, and in general to develop further the synergies between NPOs and the EPO: (i) further harmonise and standardise the search process amongst NPOs and the EPO; (ii) agree on time limits for first office action on first filings; (iii) develop ways to identify at the EPO that an application was first filed at a NPO; (iv) develop tools and procedures for an efficient exchange of search reports between NPOs and the EPO; (v) develop a common documentation standard within the EPN; and (vi) enhance the utilisation concept to make it applicable not only in relation to NPOs acting as an office of first filing and the EPO acting as an office of second filing but also with the EPO acting as an office of first filing and the NPOs acting as an office of second filing, and in relation to different NPOs acting as offices of first or second filing
Establishment of a European Quality Management System	The purpose of the establishment of a European Quality Management System (QMS) is to define common quality standards for all patent offices involved in EPN. The goal is to establish minimum quality standards within the EPN
A new co-operation policy based on partnership	The new co-operation policy between the EPO and NPOs focuses on more efficient and targeted support, according to specific needs of the NPOs, such as harmonising national practice, long-term training of patent office staff, use of databases and other tools, and raising patent awareness in contracting states
User support activities	User support activities concentrate on measures that support the EPO to focus on its core activities and help NPOs to act as a service provider for the local industry

Regarding the partnership between the EPO and the NPOs, various projects were launched and executed to gain trust and explore various ways of co-operation, as shown inTable 58.

Table 58 Past EPN projects which were realized or planned (Source: European Patent Office, 2007)

Project	Goal	Participating MS	Area
Utilisation pilot	Make best use of search work done by experienced NPOs	DE, UK, AT, DK	S&E
Special searches	Providing different types of search services through NPOs	NPOs	S&E
Technology transfer from universities to industry	Use expertise of NPOs to foster knowledge transfer	PL, HU, IT, TR, SI, PT	Exchange of best practice
Material for teaching in schools (e.g. Think Kit)	Improve IP awareness	Potentially all MS	Exchange of best practice
IPR China	Support European SMEs	Potentially all MS active in China	International co-operation

Project	Goal	Participating MS	Area
Machine Translation Programme	Improving access to patent information and improving search services	ES, SE, DE, FR, BE, CH	Common tools
EPTOS/OSSE	Provide harmonised e-governance instruments for all aspects of patent handling in NPOs	NL, PL, FR, MT	Common tools
E-Learning including European IP event calendar	Provide coherent e-learning services within the EPN	Potentially all MS	Common tools/training
Harmonisation of video conference systems	Improve communication between the members of the EPN	Potentially all MS	Common tools
European IP training network	Combining the training resources available within the EPN	Potentially all MS	Training

5.4.3 EPO's Quality Management And Products

EPO drives the quality of S&E to produce quality patents. Since its inception in 1977, the EPO has dealt with quality management. Patent examiners receive intensive specialised training; practices and procedures in the examination process are well defined, well documented and closely monitored; and the EPO ensures transparent and fair opposition and appeal proceedings. These achievements have established the EPO as a benchmark for patent offices around the world (European Patent Office, 2008a).

Table 59 EPO's quality management and products (Source: European Patent Office, 2008)

Challenges for EPO's examiners	To begin with, the EPO is receiving fewer patent applications drafted in accordance with the EPC standard, which makes the applications substantially more difficult for examiners to process and quality patents more difficult to achieve. Another challenge examiners face is classification because some technological fields have converged. Dealing with the volume of material and reorganising patent and non-patent literature in a manner that promotes efficient and complete searching, is increasingly difficult.
Systematic approach to quality	In 2007, work continued on building a quality management system based on the ISO 9001 standard. To continuously monitor performance in this area, a quality indicator was added to the Balanced Score Card. Other measures taken to assess quality at the EPO include a gap analysis, which determined what action was needed to make search and examination activities fully ISO-compliant; systematic and random quality control of search and examination activities; and the Partnership for Quality - an umbrella term for various fora, each of which promotes dialogue between the EPO and various groups of users. In addition, the EPO engages users in regular reviews via a User Satisfaction Survey, which also plays a part in shaping the content of in-house examiner training programmes.
T two-way street	In this context, the quality of incoming applications is of utmost importance, and the EPO relies on its users to file clear, well-drafted applications that conform to the standards of the EPC to ensure that searches are complete, examinations are thorough and granted patents have a high presumption of validity. Quality starts at the moment an application is drafted, not just when it reaches the patent office.

ISO certification for S&E	**In 2007, work continued on building a quality management system based on the ISO 9001 standard. In particular, a gap analysis was performed to determine what action was needed to make the EPO's S&E areas fully ISO-compliant.**
Emphasis on applicants and their representatives	**Meetings dedicated to quality issues were held with the Institute of Professional Representatives before the EPO and the Confederation of European Business and another with the American Intellectual Property Law Association. The aim is to ensure that all participants in the patent granting process are fully committed to improving the quality of search and examination products and services.**

The EPO has not yet taken a decision to seek full certification as an ISO 9001 authority, and compliance with the standard is not expected before 2010. The EPO also started work on a major revision of its search and examination guidelines, which is expected to be completed in 2011 (European Patent Office, 2009a).

5.4.4 EPO's Utilisation Of Work From Other Offices

In the world of patent processing, the Utilisation Pilot Project (UPP) ran in 2007 to test the premise that work carried out on a first filing at a national patent office can be further utilised for a subsequent filing by the applicant and the EPO. It was expected that this could benefit all participants by streamlining the patent system within Europe. The EPO looked for applicants who were willing to participate in the pilot. Eligible applicants submitted an application for a European patent as well as claiming priority at one of the national offices participating in the UPP, viz. United Kingdom, Austria, Germany and Denmark. As the participation rate was very low, the pilot was changed to an office-driven approach and as a consequence search results were directly transferred to the EPO by the participating Offices. The patent applicants were only informed of the fact that the search results were forwarded to the EPO.
There are two basic elements that are essential to the utilisation scheme:
(i) prior art searches must cover the state of the art on a worldwide basis; and
(ii) work results from the office of first filings must be available when the office of second filing starts processing the application (European Patent Office, 2007).

On January 1st 2011 a permanent utilisation scheme has been introduced (see the revised Rule 141(1) and the new Rule 70b of the EPC). Under the amended 141(1) EPC Rule, an applicant claiming pripority of a previous application has to file a copy of the results of any search carried by or on behalf of the authority with which the previous application was filed (i.e. Office of First Filing, OFF). However, applicants are exempted from this obligation if the President of the EPO determines that the OFF search results are available to the EPO and are automatically included in the file of the European patent application. Up to February 2011 the President of the EPO has exempted applicants claiming a priority from the JPO, the USPTO and the UK IPO from the obligation to file a copy of the respective search results.

Utilisation schemes require the co-operation of users of the patent system (applicants and their representatives), e.g. by providing earlier search or examination products to an office of second filing. The experience does not demonstrate a high degree of voluntary co-operation. When developing the concept of utilisation, more thought should be given to the use of the fee instrument. It might be envisaged to give applicants a choice between informing the EPO of earlier searches and other information (for which a normal fee might be charged) or to request a second or further independent search without providing such information (for which they could be charged a cost covering fee). Another approach might be to force applicants to submit relevant information in subsequent filings; there is the possibility of making systematic use of revised Article 124 EPC (European Patent Office, 2007).

The Board 28 (European Patent Office, 2007) said that the proven, time-tested features of the European patent system must be upheld in the context of global work-sharing schemes. In that context, the following aspects should be considered:
(i) the quality of the European patent system must be sustained;
(ii) the EPO generally contributes to the global patent system by providing early search reports and written opinions (EESR). Prioritisation of first filings by all offices involved is, consequently, a basic pre-condition for any effective global work-sharing scheme, also serving European interests;
(iii) the merger of the various schemes under discussion at the Trilateral level into a single, simple and efficient utilisation concept;
(iv) the identification of obstacles to utilisation of work from other offices and development of ways to overcome them; and
(v) the safeguarding of the prominent role of the PCT in the global patent system.

5.4.5 EPO's Utilisation Of Work From Other Sources

The Board 28 recommended that the EPO should foster possibilities to develop ways to utilise information available to third parties. There are only around 650 third party observations filed per year in granting and opposition procedures before the EPO. Consequently, the use of Article 115 EPC should be promoted. In addition, peer-review concepts should be tested while making use of the experience made in the peer-to-patents projects in the US. These two actions can also have a positive impact on the quality of the incoming applications (European Patent Office, 2007).

5.4.6 EPO's Collaboration

In addition to internal measures and the improvement of relations with the applicants, international co-operation is key to resolving some of the challenges that have arisen. Across Europe and the rest of the world, the NPOs face the same challenges and have recognised the vital role of quality in the global patent system. The EPO, the Japan Patent Office (JPO) and the United States Patent and Trademark Office (USPTO) indicated that they were ready to discuss ways to address quality issues for global benefit. In Europe, patent offices are working together on standards for quality (European Patent Office, 2008a).

The Patent Prosecution Highway (PPH) aims to leverage fast-track patent examination procedures to allow applicants to obtain corresponding patents faster and more efficiently. It also permits each office to exploit the work previously done by the other office. In turn, the initiative is expected to improve patent quality and reduce the examination workload (European Patent Office, 2010b).

US
The PPH pilot programme between the EPO and the USPTO was launched on 29 September 2008 and has already been extended twice until 28 January 2012 (European Patent Office, 2010b). See
http://www.epo.org/patents/law/legal-texts/journal/informationEPO/archive/20100913a.html

Japan
The EPO and the JPO announced on 13 November 2009 their intention to launch a bilateral PPH pilot programme. The PPH pilot programme commenced on 29 January 2010, for a trial period of two years ending on 28 January 2012. Notice will be published if the PPH pilot programme is terminated before 28 January 2012 (European Patent Office, 2010b).

Trilateral PCT
The Trilateral Offices announced on 13 November 2009 that they intend to launch a new PPH pilot utilising the PCT work products as of 29 January 2010. The PCT-PPH pilot programme commenced on 29 January 2010 for a period of two years ending on 28 January 2012. Notice will be published if the PCT-PPH pilot programme is terminated before 28 January 2012 (European Patent Office, 2010b).

IP5
Since October 2008, the Five IP Offices (IP5), formed by EPO, USPTO, JPO, KIPO and SIPO, have been engaged in ten collaborative projects known as the Foundation Projects. These projects were devised to harmonise the search and examination environment of each office and to standardise the information-sharing process. The projects are expected to facilitate the work-sharing initiative by enhancing the quality of patent searches and examinations and by building mutual trust in each other's work. The vehicle for work sharing will continue to be the PCT. The IP5 Offices believe that the PCT is a strong platform for work sharing but that improvements in the PCT are necessary. The Foundation Projects of the Five IP Offices are as follows:
(i) Common Documentation (lead: EPO)
(ii) Common Hybrid Classification (lead: EPO)
(iii) Common Access to Search and Examination Results (lead: JPO)
(iv) Common Application Format (lead: JPO)
(v) Common Training Policy (lead: KIPO)
(vi) Mutual Machine Translation (lead: KIPO)
(vii) Common Examination Practice Rules and Quality Management (lead: SIPO)
(viii) Common Statistical Parameter System for Examination (lead: SIPO)
(ix) Common Approach to Sharing and Documenting Search Strategies (lead: USPTO)
(x) Common Search and Examination Support Tools (lead: USPTO) (Five IP Offices, 2010).

Further analysis of IP5 is conducted in WP5 of this project.

5.5 NPOs' Quality Management, Products And Collaboration

In this section, we retrieved information about two common mechanisms, viz. (i) quality management and products, and (ii) collaboration implemented by NPOs as another step to grasp the various dimensions for developing the survey questionnaire.

5.5.1 Quality Management And Products

Patent authorities in Europe have implemented mechanisms dealing with quality management and products, such as ISO or compatible ISO standards. The European Quality System (EQS) was developed within the framework of the European Patent Network (EPN). The EQS provides a basis for continually improving the quality of products (such as patents and searches) and services of the participating offices. The EQS consists of two parts:
(i) the European Quality Management System (EQMS); and
(ii) the Product Quality Standard (PQS).

Table 60 Illustrative list of NPOs' quality management and products

NPO	Description
Bulgaria	**The organisational structure of the Patent Office of the Republic of Bulgaria contains a unit Proxy for Quality Issues. The Patent Office of the Republic of Bulgaria received the Certificate for QMS implemented and applied at the Office in accordance with the international standard for quality management systems ISO 9001:2000 on 21 June 2007 (valid until 20 June 2010). All processes running at the Office are oriented towards the improvement of quality, which is regarded as an aggregate of all requirements and criteria determining the clients' satisfaction with the Office services and products. The achievement of this objective is based on** **(i) the seven internal standards for the provision of high-quality administrative services;** **(ii) adherence to the principles of legality, impartiality and conscientiousness;** **(iii) a working QMS;** **(iv) creation of conditions for involvement and commitment of all employees for high-quality work; and** **(v) strengthening the positions and prosperity of the Office, observance of the applicable legislative requirements, respect for and accurate attitude to the Office and its clients in accordance with the Code of Ethics (Patent Office of the Republic of Bulgaria, 2010).**
Czech Republic	**The organisational structure of the Czech Republic Industrial Property Office contains a unit Internal Audit and a unit Quality Management. The Office chose to establish and implement an information security management system pursuant to the internationally acknowledged ISO/IEC 27001:2005 and a standard and quality management system pursuant to the ISO 9001:2000 international standard. These also included the integration of all elements arising from the EQMS (Czech Republic Industrial Property Office, 2008).**
Denmark	**The Danish Patent and Trademark Office (DKPTO) is ISO certified within the areas of Patents and Trademarks (Danish Patent and Trademark Office, 2010).**
Finland	**Because of an assessment made at the beginning of November 2007, the ISO 9001:2000 Certificate originally awarded in 2006 to the National Board of Patents and Registration of Finland (NBPR) was extended to also cover its national patent application procedure. In 2006, the NBPR obtained the Quality Certificate for its international patent application procedure under the PCT. After that, the NBPR continued to expand its quality management system in accordance with its objectives, so as to include the processing of national patent applications. The extended certificate covers the entire national patent application procedure and international PCT application procedure from the receipt of an application to the novelty search and patentability examination. The Quality Certificate confirms that the NBPR is committed to conducting high-quality national and international patent searches and examinations. Inspecta Certification states in its assessment report that the NBPR is continuously improving its quality system and has a deep commitment to improvement. The NBPR's active role in the international enhancement of quality systems was also considered as significant (National Board of Patents and Registration of Finland, 2010).**

NPO	Description
Germany	The organisational structure of the German Patent and Trademark Office (DPMA) contains units dealing with patent quality issues. As a QMS focusing on processes does not automatically ensure high-quality products, the product quality standard is also very important. In this context, this standard defines the minimum requirements for classifying applications, drafting reports on search results, written communications, as well as requirements for rejections and granted patents. According to the DPMA, some key issues are particularly important to produce high -quality results in patent examination. These include (i) profound scientific and technological knowledge of patent examiners, which is absolutely essential for professional examination; (ii) careful selection and ongoing training of personnel because our staff are the key to high-quality work; (iii) high degree of independence and autonomy of patent examiners, which provides a crucial incentive for good work; (iv) adequate time for processing applications to effectively deal with complex cases; and (v) awareness among all staff of the office of the importance of high-quality work (German Patent and Trademark Office, 2009).
Greece	In 2009, the Quality Management System of the Hellenic Industrial Property Organisation was certified according to the ISO 9001:2008 (Hellenic Industrial Property Organisation, 2010).
Portugal	There is a unit dealing with quality in the organigram, as quality has become one of the major concerns at the Portuguese Institute of Industrial Property (INPI). The INPI system has been audited against international reference standards and obtained certification according to the ISO 9001:2000 standards in 2006. Priorities Action for INPI have been the reduction of waiting periods in replying to applications and granting rights, making procedures simpler and more flexible, improving communication and increasing the transparency of the Industrial Property System. The desire to fulfil customer needs has led the INPI to widen channels of communication with customers, make new tools and services available and introduce improvements in the procedures. Through the Quality Management System, the INPI commits to deploy all resources towards achieving increasingly higher levels of customer satisfaction (Portuguese Institute of Industrial Property, 2010).
Slovakia	On July 7, 2008 The Industrial Property Office of the Slovak Republic was awarded a Certificate of a Quality Management System of a standard STN EN ISO 9001/EN ISO 9001:2000 for the fields of execution of the central state administration in the field of inventions, designs, trademarks and designations of origin/geographical indications protection, administration of the central patent documentation and exchange and provision of information in the field of industrial rights (Industrial Property Office of the Slovak Republic, 2010).
Slovenia	The Slovenian Intellectual Property Office (SIPO) has committed itself to quality from the very outset of its full operation in 1992, confirming this commitment in 1997 by the acquisition of the QMS certificate ISO 9002:1994 issued by the German TÜV CERT certification authority. It was the first among Slovenian state bodies to obtain such a certificate, and most probably also the first among all IP Offices. In 2005, it intensified efforts to increase the quality of its services and in 2006 received the ISO 9001:2000 certificate issued by the Slovenian Institute for Quality and Metrology (SIQ), which was upgraded in 2009 to the ISO 9001:2008 certificate issued by the same authority. One of the main objectives of SIPO - to improve its processes continuously to provide high-quality services to customers - has been, thus, once again successfully fulfilled. As part of the efforts to constantly improve its operational quality, SIPO regularly (monthly and biannually) and periodically conducts surveys on customer reactions. The analyses of survey questionnaires provide the guideline for implementation of preventive and corrective measures aiming at improvement of SIPO's overall operation (Slovenian Intellectual Property Office, 2010).

NPO	Description
Spain	**The Spanish Patent and Trademark Office (SPTO) present quality and service charters. The aspects related to quality in the public administration in general, and to industrial property in particular, are playing a fundamental role in relation to the new challenges posed by society. The SPTO has purposely undertaken this challenge as an opportunity for improvement, which will gradually become noticeable to users of the system. The first step was the approval of a resolution from the Directorate General approving the quality policy of the SPTO. A second milestone has been obtaining the ISO certificate for the quality management system for PCT services. The SPTO Quality website is a third milestone that enables an active link to be established between users and the SPTO, creating a direct, fast communication channel that allows the necessary feedback, as well as a complete dissemination of the activities that the SPTO has carried out, and it will perform within the scope of improving its services (Spanish Patent and Trademark Office, 2010).**
Sweden	**The Swedish Patent and Registration Office (PRV) has become quality certified in accordance with ISO 9001. In doing so, the PRV has become one of the few intellectual property offices in the world having quality-certified its entire operation. PRV aims to be at the top among patent offices regarding short delivery times with high processing and searching quality, as well as with organisations working to develop IPR issues. Through the quality certification, continuous dialogue with customers and management on objectives PRV is working to ensure quality in all situations (Swedish Patent and Registration Office, 2010).**
United Kingdom	**The organisational structure of the United Kingdom Intellectual Property Office (UKIPO) contains units dealing with quality issues. The UKIPO was the first patent office to achieve the ISO 9001:2000 for the pre-grant patenting process in 2003. The UKIPO re-applied in February 2006 and extended the certification to cover other patent search services. The UKIPO showed that there is a framework in place to efficiently grant patents that customers can trust to be valid and provide high-quality commercial patent searches. The framework includes day-to-day operations, policies and business infrastructure. The assessment covered training, quality assurance, IT systems, workflow management and customer relations. The UKIPO carries out an internal review every three months to ensure everything is operating effectively and ensure that the UKIPO is solving and preventing problems. An ongoing internal audit programme supports this, ensuring the UKIPO is operating consistently, and highlights areas where the UKIPO can do more (United Kingdom Intellectual Property Office, 2010).**

5.5.2 NPOs' Collaboration

Because of globalisation, some applicants have to file multiple applications with different patent authorities, choosing the filing routes highlighted in Section 3. As a consequence, more than one patent authority examines the same application. This creates duplication of work. For that reason, patent authorities have initiated projects to accept each other's work through a system of mutual recognition. The Patent Prosecution Highway (PPH) pilot project has the objective to explore to what extent search and examination results can be mutually used. In addition, an accelerated examination procedure is available to applicants.

Czech Republic
The Czech Republic Industrial Property Office has advanced co-operation with the EPO. It actively participated at the meetings of the EPO Administrative Council and other EPO bodies and working groups. In July 2008, the Working Group on the European Quality System presented a set of five Product Quality Standards for the European Patent Office and national offices of EPO member countries. The Administrative Council then approved the standards

for classification, reports on search results, written opinions, refusal and granting of a patent after the examination. The next step in the field of quality of patent registration proceedings and quality of patent products will be to put the listed standards into practice (Czech Republic Industrial Property Office, 2008).

Denmark
The Danish Patent and Trademark Office (DKPTO) takes part in the bilateral co-operation of the PPH. The DKPTO has until now opened PPH Pilot Projects with USPTO, the JPO, the Korean Intellectual Property Office and the Canadian Intellectual Property Office. Following a trial period, the DKPTO will assess whether or not similar PPH projects should be opened with other patent offices and if the existing PPH Pilot Projects should be made permanent (Danish Patent and Trademark Office, 2010).

Finland
The NBPR has launched PPH co-operative projects with the patent offices of Japan, the USA, South Korea and Hungary. The pilot agreement with Japan entered into force on 20 April 2009 and it is in force until the end of March 2011, at which point continuation of the agreement will be decided on. The one-year pilot period with the USPTO started on 6 July 2009. PPH co-operation with the Korean Republic and Hungary started on 4 January 2010 (National Board of Patents and Registration of Finland, 2010).

Germany
The permanent exchange of skills and knowledge with other offices and the search for the best methods to optimise processes and quality enrich the daily work of the examiners at the DPMA. These manifold contacts foster continual improvements to work methods and products. When an applicant applies for patents for one and the same invention in many countries, the patent offices concerned will independently conduct searches and examine the patent applications (German Patent and Trademark Office, 2010).

Regarding Japan, the PPH pilot project was launched in March 2008 and runs for two years, with the option of extension. Applicants can participate in the programme upon request (German Patent and Trade Mark Office, 2010).

Regarding the USA, The heads of the DPMA and the USPTO signed a working agreement on future co-operation of the two offices in November 2008. Staff members of the two offices will regularly exchange information at management and working levels and discuss best practices. Co-operation will focus on two programmes: a patent examiner exchange and a joint PPH pilot. The exchange and mutual utilisation of search results is intended to help enhance the quality of examination and shorten processing times. In addition, questions concerning the quality of patents and the quality management are to be discussed. A first work plan has already been adopted for the year 2009 to launch the patent examiner exchange and the PPH pilot in spring 2009 and to organise a joint symposium on current issues of IP protection in autumn 2009 (German Patent and Trade Mark Office, 2010).

Regarding the United Kingdom, there is co-operation with the UKIPO. Three patent examiners of the DPMA visited the UKIPO in Newport (Wales). The visit focused on questions regarding the quality management of patent examination processes, which has been part of a certified pre-grant patenting process at the UK for some time. Co-operation continued in 2009 (German Patent and Trade Mark Office, 2010).

Regarding China, in December 2008, two representatives of the DPMA visited the State Intellectual Property Office of the People's Republic of China. Within the scope of workshops, groups of 10 to 12 persons exchanged information on personnel recruitment, selection of personnel, training of patent examiners and quality management issues (German Patent and Trade Mark Office, 2010).

Hungary
The Hungarian Patent Office (HPO) has launched PPH co-operative projects with the patent offices of Japan, Austria and Finland. The pilot agreement with Japan entered into force on 3 August 2009. PPH co-operation with Austria and Finland started on 4 January 2010.

Netherlands
There is collaboration with the UKIPO. In 2008, the Netherlands Patent Office carried out state of the art patent searches and examinations for the UKIPO. The examinations in particular form a good opportunity for the technical advisers of the Netherlands Patent Office to keep their assessment expertise up to par. Furthermore, co-operation with the UKIPO gives the Netherlands Patent Office the opportunity to measure the quality of its own products. During the annual contract meeting, the UKIPO explicitly expressed its great satisfaction with the quality of the searches and examinations carried out. In 2008, the Netherlands Patent Office carried out 170 searches and 290 examinations. Co-operation with the UKIPO continued in 2009 (Netherlands Patent Office, 2009).

United Kingdom
In 2009, UKIPO's Patents Directorate introduced changes to forms 9A and 10 to ask for applicants' consent to share the results of search and examination of UK patent applications with patent offices in other countries before publication of the UK application. This is being done as part of the mutual recognition initiative to create a more effective global patent system (United Kingdom Intellectual Property Office, 2010).

A first pilot PPH program with the JPO started in July 2007. A second pilot PPH program with the USPTO started in September 2007. Both of these programmes have now been extended indefinitely. A third pilot PPH program with the South Korean Intellectual Property Office started in October 2009.

Sweden
PRV is an ISA and International Preliminary Examining Authority (IPEA) that has been under the PCT since the start, in 1978. PRV is a competent ISA/IPEA for applicants from Nordic countries, as well as for some developing countries and Member States of the African Regional Intellectual Property Organisation (ARIPO) and the *Organisation Africaine de la Propriété Intellectuelle* (OAPI). From 1 January 2009 it is possible to use PRV for Supplementary International Searches (SIS), in accordance with PCT Rule 45bis, which are in force from 1 January 2009.

The recent PPH of various jurisdictions are summarised inTable 61.

Table 61 Recent PPH projects (Source: Patent Prosecution Highway Portal Website, 2010)

PPH pilot program between	Trial period started/will start on
JPO-NBPR	**20 April, 2009**
USPTO-DPMA	**27 April, 2009**
JPO-ROSPATENT	**18 May, 2009**
JPO-APO	**1 July, 2009**
JPO-IPOS	**1 July, 2009**
USPTO-NBPR	**6 July, 2009**

PPH pilot program between	Trial period started/will start on
JPO-HPO	3 August, 2009
KIPO-UKIPO	October, 2009
KIPO-CIPO	1 October, 2009
JPO-CIPO	1 October, 2009
DKPTO-CIPO	1 October, 2009
KIPO-ROSPATENT	2 November, 2009
KIPO-NBPR	4 January, 2010
HPO-NBPR	4 January, 2010
EPO-JPO	29 January, 2010
Trilateral PCT-based PPH pilot program	29 January, 2010

Further analysis of PPH is conducted in WP5 of this project.

5.6 A Survey Of Mechanisms To Improve Patent Quality

A number of mechanisms to increase patent quality (displayed below) have been surveyed and assessed among selected patent authorities across Europe, which participated in an anonymous way.

Together with the Commission services, we selected patent offices to be addressed in the pilot, survey and interviews. As a preparation, we developed cover letters together with the Commission services to engage patent offices in the pilot and survey by asking them whether they would participate in this exercise. The aim of the cover letters was to obtain the commitment to take part in the pilot and survey. We continued contact with these offices until we had a sample of 10 offices that represented 67% of patent applications for the period 1883-2008. The individual respondents totalled 14.

As preparation for the survey, we developed a draft questionnaire. The objective of the survey was to undertake a general overview of existing mechanisms that support patent quality enhancement in selected patent offices across Europe. In other words, the aim was to gather examples of practices at both the national and international levels and their assessments already made on these schemes.

Because of the sample size, we developed an open questionnaire. To obtain a reasonable rate of response, the number of questions was crucial. We selected a limited number of questions to be answered in less than 30 minutes.

The draft questionnaire for offices was approved by the Commission services before submission to pilot and survey participants.

The development of the questionnaire for the pilot and survey consisted of five steps:
• Step 1: A review of latest insights on patent quality mechanisms in the literature.

• Step 2: The previous insights were contrasted with the patent quality mechanisms outlined on the websites of patent authorities. The aim was to uncover the underlying dimensions of the mechanisms.
• Step 3: Once dimensions were identified, generic questions were raised to give coherence to questions and to elicit instrumental aspects of patent quality mechanisms.
• Step 4: A pilot, survey questionnaires and an interview protocol were developed.
• Step 5: The pilot was tested by two patent authorities to ensure that the questions were suitable for gathering the required information, to find problems, potential inconsistencies and real-time demand for its application. The final version of the questionnaire was approved by the Commission services.
• The next step was to conduct the survey in full scale and proceed to reporting.

Questionnaires were submitted via email. If there was no response within a week after the first email, then a reminder was sent. We gathered the requested information via email from the participants who committed to the exercise. We ensured that all contacts were followed up thoroughly, and we provided feedback to the respondents when necessary. Apart from the initial communications via email, we contacted some participants via telephone.

The results of the survey show that specific mechanisms have been implemented, are being implemented or will be implemented. Particular mechanisms are perceived to have a positive, neutral, negative or unknown impact on improving patent quality. Certain mechanisms are considered to be the most effective ones on improving patent quality. All in all, mechanisms deal with examination process, quality assurance, involvement of third parties, patent procedures, and co-operation among granting offices as follows.

EXAMINATION PROCESS
- development of further patent classifications beyond current IPC/ECLA standards
- communication with the applicants by email and telephone on a more informal basis
- increase of the number of examiners per work unit demand
- targeted increase of patent examiners to allow more time for casework in subject matter where quality can be improved
- re-examination of patent cases prior to a decision to grant is taken
- maintenance of the competence of patent examiners, e.g. training and training materials
- exchange of information among patent examiners
- other mechanisms include: operational quality control with feedback to individual examiners from peer reviewers on samples of S&E before grant, concentrated examination, and development of guidelines for examination

QUALITY ASSURANCE
- internal auditing to improve patent quality
- external auditing of patent quality
- management and product quality certification (ISO or similar)
- application/use codes of practice for quality assurance
- randomly selection of patent applications for review of search quality
- randomly selection of granted patents for review of quality of examination
- standardisation of search practices into codified manuals
- other mechanisms include: product audits of a sample of searches and a sample of granted patents, user satisfaction surveys, and double examination by another examiner

INVOLVEMENT OF THIRD PARTIES
- efforts to increase the participation of third parties to aid examination
- efforts to increase participation of third parties in post-grant review
- creation and availability to prospective inventors of a more powerful search tool for prior art
- administrative opinion on claim scope on infringement or validity issues
- codes of practice and of moral conduct for applicants and patent attorneys that discourage improper uses of the patent system
- mechanisms for customer feedback

- other mechanisms include: post-grant opposition and intervention, compulsory training of (future) patent attorneys and legal regulation of the profession of patent attorney, and patent quality awareness campaigns for (future) applicants

PATENT PROCEDURES
- deferred examination of patent applications
- increase of filing fees to reduce the number of poor quality patent applications
- increase of immediate filtering of patents that clearly do not match the criteria upon filing (e.g. refusal to search patent application, accelerated refusal of non-patentable inventions)
- preliminary opinions on patentability to encourage early amendment or withdrawal

CO-OPERATION AMONG GRANTING OFFICES
- standardisation of practices on patent quality with other patent offices
- exchange of information among the NPO and EPO examiners
- exchange of information with patent offices in third countries (JPO, USPTO)
- share/reuse the searches done by other offices
- use of patent classification common to other offices (supplementary to the IPC key)
- use of well-functioning, machine-translated documents
- other mechanisms include: harmonisation of quality management standards and harmonisation of product quality standards

In this chapter, the empirical exercise reports the mode, i.e. the value that occurs most frequently in a given set of data results.

5.6.1 Examination Process

Administrative mechanisms against low-quality patents have been implemented, are being implemented or will be implemented by patent authorities (Table 62). The survey results suggest that mechanisms to *develop further patent classifications beyond current IPC/ECLA standards*, to *increase the number of examiners, and to conduct a re-examination of patent cases prior to a decision to grant is taken,* are all mechanisms that are not used frequently by selected patent authorities in Europe. However, mechanisms to *communicate with the applicants by email and telephone on a more informal basis,* mechanisms to *maintain the competence of patent examiners (e.g. training and training materials), and mechanisms to exchange information among patent examiners* are currently used more frequently by selected patent authorities in Europe.

The perceived effects of the administrative mechanisms by patent authorities can be positive, negative, neutral or unknown (Table 62). The survey results suggest that mechanisms *to communicate with the applicants by email and telephone on a more informal basis*, *to increase of the number of examiners per work unit demand,* to *re-examine patent cases prior to a decision to grant is taken*, *mechanisms to maintain the competence of patent examiners (e.g. training and training materials), and exchange of information among patent examiners,* are frequently perceived to have a positive impact on improving patent quality by patent authorities.

The positive impact of these mechanisms was also observed by patent quality scholars (in Section 2) who state the potential of deliberate communication (Burke and Reitzig, 2007; Edfjäll, 2007; Wagner, 2009) and systematic training among patent quality actors (Burke and Reitzig, 2007; van Pottelsberghe, 2009; Philips, 2006) to foster high-quality patents.

Further, mechanisms dealing with a *targeted increase of patent examiners to allow more time for casework in subject matters where quality can be improved* are frequently perceived to have a positive or neutral impact.
However, mechanisms *to develop further patent classifications beyond current IPC/ECLA standards,* are frequently perceived to have a neutral impact on improving patent quality.

Table 62 Implementation and perceived impact of mechanisms to improve the examination (the mode of 14 observations is reported between parentheses)

1. Examination mechanism	Implementation	Perceived impact on improving patent quality
1.1. development of further patent classifications beyond current IPC/ECLA standards	**mechanism not used (8)**	**neutral (6)**
1.2. communication with the applicants by email and telephone on a more informal basis	**mechanism currently in use (13)**	**positive (9)**
1.3. increase of the number of examiners per work unit demand	**mechanism not used (6)**	**positive (7)**
1.4. targeted increase of patent examiners to allow more time for casework in subject matters where quality can be improved	**mechanism not used (13)**	**positive (5) or neutral (5)**
1.5. re-examination of patent cases prior to a decision to grant is reached	**mechanism not used (10)**	**positive (8)**
1.6. maintenance of the competence of patent examiners, e.g. training and training materials	**mechanism currently in use (13)**	**positive (14)**
1.7. exchange of information among patent examiners	**mechanism currently in use (14)**	**positive (13)**

Finally, mechanisms *to maintain the skills of patent examiners* remain the most important ones. This result is in line with van Pottelsberghe (2009) and Wagner (2009), who recommend establishing an incentive-based approach to retain and attract highly qualified patents examiners.

5.6.2 Quality Assurance

With respect to the use of quality assurance mechanisms (Table 63), the survey results suggest that selected patent authorities in Europe are not frequently using mechanisms that *deal with external auditing of patent quality*. However, mechanisms that deal with *internal auditing to improve patent quality, management and product quality certification (ISO or similar), apply/use codes of practice for quality assurance, randomly selection of patent applications for review of search quality, randomly selection of granted patents for review of quality of examination, and standardisation search practices into codified manuals* are mechanisms that are currently used more frequently by selected patent authorities in Europe.

Concerning the perceived effects of quality assurance mechanisms (Table 63), the survey results suggest that mechanisms dealing with *internal auditing to improve patent quality*, *management and product quality certification (ISO or similar), application/use codes of practice for quality assurance*, *randomly selection of patent applications for review of search quality, randomly selection of granted patents for review of quality of examination, and standardise search practices into codified manuals* are frequently perceived to have a positive impact on improving patent quality by patent authorities.

Academic scholars support this positive assessment of patent quality mechanisms, and recommend enforcement of quality management mechanisms to promote and monitor that consistent and predictable decisions are taken (Cowan et al., 2006), support for the quality management system and promotion of the best practice manual to receive clearer, better-placed applications (Elsmore, 2009).

However, mechanisms *dealing with external auditing of patent quality* are frequently perceived to have a neutral impact on improving patent quality.

Table 63 Implementation and perceived impact of mechanisms to improve the quality assurance (the mode of 14 observations is reported between parentheses)

2. Quality assurance mechanisms	Implementation	Perceived impact on improving patent quality
2.1. internal auditing to improve patent quality	**mechanism currently in use (11)**	**positive (11)**
2.2. external auditing of patent quality	**mechanism not used (7)**	**neutral (9)**
2.3. management and product quality certification (ISO or similar)	**mechanism currently in use (10)**	**positive (8)**
2.4. application/use codes of practice for quality assurance	**mechanism currently in use (10)**	**positive (11)**
2.5. randomly selection of patent applications for review of search quality	**mechanism currently in use (14)**	**positive (13)**
2.6. randomly selection of granted patents for review of quality of examination	**mechanism currently in use (11)**	**positive (12)**
2.7. standardisation of search practices into codified manuals	**mechanism currently in use (9)**	**positive (9)**

Finally, mechanisms *to randomly select patent applications for review of search quality, and to randomly select granted patents for review of quality of examination* are regarded as the most effective mechanisms for improving patent quality.

5.6.3 Third Parties Participation

Regarding use of third parties participation mechanisms (Table 64), the survey results suggest that mechanisms dealing with *efforts to increase the participation of third parties to aid examination*, *efforts to increase participation of third parties in post-grant review*, *administrative opinion on claim scope on infringement or validity issues, and codes of practice and of moral conduct for applicants and patent attorneys that discourage improper uses of the patent system* are mechanisms that are not used frequently by selected patent authorities in Europe. However, mechanisms *to create and make available to prospective inventors a more powerful search tool for prior art* and *mechanisms for customer feedback* are mechanisms that are currently used more frequently by selected patent authorities in Europe.

Concerning the perceived effects of third parties participation mechanisms (Table 64), the survey results suggest that *efforts to increase the participation of third parties to aid examination*, c*reate and make available to prospective inventors a more powerful search tool for prior art*, *administrative opinion on claim scope on infringement or validity issues, codes of practice and of moral conduct for applicants and patent attorneys that discourage improper uses of the patent system*, and *mechanisms for customer feedback,* are frequently perceived to have a positive impact on improving patent quality by patent authorities.

The survey results indicate similarities with the academic review on patent quality mechanisms. As mentioned earlier in Section 2, the inclusion of third parties provides effective outcomes, as they ensure that examiners evaluate the validity of patents and provide for high legal certainty (Cowan et al., 2006; Shang, 2009; White, 2004).

However, the survey results suggest that *efforts to increase participation of third parties in post-grant review* are frequently perceived to have a neutral impact on improving patent quality.

Scholarly debate in the US places a high emphasis on the post-grant review process (Shang, 2009; Singleton, 2005; Wagner, 2009), unlike in Europe where this mechanism is already in place.

Table 64 Implementation and perceived impact of mechanisms to improve third parties participation (the mode of 14 observations is reported between parentheses)

3. Third parties participation mechanisms	Implementation	Perceived impact on improving patent quality
3.1. efforts to increase the participation of third parties to aid examination	**mechanism not used (7)**	**positive (8)**
3.2. efforts to increase participation of third parties in post-grant review	**mechanism not used (10)**	**Neutral (5)**
3.3. creation and availability to prospective inventors of a more powerful search tool for prior art	**mechanism currently in use (6)**	**positive (8)**
3.4. administrative opinion on claim scope on infringement or validity issues	**mechanism not used (9)**	**positive (6)**
3.5. codes of practice and of moral conduct for applicants and patent attorneys that discourage improper uses of the patent system	**mechanism not used (8)**	**positive (8)**
3.6. mechanisms for customer feedback	**mechanism currently in use (12)**	**positive (12)**

5.6.4 Patent Procedures

Concerning the use of patent procedures (Table 65), the survey results suggest that mechanisms to *allow deferred examination of patent applications, increase filing fees to reduce the number of poor quality patent applications, increase immediate filtering of patents that clearly do not match the criteria upon filing (e.g. refusal to search patent applications, accelerated refusal of non-patentable inventions)* are mechanisms that are not used frequently by selected patent authorities in Europe. However, mechanisms to *provide preliminary opinions on patentability to encourage early amendment or withdrawal* are mechanisms that are currently used more frequently by selected patent authorities in Europe.

Concerning the perceived effects of patent procedures (Table 65), the survey results suggest that mechanisms to *provide preliminary opinions on patentability to encourage early amendment or withdrawal* are frequently perceived to have a positive impact on improving patent quality by patent authorities.

These patent quality mechanisms are also positively accepted by several patent quality scholars (Burke and Reitzig, 2007; Cowan et al., 2006; Elsmore, 2009; Edfjäll, 2007; Philipp, 2006). In line with survey results, these scholars argue that ongoing deliberations on the patentability of various subject matters and thorough claim-construction analysis lead to a cost-effective examination process.

However, mechanisms to *allow deferred examination of patent applications* are frequently perceived to have a negative or neutral impact on improving patent quality. Moreover, mechanisms to *increase filing fees to reduce the number of poor quality patent applications* and mechanisms to *increase immediate filtering of patents that clearly do not match the criteria right upon filing (e.g. refusal to search patent applications, accelerated refusal of non-patentable inventions)* are frequently perceived to have a neutral impact on improving patent quality.

Table 65 Implementation and perceived impact of mechanisms to patent procedures (the mode of 14 observations is reported between parentheses)

4. Patent procedures mechanisms	Implementation	Perceived impact on improving patent quality
4.1. deferred examination of patent applications	**mechanism not used (9)**	**negative (5) or neutral (5)**
4.2. increase of filing fees to reduce the number of poor quality patent applications	**mechanism not used (9)**	**neutral (6)**
4.3. increase of immediate filtering of patents that clearly do not match the criteria upon filing (e.g. refusal to search patent application, accelerated refusal of non-patentable inventions)	**mechanism not used (9)**	**neutral (7)**
4.4. preliminary opinions on patentability to encourage early amendment or withdrawal	**mechanism currently in use (12)**	**positive (11)**

Finally, mechanisms to *provide preliminary opinions on patentability to encourage early amendment or withdrawal* are regarded as the most effective for improving patent quality.

5.6.5 Collaboration

With reference to the implementation of co-operation among granting offices (Table 66), the survey results suggest that mechanisms to *standardise practices on patent quality with other patent offices*, exchange of *information among the NPO and EPO examiners, exchange of information with patent offices in third countries* (*JPO, USPTO), to share/reuse searches done by other offices, to use patent classifications common to other offices (supplementary to the IPC), and to use well-functioning, machine-translated documents* are mechanisms that are currently used more frequently by selected patent authorities in Europe.
Concerning the perceived effects of co-operation among granting offices (Table 66), the survey results suggest that *mechanisms to standardise practices on patent quality with other patent offices, exchange information among the NPO and EPO examiners, exchange information with patent offices in third countries (JPO, USPTO), to share/reuse the searches done by other offices, to use patent classifications common to other offices (supplementary to the IPC),* and to *use well-functioning, machine-translated documents* are frequently perceived to have a positive impact on improving patent quality by patent authorities.
In connection with Section 2, Philipp (2006) also emphasises the impact of high patent quality co-operation initiatives, although he focuses mostly on patent offices and commercial information providers.

Table 66 Implementation and perceived impact of mechanisms to improve co-operation among granting offices (the mode of 14 observations is reported between parentheses)

5. Collaboration mechanisms	Implementation	Perceived impact on improving patent quality
5.1. standardisation of practices on patent quality with other patent offices	**mechanism currently in use(8)**	**positive (8)**
5.2. exchange of information among the NPO and EPO examiners	**mechanism currently in use(9)**	**positive (9)**
5.3. exchange of information with patent offices in third countries (JPO, USPTO)	**mechanism currently in use(7)**	**positive (8)**
5.4. share/reuse of the searches done by other offices	**mechanism currently in use(13)**	**Positive(10)**
5.5. use of patent classification common to other offices (supplementary to the International Patent Classification key)	**mechanism currently in use(10)**	**positive (9)**
5.6. use of well-functioning, machine-translated documents	**mechanism currently in use(13)**	**positive (11)**

Finally, mechanisms to *exchange information among the NPO and EPO examiners* and to *share/reuse the searches done by other offices* are regarded as the most effective for improving patent quality.

5.7 Perceived Best Mechanisms

Our survey among patent authorities shows that there exist administrative mechanisms which are perceived as the most effective ones to improve patent quality. Those perceived best practices are: patent examiner's training, review of search and examination quality, preliminary opinion on patentability, and exchange of information. Selected interviews with some representatives of patent authorities provided further details of these perceived best mechanisms. We exemplify such mechanisms with cases at various levels (international, European or national). It is worth mentioning that the same sort of mechanisms already exist in other offices.

Practices to increase patent quality are not new. One of the pillars of the EPN[45] is the Quality Project. The purpose of the Quality Project is to review existing quality systems at patent authorities of the EPN and provide a set of minimum standards they should implement. In this respect, the EQMS defines minimum requirements that the EPO and the NPOs shall implement within the framework of the EPN as a first step to a European Quality System with regard to:

1. Leadership and policy
2. Management of resources
3. Management of administrative workload
4. Quality assurance
5. Two-way communication between offices and their respective users
6. Internal review mechanisms (based on quality data)
7. Independent review mechanism
8. Inter-Office communication
9. Documentation
10. Extent of information on the search process
11. Minimum requirements on the standards of the search results

[45] http://www.epo.org/about-us/european-patent-network.html

In addition, the EPO's Strategic Renewal Process[46] (SRP) is an ongoing process to help make the Office fit for the challenges it is facing. This process is divided into different programmes and projects.

One activity under SRP is the “IP5 programme” launched by the five major Offices (EPO, USPTO, SIPO, KIPO and JPO) in May 2007. The vision of the IP5 programme is improved global co-operation so as to eliminate unnecessary duplication of work among the IP5 Offices and to enhance patent examination efficiency and quality. One of the ten foundation projects aims to provide Common Rules for Examination Practice and Quality Control. This project is led by SIPO.

A further SRP activity is "Raising the Bar". It focuses on internal practice, legal aspects and external practice. The latest development concerned proposals to amend Rules of PCT. At the 40th session of the Assembly of the PCT Union (PCT Assembly) held in Geneva between 22 September and 1 October 2009, approval was given to amendments to Rules 46.5 and 66.8 PCT as proposed by the EPO at the last Meeting of International Authorities.

An additional SRP activity is the "Single Patent Process". It focuses on the EPO's vision of the future and the implementation of a highly efficient patent process. It aims to ensure that the initiatives developed support quality assurance in the future including the integration of more plausibility checks in automated processes and supporting tools.

5.7.1 Patent Examiner’s Training

As far as the examination is concerned, mechanisms to *maintain the skills of patent examiners* are regarded as the most effective for improving patent quality. Across Europe, examiners are trained both as soon as they are recruited and alongside their career path. Usually examiners hold a master or doctoral degree in a particular technical field. Some patent authorities pay special attention to industry experience of candidates. With respect to the training of new examiners, there is an initial period for lessons in the law of patents and practice of prosecution, these lesson are in-house or provided by academic institutions. At the beginning of their careers, trainees are assigned a tutor, who will sign all documentation produced by the new comer. After finishing the traineeship, examiners will maintain their skills following learning programmes.

We illustrate the mechanisms to *maintain the skills of patent examiners* by providing two cases, one at European level and another at national level.

European Patent Office
The EPO offers a two-year training programme[47] for newly recruited examiners, combining classroom learning with tutoring by individually assigned coaches. Training usually takes place at the examiners' place of work, namely Munich, The Hague or Berlin. The programme empowers examiners-in-training by providing:

- Classroom learning in groups of 12 (or fewer): During the first two years, examiners enrol in an extensive training programme to become familiar with the tools and procedures necessary for the job.
- Guided learning with a personally assigned coach: Mainly during their first year, examiners are assigned personal coaches. These are specially trained and experienced examiners who are experts in the new examiner's field.

The training covers:

- Hands-on learning about everyday tools and procedures: Courses cover computer tools, databases, search methods and procedures used in everyday examining work.
- Legal and practical expertise: Examiners learn to apply the patentability criteria: novelty, inventive step and industrial applicability. They also attend courses on European and international patent law and practice.

[46] http://www.wipo.int/export/sites/www/pct/en/quality/2009/2009_ep.pdf
[47] http://www.epo.org/about-us/jobs/examiner/training.html

- Language skills: New recruits will preferably be proficient in all three EPO languages, but some may need to work on one or two. The EPO offers the necessary language training.
- Work on real-life patents: Under the close supervision of their coaches, newly recruited examiners work on actual patent applications from day one.

In addition, the European Patent Academy[48] ensures the overall co-ordination of the external education and training activities of the EPO. The mandate of the European Patent Academy, based at the European Patent Office in Munich, reflects the need to improve patent-related IP training and education structures in Europe.

The Academy is building on partnerships with other organisations to realise its objectives and promote and support the spread of patent-related knowledge throughout Europe. The Academy seeks to assist its partners where invited and to complement existing training initiatives in current and future contracting states of the EPC, according to the principles of complementarity and subsidiarity.

Patent Office of the Republic of Poland
The expert's training shall last three years; when reasonable, it may, at the request of a candidate, be shortened to up to one and a half-year. The expert's training shall be completed with an examination. The failed examination may be re-sat only once, not earlier than six months and not later than one year after the date of the first sitting for the examination. An examination shall be conducted by an examination board set out by the President of the Patent Office. Failure to sit for an examination without giving reasons or failure to pass the examination for the second time shall result in the dissolution by the Patent Office, at prior notice, of a contract of employment with a candidate (Art. 267, Act of 30 June 2000, Industrial Property Law).

After the pass of the examination, a candidate shall be assigned duties of an assistant expert for a period of not less than two years. The assistant expert shall be assigned performance of the expert's work, which shall be subject to assessment. Where the assessment of the assistant expert's work is positive, the assistant expert shall be admitted as an expert. The Prime Minister shall, by way of regulation, determine the detailed principles, extent and procedure of undergoing the expert's training and apprenticeship, and of passing examinations, including remunerating of persons conducting an examination (Art. 268, Act of 30 June 2000, Industrial Property Law).

The expert's training is to carry out actions by the candidate for the examiner, under the direction of the assigned guardian, during which he has to obtain the necessary knowledge and ability to work independently. Activities made by the assistant expert during the assessment are subject to a check carried out by a guardian of the assessment. At least one of checked applications should be positive, i.e. patent granted (Regulation of the Prime Minister of 17 June 2001).

Finally, analysis on patent examiners' training at the USPTO is conducted in Section 4.3.4 of this report.

5.7.2 Review Of Search And Examination Quality

With respect to quality assurance, mechanisms *to randomly select patent applications for review of search quality, and to randomly select granted patents for review of quality of examination* are regarded as the most effective for improving patent quality. Across Europe, there exist controls of search and examination of open and closed files. Open files are before granting and closed files are after granting. With respect to files handled by trainees, the tutor will control all tasks carried out by trainees. With respect to files handled by examiners, a peer, superiors or a committee will check their files.

[48] http://www.epo.org/about-us/office/academy.html

We illustrate the mechanisms *to randomly select patent applications for review of search quality, and to randomly select granted patents for review of quality of examination* by providing two cases, one at European level and another at national level.

European Patent Office
The CL-OQC methodology (Cluster-level Operational Quality Control) was extended by implementing cross-site checking in most Joint Clusters (JCs) between Munich, The Hague and Berlin of DG1 (Operations). The aim of CL-OCQ is to identify any substantive site-related differences in practice and to ensure harmonisation of working procedures. Corrective action is taken - where necessary - to ensure that work is produced to the same standards at each site. To achieve this goal around 1% of the whole production is checked across sites and 5% on-site. The continuation of the CL-OQC in-process checks on-site and across sites in 2009 allows the EPO to quantify the extent of compliance of S&E work with PCT/GL/ISPE by sampling during the production process. A dedicated sampling, checking and reporting procedure provides each JC with six-monthly reports on the nature and extent of deficiencies of S&E work performed under the PCT. A total of 13,137 applications were checked under CL-OQC during 2009, 1,844 of these were checked across sites and 4,283 of these filed under the PCT.

A harmonised approach ensuring corrective action for S&E work on the basis of CL-OQC results across all JCs was developed by the DG1 / DG2 Quality board which was assisted by Directorate Learning and Development in creating field- specific training on clarity objections based on CL-OQC findings, as well as training material dealing with the issue of added subject-matter was continued in 2009. An extensive process-audit of the entire CL-OQC procedure was performed in 2008. Recommendations for improving the process and in particular its documentation were addressed and implemented in 2009.

In-depth post-production checks on a statistically significant sample of examination and search products (750 and 350 respectively) were carried out by Directorate Quality Audit (DQA) of PD Internal Audit in 2009. The results indicate the extent of compliance of the search and examination products produced by the office as a whole.

The DG1/DG2 Quality Board met four times in 2009. It decided to align the checklists on clarity for CL-OQC and Quality Audit. A critical review of results generated by PA- OQC, the User Satisfaction Survey (USS) and the complaints received by the office took place and fields of improvement were identified.

CL-OQC results highlighted the need for corrective actions in some areas of examination work, notably clarity of the claimed subject matter. The DG1/DG2 Quality Board launched these in 2008, implemented them in 2009 and will monitor progress in 2010.

Austrian Patent Office
In 2009, modifications of the QMS at the APO[49] concerned the way in which the files for the internal review have been chosen. The principle that such files are chosen randomly four times a year is still kept, however at special circumstances, other parameters can influence the choice.

In 2007/2008, the APO took part in the UPP. In this project, second filings at the EPO, where the first filing has been in AT, DE, DK or UK have been analysed. EPO examiners of the second filing have assessed how useful the search and examination reports of the first office are for preparing the reports for the second filing.

After the pilot project, those Austrian first-files, for which the Austrian examiners only had cited A-documents, while the EPO examiners have cited X or Y-documents have been assessed by the Austrian QM-Board, instead of random choice, as those files were considered as being candidates for detecting quality issues.

[49] http://www.wipo.int/export/sites/www/pct/en/quality/2009/2009_at.pdf

It is worth noting that X indicates that a claim was anticipated by the reference, Y indicates that a claim would have been obvious in light of that reference when combined with other such references, and A indicates that the cited reference merely defines the states of the art and is not of significance to patentability. If the search report contains at least one X or Y document, the EPO will issue a negative written opinion. On the other hand, if the search report does not cite X or Y references, then the EPO will issue a favourable preliminary examination report.

In 2008/2009, the APO and the HPO tested a cooperation of both offices, where HPO executed PCT Searches. Those files also have been included in the pool of files which are evaluated by the QM-Board.

For the last quarter of 2009, it was planned to concentrate on PCT-Search Reports where only A- documents have been cited by the Austrian examiners.

The intention of those temporarily changes to conditional probability in the choice of sample-files is to increase the probability of finding files representing quality defects, compared to the probability reached by an unconditional arbitrarily choice, so to increase the number of detected errors, and consequently to learn how to avoid those errors in the future.

5.7.3 Preliminary Opinion On Patentability

Concerning patent procedures, mechanisms to provide preliminary opinion on patentability to encourage early amendment or withdrawal are regarded as the most effective for improving patent quality. In Europe, a preliminary opinion on patentability under the PCT is established by the Austrian Patent Office, the European Patent Office, the Spanish Patent and Trademark Office, the National Board of Patents and Registrations of Finland, the Swedish Patent and Registration Office and the Nordic Patent Institute. In the national filing route, preliminary opinion on patentability is foreseen in some patent authorities in Europe.

We illustrate the mechanisms to provide preliminary opinion on patentability to encourage early amendment or withdrawal by providing three cases, one at international level, a second at European level and a third at national level.

International Preliminary Report on Patentability.
According to Rule 43bis PCT, a written opinion shall be established by the ISA together with the international search report, that will contain a preliminary and non-binding opinion on the questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), and to be industrially applicable. For the purposes of the written opinion, a claimed invention shall be considered novel if it is not anticipated by the prior art as defined in the Regulations. A claimed invention shall be considered to involve an inventive step if, having regard to the prior art as defined in the Regulations, it is not, at the prescribed relevant date, obvious to a person skilled in the art. A claimed invention shall be considered industrially applicable if, according to its nature, it can be made or used (in the technological sense) in any kind of industry. "Industry" shall be understood in its broadest sense, as in the Paris Convention for the Protection of Industrial Property. The criteria described above merely serve the purposes of establishing the written opinion, that will subsequently be issued by the International Bureau as an International Preliminary Report on Patentability. Any Contracting State may apply additional or different criteria for the purpose of deciding whether, in that State, the claimed invention is patentable or not. The written opinion shall take into consideration all the documents cited in the international search report.

Essential differences exist, however, between the PCT procedure and the examination of European patent applications[50]:
(i) international preliminary report on patentability does not lead to the grant of a patent or refusal of the application;
(ii) for establishing the written opinion the time limits set in Rule 42 PCT are to be met;

[50] http://www.epo.org/patents/law/legal-texts/html/guiex/e/e_ix_4_1.htm

(iii) the procedure followed in cases of lack of unity of invention; and
(iv) in accordance with the Agreement between the European Patent Organisation and the International Bureau of the World Intellectual Property Organization (OJ 11/2007, 617), the EPO may limit its work as an ISA. A limitation of the EPO's competence is applicable for applications relating to business methods filed by a US national or resident (OJ EPO 3/2009, 206).

Any negative findings provided by the ISA, substantive or formal, will be placed before the national (or regional) examiner where the national phase is entered. At some point in the patenting process, it is reasonable to conclude that an applicant will have to respond to each negative finding contained in the written opinion with amendments or arguments. The optional international preliminary examination procedure gives the applicant the opportunity to respond to these once, during the international phase, as opposed to writing and filing multiple responses in all national offices where national phase entry is made.
For cases where the written opinion of the ISA contains negative findings, the savings in the time of applicant and agent, and, where applicable, agent's fees, required by multiple responses to national offices may well justify the use of the international preliminary examination procedure. [51]

European Patent Office
Under Rule 62(1) EPC, a European search report is accompanied by an opinion on whether the application and the invention to which it relates seem to meet the requirements of the EPC. The extended European search report (EESR) comprises the European search report or supplementary European search report (ESR) and the European search opinion (ESOP). If the application and the invention do seem to meet all requirements of the EPC, a positive opinion (standard clause) is issued which may later serve as the basis for grant of a European patent. The opinion is not part of the ESR, and therefore is not published with it under Rule 68(2) EPC. However, once the European patent application has been published (Article 128(4) EPC), the ESOP is open to file inspection.

National Institute of Industrial Property of the Republic of France
The search results are in the form of a "Preliminary Search Report" having the same structure as a European or PCT Search Report. An Extended Preliminary Search Report is issued for applications filed after 1st July 2005. It consists of a Preliminary Search Report and a written opinion. The written opinion is not published with the application but is accessible to third parties with the other documents of the file after publication.

When the application is a first application (no priority claimed), the Preliminary Search Report, drawn up by the EPO as subcontractor, is usually sent to the applicant within 9 months from the filing date. The applicant receives the result of the search within the priority year, before the end of the time limit for filing parallel patent applications abroad.

When the application is a second application (priority claimed), the Preliminary Search Report is often established later (one or even several years after filing). Publication of the Preliminary Search Report is then made separately from the earlier publication of the application as filed.

It should be noted that a Provision was introduced in the French IP Code by the Decree N°2007-280 of March 1st, 2007, allowing the French Patent Office to request, before the drawing up of the Preliminary Search Report, that the applicant discloses the prior art cited in parallel proceedings in other countries, when the application is filed under priority. With respect to such applications claiming priority rights, the Preliminary Search Report is now drawn up by the French Patent Office itself, not by the EPO.[52]

The establishment of the "Preliminary Search Report" is a strategic step in the patent prosecution because it allows applicants to evaluate the competitive environment of their innovation. It quotes the state of the art, i.e. it establishes a list of patents and scientific documents in relation with the invention and those citations were accessible to the public

[51] http://www.wipo.int/edocs/pctndocs/en/2010/pct_news_2010_05.pdf
[52] http://www.cabinetbeaudelomenie.fr/gb/documentation/etudes/patentsystem.html

before the date of filing. The search is conducted in an international database of documents and is presented in the report. The report can be written in French, English or German, and the French patent authority is not in charge of the translation of the reports of search. For utility models, no search report is carried out.

The report is provided together with an opinion of patentability of the invention. This aims to help the applicant to interpret the report of preliminary search in the matter of novelty and inventive step. This opinion is only indicative, but it recommends the applicant to study carefully the patentability. These two documents (the preliminary search report and the opinion of patentability) are addressed to the applicant by mail.[53]

5.7.4 Exchange Of Information

With reference to co-operation among granting offices, mechanisms to exchange information among the NPO and EPO examiners and to share/reuse the searches done by other offices are regarded as the most effective for improving patent quality. The optimal tool for this is the PCT, as it has a harmonised legal framework, established procedures and a central secretariat in place, and deals with timeliness and quality.

For files that enter into the regional phase after PCT, the prior search and often the search opinion are in the file that arrives on the examiner's desk. Furthermore, since examiners were equipped with electronic search tools they routinely start their searches by checking whether another patent office has already done a search and if so what the results were, in particular if the application has a foreign priority. Many patent offices provide such information more or less automatically to their examiners. [54]

Work sharing
The main work-sharing models are: re-utilization of S&E work, co-operative S&E, and mutual recognition.

With respect to re-utilization of S&E, the EPO has done what was called the "Utilisation Pilot Project (UPP)". The objectives of the UPP were to test, without changing the existing National procedures, the process by which work carried out during the priority year on a first filing at a NPO can be further utilised by an applicant and the EPO in the treatment of a subsequent filing.

The participating offices were the DKPTO, the APO, the DPMA, and the UKIPO. The UPP has demonstrated that work carried out during the priority year on a first filing at a NPO can be further utilised by the EPO in the treatment of a subsequent filing to yield: a perceived quality gain by the EPO examiner; pre-classification benefits for routing at the EPO; and an expected time saving, or, at a minimum, a time-neutral effect on the examiner's work. Therefore, it was decided to roll out a permanent utilisation scheme. For this purpose it was necessary to revise the EPC Implementing Regulations. A key principle of the utilisation scheme is that the EPO examiner remains free to carry out further searches and to apply his or her own discretion in utilising search products from NPOs. Informal feedback from applicants suggests that the increase in quality obtained by "a second pair of eyes" is a reason why e.g. some US applicants file their PCTs at the EPO.

The utilisation scheme which will enter into force on 1 January 2011 looks in a nutshell as follows:

Article 124 EPC gives the EPO the power to call upon the applicant to file prior art information (search report) that has been received on related applications. If the applicant fails to respond in time, the patent application is deemed to be withdrawn. This provision together with the revised Rule 141 EPC and the newly introduced Rule 70b EPC serve as legal basis for the permanent utilisation scheme.

[53] http://www.inpi.fr/fr/brevets/deposer-un-brevet/les-16-etapes-cles-du-depot.html
[54] http://www.suepo.org/public/ec10093.pdf

The new Rule 141 Information on prior art establishes that an applicant claiming priority shall file a copy of the results of any search carried out by the authority with which the previous application was filed together with the European patent application, in the case of a Euro-PCT application on entry into the European phase, or without delay after such results have been made available to him. The copy shall be deemed to be duly filed if it is available to the EPO and to be included in the file of the European patent application under the conditions determined by the President of the EPO. Where the European Patent Office notes, at the time the Examining Division assumes responsibility, that a copy referred to in Rule 141 has not been filed by the applicant and is not deemed to be duly filed under Rule 141, paragraph 2, it shall invite the applicant to file, within a period of two months, the copy or a statement that the results of the search referred to in Rule 141, paragraph 1, are not available to him (Rule 70b(1) EPC).

As far as co-operative S&E is concerned, for example, the JPO and the DPMA joined efforts in the context of the PPH. The experience with collaborative searching of the examiners in the German office seems to be largely positive. Informal feedback is that the quality of the searches is greatly improved through two mechanisms: better access to Japanese language databases through the search of the Japanese counter-part, and a better understanding of the technical matter of the (translated) application through a personal exchange with the Japanese counterpart.

Mutual recognition of preliminary S&E results is actually practiced in the PCT procedure. Some patent offices also de facto recognize the outcome of the procedures in the major patent offices. It could be argued that the outsourcing of searches to other national patent offices previously practiced for example by the UKIPO comes close to recognition of the search results.

Catalogue of differing practices (CDP)
The Trilateral Offices (i.e. EPO, JPO and USPTO) agreed to compile a catalogue of differing examination practices (CDP). The Trilateral Offices recognised that the catalogue could be beneficial for examiners utilizing the work results in other patent authorities. Extension to IP5 (i.e. also SIPO and KIPO) is expected for 2011. The Trilateral Offices agreed to enhance the quality management and investigate measures for improving quality, promoting mutual understanding of the philosophy on quality. [55]

5.8 Conclusions

In this chapter we have initially reviewed the academic debate on patent quality mechanisms in order to understand how incremental reforms can be made to encourage high quality and sustainable property rights.
Section 3 showed that PCT offices conducting international search and examination are complying with the protocols for an improved quality framework for international search and preliminary examination. The annual reports prepared by the European ISAs, identifying the lessons learned and actions taken, and making recommendations in light of the review, help identify and disseminate best practices among patent offices.

Sections 4 and 5 presented two categories of administrative mechanisms to improve patent quality. One category dealt with the quality of processes and products in patent offices at the European and national levels. The EPO together with the EPN have developed standards: the EQMS, which establishes the minimum requirements for the processes, and the PQS, which establishes the minimum requirements for the products classification, search, examination and granted patent.

[55] http://www.trilateral.net/conferences/conferencesummaries.pdf

The other category dealt with co-operation with EPO, with national patent offices in Europe, and with other jurisdictions outside of Europe. Delivering high-quality work is often perceived as being a task that is both time and cost-intensive, but with the co-operation of patent applicants and examiners and the committed support of management, the quality of the patent offices' products and procedures has been tackled. This is in line with the conclusions on an enhanced patent system in Europe, viz. points 41-49 (Council of the European Union, 2009).

In tandem with its drive to improve the quality standards, patent authorities have recently taken various steps to strengthen the validity of granted patent applications and increase legal certainty at the different stages of examination.

Section 6 presented administrative mechanisms against low-quality patents that have been implemented, are being implemented or will be implemented by selected patent authorities. Aside from that, it was shown that the perceived effects of mechanisms against low-quality patents can be positive, negative, neutral or unknown.

Further, we recommend devoting additional efforts in administrative mechanisms that have positive perceived effects to increase patent quality but are not generally used by some patent authorities in Europe, namely:

EXAMINATION PROCESS
- increase of the number of examiners per work unit demand
- targeted increase of patent examiners to allow more time for casework in subject matters where quality can be improved
- re-examination of patent cases prior to a decision to grant is reached

INVOLVEMENT OF THIRD PARTIES
- participation of third parties to aid examination
- administrative opinion on claim scope on infringement or validity issues
- codes of practice and of moral conduct for applicants and patent attorneys that discourage improper uses of the patent system

Moreover, we recommend keeping the following administrative mechanisms currently in use by some patent authorities in Europe, which have positive perceived effects on patent quality:

EXAMINATION PROCESS
- communication with the applicants by email and telephone on a more informal basis
- maintenance of the competence of patent examiners, e.g. training and training materials
- exchange of information among patent examiners

QUALITY ASSURANCE
- internal auditing to improve patent quality
- management and product quality certification (ISO or similar)
- application/use codes of practice for quality assurance
- randomly selection of patent applications for review of search quality
- randomly selection of granted patents for review of quality of examination
- standardisation of search practices into codified manuals

INVOLVEMENT OF THIRD PARTIES
- creation and availability to prospective inventors of a more powerful search tool for prior art
- mechanisms for customer feedback

PATENT PROCEDURES
- preliminary opinions on patentability to encourage early amendment or withdrawal

CO-OPERATION AMONG GRANTING OFFICES
- standardisation of practices on patent quality with other patent offices

- exchange of information among the NPO and EPO examiners
- exchange of information with patent offices in third countries (JPO, USPTO)
- share/reuse the searches done by other offices
- use of patent classification common to other offices (supplementary to the IPC key)
- use of well-functioning, machine-translated documents

Priority should be given to the following perceived best practices portrayed in Section 7:

1. mechanisms to *maintain the skills of patent examiners* are regarded as the most effective for improving patent quality.
2. mechanisms *to randomly select patent applications for review of search quality, and to randomly select granted patents for review of quality of examination*
3. mechanisms *to provide preliminary opinions on patentability to encourage early amendment or withdrawal*
4. mechanisms *to exchange information among the NPO and EPO examiners and to share/reuse the searches done by other offices*

6 Conclusions and Policy Recommendations

6.1 Aim and background of the study

Over the past decade, the growth in the number of patent applications filed in Europe and other major economies has exceeded economic indicators such as the rise in GDP or proportionate increase in spending on R&D. Current trends reveal an increase in the length of patent applications as well, both in terms of pages of description and the number of claims defining the scope of the invention. Scientific advances have resulted in greater demand for applications in high technology fields such as biotechnology and computing, where there is particular public interest on what inventions should be patented. Furthermore, the increased innovation activity of companies in emerging countries indicates that these entities have started to file an constantly growing number of patent applications with a non trivial impact on the main patent offices worldwide.

These events have put an increasing pressure on the world's leading patent offices that face growing backlogs of unexamined patent applications. Given that it takes several years for a patent examiner to be fully trained and operational, the increased recruitment of patent examiners cannot fully keep up with demand for patents and achieve significant reductions to these backlogs in the short-term.

There is no single definition of patent quality. For granted patents, quality can be considered from the viewpoint of the patented invention meeting all the statutory requirements as interpreted by case law from the courts. The legal perspective of patent quality therefore deals with whether the conditions for an invention to be patented are fulfilled, principally, novelty, inventive step, not relating as such to an excluded area (e.g. methods of doing business), and sufficiency of disclosure.

However, taking a broader perspective and looking at the quality of the system as a whole, it is relevant to consider how the quality of patents is contributing to the intended purpose of patents to encourage innovation and the diffusion of technology. At this point, additional factors, including the costs for obtaining, managing and enforcing patents become relevant.

To a certain extent, concerns about patent quality have been brought into question from incidents which do not solely relate to quality, but are nevertheless linked. One example, occurring primarily in the ICT sector is "patent thickets", where innovation is slowed down due to the high number of patents associated with a particular technology. The long-term societal benefit expected from the patent system is more difficult to fathom in these cases. This has raised questions on whether the granting of fewer patents would achieve a better balance in the system, rewarding patentees for true innovative contributions and increasing innovation by the patentee and his competitors. For example, higher patent fees would be expected to lower the number of applications, but a downside to this might discourage innovative SMEs and start-up firms to patent their inventions. In the background of rising backlogs, there is no obvious solution to improving patent quality; greater time spent on examination prior to grant will increase pendency times further.

The aim of this final section of the study is to propose evidence-based policy recommendations for the optimal functioning of the future patent system in Europe. To this aim, we present the evidence gathered in the previous sections, we provide discussions and recommendations, and contrast them with theory and practice.

Regarding the several interpretations, views or perceptions on patent quality, a caveat should be interposed here. The results of this study are not expected to defend or contest shortcomings in the dual nature of patent quality thereof, but rather to analyse them realistically and indicate to what extent they may cause a need for policy intervention. Indeed, different opinions exist about the level of policy intervention needed on the issues in question. In this respect, this study aims at providing a balanced view on how and why these problems are important.

The current European Patent System is characterised by inter-governmental co-operation under the EPC system. Currently, the EPO, its President and the Administrative Council exercise combined powers of initiating law making, making the law and executing the law. The EPC established uniform European patent law among the 38 EPC contracting states and had a harmonising effect to the national patent laws of these states.

So far, there is no one-single, centrally enforceable, European-wide patent. Since the 1970s, there has been an almost continuous discussion regarding the creation of a unitary EU Patent and a unified European patent court in Europe. Generally accepted features of unitary EU patents comprise a unitary title, a respect for EU legal order, co-existence with the European and national patents, affordability, cost efficiency, legal certainty, high quality, non-discrimination, a pre-grant phase regulated by the EPC, and a post-grant phase regulated by the EU legislation.

In this chapter we collect the most important pieces of evidence emerged in the study and re-organise them along four main themes: the concept of quality, the quality of granted patents, the quality of the patent system, and the expectation from future patent reforms.

Section 3 presents the dual nature of quality in a patent system and refers to the evidence provided by industry and academia on the determinants of perceived patent quality. Section 4 displays the quality of the granted patents referring to the view of the patentees on the examination process; the results from the analysis of patent oppositions; the mechanisms and tools adopted at various patent offices to improve quality; and overseas initiatives to improve patent quality. Section 5 shows the quality and effectiveness of the European Patent System by referring to the evidence of validation, translation, and enforcement of patents. Section 6 describes the expectations from future reforms. Finally, Section 7 defines an agenda of priorities for patent quality in Europe.

6.2 The dual nature of patent quality

An effective improvement of patent quality requires a preliminary assessment of the actual perception of the users on the drivers of quality. In this context, the results from the survey among companies and universities offer important insights.

Among three different options to assess the quality of a patent (i.e. “optimal balance between scope and legal certainty”, “clear disclosure”, and “high inventive step”), companies (regardless of firm size) largely indicated the “optimal balance” and “clear disclosure” as the most significant measures of quality. Further, “inventive step” received on average a higher rating by companies operating in the chemical sector and by universities and public research centres.

Among the options to assess the quality of a patent system (i.e. “strong compliance with legal requirements for patentability”, “cost effectiveness” and “timeliness”), large companies consider “legal certainty” the most important requisite.

Further, SMEs express strong preferences for “cost effectiveness”, and less concerns about the “legal certainty” and “timeliness”.

Overall results suggest that the effectiveness of the patent system in terms of procedural features depends to a higher extent on the pecuniary costs incurred for obtaining patents, rather than the speed of the granting process.

In order to find out the most important dimensions of quality at the systemic level, companies and universities have been asked to rank different items. As stated earlier, “high legal certainty concerning patentable subject matter” ranked first, both for large companies and SMEs. When considering the whole sample of companies and universities, “strong enforcement tools” and “easy access to justice” were the second determinants of quality at the systemic level. In particular, SMEs, universities and PROs considered the “minimised fees for obtaining and handling patents” very important.

The evidence shows that companies consider a clear and robust definition of the boundaries of patentable subject matter to be extremely relevant for patent quality. This consideration might imply that companies perceive the “uncertainty on patentable subject matter” as a potential driver of low quality patents. Furthermore, the results on patent enforcement suggest that initiatives to foster access to justice are likely to have a strong impact on the perceived quality of the European Patent System. It is important to mention that such access must be ensured not only to patent owners, but also to all participants of the patent system at large.

For comparison, we also examined the patent quality academic literature. Scholars do not indicate clearly which of the patentability standards should be given higher importance. In this respect, Borrás (2003), Langinier and Moschini (2002), Tödtling and Trippl (2005) argue that both the EPO and the NPOs should make sure that the patentability standards are followed effectively and consistently when granting patents and determining the extent to which a particular subject matter is patentable. Regarding the legal patentability standards, a caveat should be interposed here. The quality of a patent cannot be ascertained merely by looking into whether it fulfils the legal requirements. Among many other factors, one critical aspect of a high quality patent is that it is based on a comprehensive search, but there are no standards for search in the EPC.

Current initiatives illustrate that the EPO is still making use of its process of continuous dialogue with its primary users under the "Partnership for Quality", while holding useful exchanges with the European Patent Institute (epi), the BusinessEurope and the American Intellectual Property Law Association. It agreed with the epi on the production of a Manual of Best Practice which seeks to document the best practices that the patent applicants, their representatives, and the EPO should adopt during the prosecution of an application, with a view to providing a more efficient procedure with a higher quality level, particularly among applicants[56].

To sum up, we can say that users perceived the patent quality as two-sided concept. First, users noted the quality of a patent as such, which involves search and substantive examination, opposition and office mechanisms. Second, users noted the quality as a system, which involves issue related to fees and enforcement procedures. Based upon this dual nature of patent quality, in Section 4 we discuss our findings on the quality of granted patents and in Section 5 we discuss the quality and the effectiveness of the European Patent System.

6.3 The quality of granted patents

This section puts forward the level of quality of granted patents based on the results obtained in the survey among companies and universities, the analysis of patent oppositions for the years 2000 to 2008, the tools and mechanisms adopted by patent authorities, and the assessment of overseas initiatives.

[56] See: http://www.epo.org/about-us/office/annual-reports/2009/business-report/quality.html

Quality can be assessed on the presumption of validity that can be attached to a granted patent. The purpose of the search and examination procedures conducted by the patent office is to ensure a reasonable certainty to both the patentee and the wider world about the validity of the granted patent. Quality depends on the competence of the examiners as well as the time and search material available to them. In this section the data come from various sources (i.e. users' survey, opposition statistics, and office mechanisms) and exhibit different indicators which contribute to analyse quality from the perspective of granted patents. For this reason, we discuss the findings in four sub-sections. First, Sub-section 4.1 focuses on users' perceptions of granted patents. Second, Sub-section 4.2 summarizes the evidence from the analyses of patent opposition cases. Third, Sub-section 4.3 describes the tools and mechanisms adopted by patent authorities. Finally, Sub-section 4.4 puts the case of an overseas initiative.

6.3.1 Survey of users' perceptions

On the one hand, the survey results show that respondents assigned the European Patent System to the highest overall rating (2.90); the JPO received a positive evaluation as well (2.74), whereas the rating averages of KIPO, USPTO and SIPO are below the value of 2.5 (scale 1 to 4).

The European Patent System received a higher rating average from respondents that ranked "timeliness" as the first or the second most important characteristic for the quality of a patent system. This might to some extent reflect an appreciation by patent users of the relatively small backlog of the EPO, as compared to the other patent offices.

Further, 80% of the respondents consider the search report of the EPO's patent examiner clear and satisfactory.

In addition, 78% of the respondents are satisfied by the final EPO patent document in terms of scope.

Putting this last evidence into perspective, Lazaridis and van Pottelsberghe de la Potterie (2007) show that the EPO grants at least 60% of all patent applications, the rest being either withdrawn (30–35%) or refused (5%). They provide quantitative evidence suggesting that up to 54% of all patent withdrawals could be considered as induced by the work of the EPO examiners, and hence may be taken as a more appropriate indicator of the rigour of the EPO.

Our survey results among universities and companies are consistent with those obtained by Thomson Reuters and the Intellectual Asset Management magazine among patent attorneys. According to them, 71% of corporate counsels thought that the quality of the EPO-granted patents is "excellent or very good", with 56% of the private practice attorneys sharing this view. The Japan Patent Office came in second, followed by the United States Patent and Trademark Office, the Korean Intellectual Property Office and the State Intellectual Property Office of the People's Republic of China. They also show that the level of quality of patents granted by the EPO improved over the previous years: 28% of the corporate attorneys and 29% of their counterparts in private practice agreed to this view, while roughly two thirds of the respondents confirmed that it had stayed the same, and 6% and 7% respectively answered that the quality had deteriorated[57].

On the other hand, users seem to contend that the communication with and the provision of guidance from the examiner, when drafting and adjusting the contents of the patent application, can be further improved. This result needs to be contrasted with mechanisms currently in use at patent authorities with positive perceived effects on patent quality which include the possibility of communication with the applicants by email and telephone on a more informal basis.

[57] See also: http://www.epo.org/topics/news/2010/20100614.html

Moreover, only half of the respondents declare that the examination process has been similar and standardised across the different EPO applications, suggesting the presence of some non negligible heterogeneity at the level of the examiners and of the management of the examination process inside the EPO. However, it must be stressed that the evidence reports only the perception of the users, but there is no way to conclude that a significant heterogeneity exists. Furthermore, survey results need to be contrasted with the pro-quality mechanisms being put in place by patent authorities. Among such mechanisms we mention the Single Patent Process initiative at the EPO.

6.3.2 Analysis of patent oppositions

In recent years, the aggregate statistics show a slightly decreasing trend in the patent opposition rates. However, we found that intra-sectoral opposition rates remained rather constant. It seems that the aggregated decrease can be partly attributed to the increase in the number of new patents granted in the electrical engineering area, which is characterised on average by lower opposition rates.

When comparing opposed and non opposed patents we found robust evidence supporting the fact that opposed patents have on average higher economic and technological relevance, as captured for example by the number of citations received.

One might argue that the likelihood of observing an opposition can show a significant correlation with the duration of the substantive examination process. Our analyses did not lead us to conclude that there is any actual significant correlation. This can interpreted along different perspectives: i) the opposition process cannot be attributed to a too fast examination strategy by the examiner; ii) the strategy of stretching the duration of the examination is not perceived by patent holders as one that presents patent applications of dubious validity.

Concerning the geographical dimension of the phenomenon, we have investigated the impact of original priorities on the likelihood of observing an opposition. The data clearly highlight a below average incidence of oppositions in case of patents with a JPO priority.

An opposition may result in different outcomes: it may be rejected or the opposed patent may be revoked or amended (narrowed). In other cases, the opposition proceeding is closed either because the patent-holder let the patent lapse by not paying the renewal fees or by a withdrawal of the opposition by the opponent. Our elaboration suggests a relative stability along time of the typologies of outcome. There is a tendency toward the increase of cases ending with termination requested by the opponent and a reduction of the incidence of cases ending with a patent amendment.
The data do not seem to suggest a significant increase in the incidence of cases of revocation of patents previously granted by the EPO.

We have identified some factors (i.e. the number of claims, number of forward citations, number of opponents, the fact of having a Japanese priority) that seem to show a positive - but rather weak - correlation to the duration of the proceedings.

Our data elaboration also indicates that there is not any robust evidence in favour of an average deterioration of the quality of granted patents.

However, the joint evidence on the effects of patent value and the elevated incidence of opposition cases filed in recent years and are still pending, lead us to stress that a key issue is the average non negligible duration of the opposition proceedings. This can generate a prolonged period of uncertainty for both the patent owner and other companies. Additional concerns are due to the fact that patents subject to opposition (and being upheld after the proceedings) are those of relatively higher economic value (as captured by the number of subsequent citations received)

Any reform and intervention aimed at reducing the average duration of such uncertainty period would have a positive impact on the quality of the system as a whole.

The mechanism of patent opposition is unanimously regarded by patent scholars as an important tool for keeping high quality patents (as witnessed by the discussions about its adoption also in the US). We recommend efforts to reduce the time required to reach a final decision.

In interpreting our results it is important to recall that the proportions of patents which are maintained as granted, amended or revoked on appeal can easily be derived from statistics, although caution must be exercised in interpreting this data. In appeal proceedings, the basis on which a patent is reviewed may differ considerably from that underlying the examination which led to the grant. New evidence may be proffered, new arguments put forward and, in order to overcome objections, the patent claims may be modified.

In this context, it is important to bear in mind that the Boards of Appeal consider the validity of only a very small number of all granted European patents. The Boards of Appeal deals with granted patents in appeal proceedings following on from inter partes post-grant opposition proceedings.

It is clear that poor quality patents that do not meet the patentability requirements cause many legal and economic uncertainties. Furthermore, policy actions to improve patent quality need to account for the fact that resources to examine and grant patents are limited and pending patent rights cause uncertainty to third parties.

Current initiatives illustrate that the EPO's "Raising the Bar" focuses on internal practice, legal aspects and external practice. It was clear that significant adjustments were needed in the grant procedure to keep the patent system fit for purpose in the long term. A set of changes applicable from 1 April 2010 is aimed at enhancing the quality of incoming applications, improving the co-ordination between search and substantive examination and tightening up major time limits, especially those for filing divisional applications[58].

6.3.3 Tools and mechanisms adopted by patent authorities

Patent authorities have taken various initiatives to improve quality. Patent offices have also introduced quality management systems for processes, with some going on to attain internationally-recognised accreditation such as ISO 9001:2000. Within the EPO, the current strategy for improving quality systems derives from the strategy debate which in 2006 led to the establishment of a working group dealing with the creation of a European Quality System. The group was composed of quality and patent specialists from the EPO and EPC states and has defined a European Quality Management System for patent offices, including a Patent Process Standard and Patent Product Standard which was adopted by the Administrative Council in 2008. Currently, work continues within the framework of the "Raising the Bar" project which is one strand of the Office's overall strategic renewal. The key characteristic of these measures is the goal to improve patent quality and acknowledge the need to manage future workload.

The actual adoption and perceived relevance of tools and mechanisms to increase patent quality at patent offices belong to different categories, namely: examination process, quality assurance, involvement of third parties, patent procedures and co-operation among granting offices. Priorities come from the mechanism that occurs most frequently in a given set of categories (mode).

Based upon a survey among selected patent authorities, we recommend devoting additional efforts in administrative mechanisms that have positive perceived effects but are not generally used, namely:

[58] See also:
http://documents.epo.org/projects/babylon/eponet.nsf/0/afbc07d9e3b95f12c125770d0055a883/$FILE/epo_annual_report_2009.pdf

EXAMINATION PROCESS
- Increase of the number of examiners per work unit demand
- Targeted increase of patent examiners to allow more time for casework in subject matters where quality can be improved
- Re-examination of patent cases prior to a decision to grant is reached

INVOLVEMENT OF THIRD PARTIES
- Participation of third parties to aid examination (please see next section on “Overseas Initiatives”)
- Administrative opinion on claim scope on infringement or validity issues
- Codes of practice and of moral conduct for applicants and patent attorneys that discourage improper uses of the patent system

Further, we recommend maintaining the following administrative mechanisms generally in use, which have positive perceived effects on patent quality:

EXAMINATION PROCESS
- Communication with the applicants by email and telephone on a more informal basis
- Maintenance of the competence of patent examiners, e.g. training and training materials (top priority)
- Exchange of information among patent examiners

QUALITY ASSURANCE
- Internal auditing to improve patent quality
- Management and product quality certification (ISO or similar)
- Application/use codes of practice for quality assurance
- Randomly selection of patent applications for review of search quality (top priority)
- Randomly selection of granted patents for review of quality of examination (top priority)
- Standardisation of search practices into codified manuals

INVOLVEMENT OF THIRD PARTIES
- Creation and availability to prospective inventors of a more powerful search tool for prior art
- Mechanisms for customer feedback

PATENT PROCEDURES
- Preliminary opinions on patentability to encourage early amendment or withdrawal (top priority)

CO-OPERATION AMONG GRANTING OFFICES
- Standardisation of practices on patent quality with other patent offices
- Exchange of information among the NPO and EPO examiners (top priority)
- Exchange of information with patent offices in third countries (JPO, USPTO)
- Share/reuse the searches done by other offices (top priority)
- Use of patent classification common to other offices (supplementary to the IPC key)
- Use of well-functioning, machine-translated documents

Especially, priority should be given to the following perceived best mechanisms:
- Mechanisms to maintain the skills of patent examiners are regarded as the most effective for improving patent quality.
- Mechanisms to randomly select patent applications for review of search quality, and to randomly select granted patents for review of quality of examination
- Mechanisms to provide preliminary opinions on patentability to encourage early amendment or withdrawal
- Mechanisms to exchange information among the NPO and EPO examiners and to share/reuse the searches done by other offices

In the study, we also collected and discussed extensive evidence on specific projects and initiatives that have been put in place by Pos to foster patent quality. Such evidence

witnesses a non negligible effort by European patent authorities, and particularly the EPO, to keep high quality standards. Below we report selected evidence.

As far as the examination is concerned, mechanisms to “maintain the skills of patent examiners” are regarded as the most effective for improving patent quality. Across Europe, examiners are trained both as soon as they are recruited and alongside their career path. Usually examiners hold a master or doctoral degree in a particular technical field. Some patent authorities pay special attention to industry experience of candidates. With respect to the training of new examiners, there is an initial period for lessons in the law of patents and practice of prosecution, these lesson are in-house or provided by academic institutions. At the beginning of their careers, trainees are assigned a tutor, who will sign all documentation produced by the new comer. After finishing the traineeship, examiners will maintain their skills following learning programmes.

As a special service to European industry, the EPO has set up an Asia Helpdesk, staffed by experts of the Japanese, Chinese and Korean patent systems, who perform search in original language patent databases for customers or offer advice on the efficient use of free Internet sources. The ever-growing range of automatic translation tools is opening up the world of Japanese, Chinese and Korean patents[59].

The EPO and the SIPO have taken a further step towards making China's prior-art documentation more easily available for patent searching. In September 2004 they signed an agreement in Shanghai related to lexical and terminological data for building English-Chinese and Chinese-English dictionaries to be used for machine translation. The move towards a systematic caption of Chinese prior-art was strongly welcomed by the representatives of European industry[60].

Current initiatives illustrate that quality of a patent is too complex to be improved with a single approach or mechanism.

In relation to the international route, patent offices conducting international search and examination in Europe (i.e. Austrian Patent Office, the European Patent Office, the Spanish Patent and Trademark Office, the National Board of Patents and Registrations of Finland, the Swedish Patent and Registration Office and the Nordic Patent Institute) are complying with the protocols for an improved quality framework. The annual quality reports help identify and disseminate best practices among patent offices.

Tools and mechanisms to increase patent quality are not new. For example, the European Patent Network “Quality Project” defines minimum requirements for a European Quality System: processes and products; one of the IP5 (i.e. EPO, USPTO, SIPO, KIPO and JPO) projects deals with “Common Rules for Examination Practice and Quality Control” (project led by SIPO); the EPO "Raising the Bar”; and intensive co-operation with EPO, with national patent offices in Europe, and with other jurisdictions outside Europe.

Following the WIPO’s Standing Committee on the Law of Patents meeting in October 2010, Committee’s future work would focus on quality of patents, among other substantive issues. The work on quality was proposed by the so-called Group B states, which are mainly developed countries. The work programme includes elaborating options, measures and conditions, both legal and practical, that would be required to ensure and, where necessary improve, the issuance of high-quality patents. Patent quality, including oppositions, is one of five issues that the Standing Committee on the Law of Patents has agreed to focus work on in the coming months. The Group B countries suggested that three steps be taken as part of the work programme. First, members will exchange information on laws and practices relating to the quality of patent applications and patents. This could include databases on search and examination reports, dissemination of patent information and substantive patent law/inventive step. Second, they will identify suitable measures to guarantee and improve the quality of patents worldwide. Third, recommendations “in respect of such legislative and practical

[59] See: http://www.epo.org/patents/patent-information/east-asian.html
[60] See: http://www.epo.org/topics/news/2010/20100910.html

measures" will be elaborated for the benefit of WIPO members. The proposal added: "in establishing the work programme, due attention shall be given to avoiding duplication of work already undertaken in the framework of other WIPO committees." In their proposal, the developed countries said that the patent system must be well-functioning and balance the interests of inventors and patent owners with those of third parties and the public (Nurton, 2010b).

EPO made progress on implementing a quality management system, taking further steps to prepare for ISO 9001 certification. The system is to be broad in scope, covering end-to-end processing of applications, oppositions and requests for revocation/limitation along with all the support and management processes.

Delivering high-quality work is often perceived as being a task that is both time and cost-intensive, but with the co-operation of patent applicants and examiners, and the committed support of management, the quality of the patent offices' products and procedures has been tackled. This is in line with the conclusions on an enhanced patent system in Europe, viz. points 41-49. Ministers agreed on an "enhanced partnership" between the EPO and NPOs aimed at cutting duplication of effort. The EPO "would be expected to consider but not obliged to use" work provided by participating offices, and applicants would be allowed to file patents requests directly at the EPO. Enhanced partnerships should be based on a European search standard that contains criteria for ensuring quality (Council of the European Union, 2009).

Corrective action was undertaken to address lack of clarity (Art. 84 EPC) and the added subject-matter (Art. 123 EPC), which are considered as the most frequent causes of deficient work. Audits of classification work and the classification system identified room for improvement, and a pilot quality control system was introduced for classification work, with the aim of developing an officewide system in 2010. New procedures also made it clear that quality control could not be performed on searches without adequate documentation of the search process. As a result the EPO has undertaken various activities to ensure that meaningful records are kept for all searches performed, and this will become mandatory in the course of 2010.

An additional activity of the EPO is "the Single Patent Process" (SPP). It focuses on the EPO's vision of the future and the implementation of a highly efficient patent process. It aims to ensure that the initiatives developed support quality assurance in the future including the integration of more plausibility checks in automated processes and supporting tools. The SPP was set up in 2009, with the mandate of redesigning and improving the patent process, thereby ensuring that the EPO remains a benchmark in the patent world. The SPP aims to deliver simpler and more efficient processes, better-integrated working environments, more ergonomic tools and enhanced co-operation among examiners, formalities officers, applicants and external bodies. The programme definition phase has now been completed, and a gateway review has been performed by outside experts[61].

As far as the communication and guidance is concerned, under Rule 62(1) EPC, a European search report is accompanied by an opinion on whether the application and the invention to which it relates seem to meet the requirements of the EPC. The extended European search report (EESR) comprises the European search report or supplementary European search report (ESR) and the European search opinion (ESOP). If the application and the invention do seem to meet all requirements of the EPC, a positive opinion (standard clause) is issued which may later serve as the basis for the grant of a European patent. The opinion is not part of the ESR, and therefore is not published with it under Rule 68(2) EPC. However, once the European patent application has been published (Art. 128(4) EPC), the ESOP is open to file inspection.

6.3.4 Assessment of overseas initiatives

[61] See: http://www.epo.org/about-us/office/annual-reports/2009/business-report/quality.html

Patent quality improvement is a priority in the major patent offices worldwide. Evidence shows that a very important determinant of the examination quality relates to a rich substantive examination, especially for what concerns searching and retrieving all the relevant prior art for the correct assessment of novelty and obviousness.

The USPTO peer-to-patent project has proved to be among the most advanced proposals for improving the patent examination process, where the public can contribute to retrieving prior art and suggests it to the examiner. A new, expanded, peer-to-patent pilot programme was launched by the USPTO in October 2010. The number of eligible subject matter classes has been trebled and includes software, business methods, biotechnology, bioinformatics, telecoms and speech recognition applications. In a survey, 73% of patent examiners said the programme would be helpful if implemented into regular office practice. They used art found by peer reviewers in about 20% of applications reviewed.
However, with uneven participation, there are risks that the mechanism would mostly benefit large incumbents that have sufficient resources to monitor new applications and oppose prior art, rather than SMEs. Also for this reason, the majority of respondents to our questionnaire indicate that they would prefer the patent offices to retain full control on the examination and appreciate their contribution as *super partes* experts specialised in evaluation.

In Europe, third parties observations to be received by the examiner, after the publication of the patent application notice is ruled by Art.115 EPC (see participation of third parties to aid examination in previous section). Under this mechanism, which resembles the principles of participated peer review, third parties are set free to submit their observations on the relevant prior-art, to assess a pending patent to the EPO examiners in charge of the substantive examination. Submission of observations is at no cost for third parties and can be done by sending an ordinary mail (clearly showing the application number) to the EPO. The examiner retains full responsibility on the examination and is set free to assess the relevance of the observations. However, Art. 115 EPC is not frequently used.

6.4 The quality and effectiveness of the European patent system

This section sums up the results on the impact on perceived quality of the systemic dimension of the European Patent System. Results suggest the presence of non-negligible criticalities mainly related to the costs that patent owners incur for the validation, translation, and enforcement. Such costs are to a large extent linked to the fragmented nature of the European patent system. Our findings from the survey show that the average number of European countries in which European patents have been validated and renewed for at least one year is between 3 and 5 for 37% of respondents. Differences arise among them: 15% of universities and PROs choose to validate patents in one country and two thirds of respondents in less than seven countries.

6.4.1 Validation

The validation phase takes place after a European Patent is granted, wherein applicants must “validate” the European Patent in each target country. In order for the European patent to become effective applicants must fulfill validation requirements in each individual country, e.g. filing a translation within three months after a European patent is granted by the EPO.

The survey of users’ perceptions shows that 55% of respondents regard the current structure of fees complex and too much fragmented.

Concerning the costs for validation across European countries, we investigated their impacts using a threshold of four countries (which corresponds to the current average number of validated countries). Results clearly indicate the non-negligible impact of marginal additional validation costs. In 41% of the cases, maintenance fees for validated patents are regarded a

large obstacle for the user when considering less than four designated countries. The percentage increases dramatically to 76% when considering more than four countries (93% in the case of SMEs).

Contrasting the evidence with actual practice, Ireland can give assistance with patent expenses in some cases and Wallonia (one of the regions of Belgium) provides subsidies for patent registration. A few patent offices do not charge a filing fee for patents (for example, the UK) and at least one national patent office (that of Italy) has, in 2006, stopped charging any fee for any activity concerning grant or maintenance of the patent[62] which, however, was reintroduced in 2007.

6.4.2 Translation

The difference in costs between the European Patent System and other patent systems is mostly due to translation requirements. The data from the survey confirm this point. Translation costs represent a heavy financial burden for 77% of respondents, and there is a unanimous agreement on the fact that the EU ("Community") Patent should provide a significant reduction beyond the current benefits generated by the London Agreement.

The validation requirements in many countries include the obligation to file a translation of the entire or part of the patent. At present, the following translation requirements are provided for the: supply of a translation in the national language of the complete European patent specification, supply of a translation in the national language of the claims only, or supply of a translation of the claims in the national language and a translation of the European patent specification in English, or if the European patent was granted in French or German.

Under Article 65(1) of the European Patent Convention, any contracting state may, if the European patent as granted, amended or limited by the European Patent Office is not drawn up in one of its official languages, prescribe that the proprietor of the patent supply to its central industrial property office a translation of the patent as granted, amended or limited in one of that state's official languages at his option or, where that state has prescribed the use of one specific official language, in that language. Under Article 1(1) of the London Agreement, a contracting state to the Agreement which has an official language in common with one of the official languages of the EPO will dispense with the translation requirements under Article 65(1) EPC. Under Article 1(2) of the London Agreement, a contracting state to the Agreement which does not have an official language in common with one of the official languages of the EPO will dispense with the translation requirements under Article 65(1) EPC if the European patent: i) has been granted in the EPO official language prescribed by that state, or ii) is translated into that language and filed under Article 65(1) EPC.
Under Article 1(3) of the London Agreement, such a contracting state can, however, require that a translation of the claims into one of its official languages be filed under Article 65(1) EPC.

Of the 38 contracting states to the European Patent Convention (status: 1 January 2011), 21, namely Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Estonia, Finland, Greece, Hungary, Ireland, Italy, Lithuania, Malta, Norway, Poland, Portugal, Romania, Slovakia, Spain, the former Yugoslav Republic of Macedonia and Turkey, have enacted provisions under Article 65 (1) and (2) EPC. Except for the former Yugoslav Republic of Macedonia, which requires a translation of the claims only, all of the above-mentioned states require a translation of the complete patent specification.
Sixteen contracting states have also ratified the London Agreement (Croatia, Denmark, France, Germany, Hungary, Iceland, Latvia, Lithuania, Liechtenstein, Luxembourg, Monaco, the Netherlands, Slovenia, Sweden, Switzerland and the United Kingdom). These states dispense entirely or partly with the translation requirements under Article 65(1) EPC.

[62] See:
http://www.wipo.int/export/sites/www/sme/en/documents/pdf/managing_patent_costs.pdf

Contracting states to the London Agreement which have an official language in common with the EPO, i.e. France, Germany, Liechtenstein, Luxembourg, Monaco, Switzerland and the United Kingdom, dispense entirely with the translation requirements.
The following states do not have an official language in common with the EPO and require a translation of the claims to be filed in one of their official languages if the European patent has been granted in English, or has been translated into English and filed under Article 65(1) EPC: Croatia**, Denmark, Hungary, Iceland, the Netherlands and Sweden. Except for Croatia, the European patent specification can also be filed in these countries in the respective country's language. Latvia, Lithuania and Slovenia only require a translation of the claims into their respective official languages, regardless of the official language in which the EPO has granted the patent.
All EPC contracting states have prescribed, in accordance with Article 65(3) EPC, that in the event of failure to observe the relevant national provisions, the European patent will be deemed to be void ab initio. The circumstances in which such a loss of rights occurs are determined by the national law of the contracting states concerned. In most contracting states the time limit for filing the translation is non-extendable[63].

Accordingly, the translation requirements at the national level represent a shortcoming in the quality of the fragmented European Patent System. If a unitary title were to simplify the translation regime, then it would solve the problem of costs and would increase the quality of the system. In other words, the immediate European added value will be the reduction of language-related expenditures and the raise in quality. By doing this, the system will provide more incentives to protect the inventions of Europeans at lower costs and higher quality; and to foster innovation and competitiveness in the knowledge economy in Europe.

Concerning recent initiatives at the EPO, the Administrative Council has agreed to vastly increase investment in the current co-operation programmes between the EPO and member state NPOs in order to accelerate the optimisation of automated translation systems.[64] As far as quality is concerned, the development of "fit-for-purpose" machine-translation technology not only enables a technically qualified user skilled in the art to understand the technical content of the patent document (fit- for-purpose) but also enables a technically qualified user skilled in the art to assess whether a given patent document is relevant from a technical or economic point of view (minimum quality).[65]

6.4.3 Enforcement

The analysis of the European perceptions about the efficacy of the European patent litigation system shows some clear results.

The vast majority of companies (96%) agrees with the fact that the current fragmentation across different jurisdictions generates excessively high legal costs and excessive uncertainty on the actual enforceability of patents, eventually harming patenting incentives.

Further, the expected costs to gain access to courts are so high that they discourage patent owners from filing lawsuits according to 81% of large companies and 96% of SMEs.

Moreover, the risk of diverging or contradicting outcomes from infringement proceedings at different courts is perceived of strong negative relevance on the incentives for patenting according to 81% of large companies and 91% of SMEs.

[63] See: http://www.epo.org/patents/law/legal-texts/html/natlaw/en/iv/index.htm
[64] See:
http://documents.epo.org/projects/babylon/eponet.nsf/0/e8e346b6b89d903dc12577d600311dbe/$file/battistelli_speech_20101108.pdf
[65] See:
http://documents.epo.org/projects/babylon/eponet.nsf/0/fdb7aeb9ab8d5336c12577ca0050972d/$file/georgartelsmair_mt_developments.pdf

More than two thirds of respondents strongly agreed on the fact that the lack of technically trained judges is a major obstacle to enforceability.

In the fragmented European Patent System, infringement enforcement is determined under the national law and the EPC (see Art. 69 EPC and its protocol on interpretation). The nullity grounds for a European patent are exclusively determined by the EPC (Art. 138 EPC). In one of its very few substantive interventions into national law, the EPC requires that national courts must consider the "direct product of a patented process" to be an infringement. All other substantive rights attached to a European patent in a Contracting State[66], such as what acts constitute infringement, the effect of prosecution history on interpretation of the claims, remedies for infringement or bad faith enforcement, equitable defences, coexistence of an EP national daughter and a national patent for identical subject matter, ownership and assignment, extensions to patent term for regulatory approval etc., are expressly remitted to national law. The European Court of Justice (ECJ) held that European patents are national rights that must be enforced nationally, and it was "unavoidable" that infringements of the same European patent have to be litigated in each relevant national court, even if the lawsuit is against the same group of companies, and that cross-border injunctions are not available.

Accordingly, patent enforcement at the national level represents a shortcoming of the quality of the fragmented European Patent System. If a unified jurisdiction was to simplify the enforcement regime, then it would solve the problem of costs and uncertainty, and would increase the quality of the system. In other words, the immediate European added value will be the reduction of litigation expenditures and the raise in legal certainty across the EU single market. By doing this, the system will provide more incentives to enforce patents of Europeans at lower costs and higher certainty; and to foster innovation and competitiveness in the knowledge economy in Europe.

Concerning relevant recent initiatives, the European and EU Patents Court draft aims to create a centralised European patent litigation system to avoid multiplicity of parallel national litigations and thus to diminish litigation costs. In addition, the European and EU Patent Court draft aims to offer a solution to contradicting outcomes and thus to increase certainty in the European Patent System.[67]

6.5 Expectations from future patent reforms

This section shows the expectations of industry from future reforms with a special focus on the EU Patent. Despite the well-known political complexities and difficulties that major reforms of the European Patent System have been experiencing, we were able to collect crucial information in our survey. This information provides an added value to the most critical aspects of the current system. It is clear that the reported results represent the views of European patent users that agreed to join our survey and do not take into account all the costs and trade-offs for implementing such reforms.

To begin with, survey respondents agree with the fact that the EU Patent should provide a very high level of legal certainty according to 94% of large companies and 98% of SMEs.

In addition, a major expectation is given a reduction of translation costs according to 90% of large companies and 96% of SMEs.

Further, it is expected that the EU patent should reduce the administrative costs by having fewer validation procedures according to 89% of large companies and 91% of SMEs. The EU Patent should reduce the current procedural complexity according to 82% of large companies and 93% of SMEs.

[66] In the European Union, some of these issues are harmonised by Directive 2004/48/EC of the European Parliament and of the Council of 29 April 2004 on the enforcement of intellectual property rights ("Enforcement Directive").
[67] See: http://ec.europa.eu/internal_market/indprop/patent/index_en.htm

Putting the evidence into perspective, Danguy and van Pottelsberghe de la Potterie (2009) have simulated the financial consequences of renewal fees, translation, intermediation and litigation costs of a straight switch of 50,000 patents granted by the EPO under the fragmented system to the EU patent. In the simulation, the EU patent would result in net savings of €250 million for the business sector. However, contrary to common assumption, both the EPO and NPOs would also benefit, in the former case by €43 million, and in the latter by €78 million. On the other hand, attorneys and translators would lose €270 million and the drop in parallel-litigation costs of lawyers would amount to at least €121 million. In other words, nearly €400 million would be redirected from patent attorneys, translators and lawyers to patent offices and companies. They conclude that NPOs would see a net increase in their budget.

Institutionally, the Council of the European Union (2009) agreed on the features of the European and EU Patents Court. The Council of the European Union stressed that the conclusions are without prejudice to the request for an opinion of the ECJ as well as to Member States' individual written submissions, and are conditional on the opinion of the ECJ.

6.6 Defining an agenda of priorities

The empirical evidence in this study (provided by the exercises conducted through the users' survey, patent opposition statistics, office mechanisms survey and interviews) confirm that, when patent quality is analysed from the perspective of "single patent", Europe shows better results in comparison to other jurisdictions, especially when considering the EPO and the search and substantive examination.

However, when moving to the systemic perspective of patent quality, results show a significant dissatisfaction of European users. In particular, serious concerns are raised about the negative impact of administrative costs, system complexity and difficulties in the enforcement of patents.

The European Patent System is complex and the views of the patent stakeholders (collected from the companies, universities as well as patent authorities) represent vested interests. As such, the policy recommendations addressing the dual nature of quality need to take into account how regimes are reformed or constructed.

A radical reform by means of EU patent and European patent court represents a challenge. Incremental reforms that address specific issues related to patent quality are nevertheless still viable.

Based on the evidence collected in this study, the discussion on potential reforms can be organised along the following dimensions:

- Improvements in the patent examination process;
- Reductions of the barriers to patenting;
- Improvements in the patent enforcement.

6.6.1 Improvements in the patent examination process

The quality of granted patents builds upon a double process of patent drafting on the side of applicants and patent examination on the side of patent offices. Such double process can be positively influenced along a number of measures.

On the side of the patent applicant, for instance:

First, develop projects aiming at **improving the access by users to the sources of technical and scientific knowledge required identifying relevant prior-art**.

> Making the existing prior-art more accessible to all users (individuals, SMEs, and universities). Large firms have a serious competitive advantage regarding the search and treatment of existing information regarding prior-art of the subject matter. Advanced search tools for patent and non-patent literature access and information retrieval would help small applicants in their search of prior art in the drafting of their application. The search tools and databases currently available to examiners could be made public, with a free online access through the Internet (Guellec and van Pottelsberghe de la Potterie, 2007).
>
> We stress that the final quality of granted patents is significantly affected by the quality of the original application. In this perspective, the availability for companies of more effective tools to retrieve relevant prior art (jointly with machine translation of extant patent documents) can have a positive impact on the input side, e.g. better drafted applications.

Second, allow **a more effective and rapid communication between patent examiners and applicants** during the search and examination process.

> "Induced withdrawals" and refusals occur for up to 23% of all applications at the EPO. The role of examiners is more important than the low refusal rate seems to show, as more than 50% of withdrawals are induced by a communication from the examiner (either with the search report or during the substantive examination). Refusals should be made easier for the examiner, by increasing the rewards they provide in accordance with the time and effort refusals usually require. That would reduce the current de facto bias for granting a patent. Further rewards could be added for each additional communication that takes place during the substantive examination process, keeping in mind, however, that each additional communication increases the granting (withdrawal, or refusal) delay by an additional year (Guellec and van Pottelsberghe de la Potterie, 2007).

Third, set-up initiatives to **foster the contribution of third parties** as a supplement for the identification of prior-art.

> The creation of a web-based tool to facilitate the discussion, selection and submission of third parties observations can be considered. A supporting web-based facility may enable the systematic submission of third parties observation and increase the quality of submissions.
>
> We claim that third parties participation in pre-grant phase might have a positive impact, provided that feedbacks are funnelled through appropriate forum platforms set up by learned societies and advisory boards in order to avoid numerous individual reactions that cannot be timely handled by examiners. After an open consultation, the learned societies and advisory boards will submit a document of reasonable size providing the examiner with feedback during the pre-grant phase.

Fourth, sign in for a **"code of conduct" for patent prosecution** to avoid a deliberate abuse of the system.

> The deliberate abuse of the system includes a drafting style of the application that is deliberately deficient (i.e. with a large number of claims and a complex description) and may induce an unwanted burden on the patent office; a disproportionate degree of uncertainty to competitors and society at large, since it is nearly impossible to predict what scope of protection will be finally granted, if any at all; and an unclear published prior art, leading to difficulties in the electronic handling, searching, and identifying of the relevant prior art for future applications (Stevnsborg and van Pottelsberghe de la Potterie, 2007). The onus for ensuring patent quality should not be on the PO alone, but should instead be borne by the applicants as well. Patentees

should also be held to an obligation of good faith and candour in their dealings with the PO. Such a duty of candour exists, for example, in the United States and requires that everyone involved with a patent application must disclose all information known to them which is material to the patentability of their invention (Roox et al., 2008).

On the side of patent offices, measures include:

First, increase efforts to **maintain the skills of patent examiners**.

Encourage examiners to look beyond S&E and to study the work of industry and the courts; keep skills in technical tools (software and hardware), intellectual tools (up-dated prior art from IP5 offices, prior art from Asian jurisdictions, proper classification of prior art), and access to extra-mural materials (judiciary cases).

Second, randomly select patent applications for **review of search quality**, and randomly select granted patents for review of quality of examination.

Intensify controls of S&E of open files (when applicable) and closed files (always). Open files are those before granting and closed files are those after granting. With respect to the controller, a peer, superiors or a committee should check the files at random in order to keep a balance between the applicant and society at large (competitors, consumers, patients, scientists and other stakeholders).

Third, provide **preliminary opinions on patentability** in order to encourage early amendment or withdrawal.

Help applicants with an opinion of patentability of the invention to interpret the report of preliminary search in the matter of novelty and inventive step.

Fourth, intensify **the exchange of information among NPOs and EPO** examiners, and share/reuse the searches done by other offices to avoid duplication in the work of patent offices.

Foster examiners of various patent authorities to conduct pilot searches in groups to find the influence of certain parameters, such as search time, search strategy and/or indexing structure, on the quality of the search result.

6.6.2 Reductions in the barriers to patenting

The European Patent System is fragmented and costly. A granted European patent can only be validated at national level and it might need to be translated into national language and national validation and renewal fees are expected to be for paid for enforcement. Moreover, nullity and infringement cases are dealt with at the national courts.

This fragmentation and related costs are regarded as major barriers for the EU single market.

Policy initiatives need to be developed aiming at reducing the patent-related costs, with specific focus on increasing competitiveness of the EU single market. The current fragmentation poses serious concerns about the negative effects on competitiveness of European innovative companies. The high costs for translation, validation and enforcement of a patent might induce sub-optimal IPR strategies specifically from less financially endowed applicants, including innovative start-up firms.

Initiatives may include:

First, **simplification in the patent prosecution, such as launching electronic only procedures.**

> Establish digital prosecution in which the application and every substantive communication between the applicant and examiner, including office actions, amendments, information disclosure statements, and the like, are exchanged electronically over the Internet. Keep the prosecution of the application in electronic form from intake in the office electronic mail room to payment of the issue fee by the applicant. Regard the electronic file as the official legal record, and supplant archival of all paper copies[68].

Second, **the recognition of the "SMEs status" of applicants**, with direct-related financial considerations.

> Either fix specific fees structures for filing fees, search fees, examination fees for SMEs during the entire pre-grant phase or provide subsidies, grants or other type of compensation to SMEs in order to partially reimburse pre-grant fees.

Third, the provision of free-of-charge **automatic translation systems**.

> Create a rapid and efficient online translation system tailored specifically to the needs of inventors looking for information on existing patents in order to overcome language barriers that might inhibit innovation incentives. Individuals and SMEs have to go through a lengthy and costly process when venturing into a new market. A thorough search for existing patents is a must, but this is made more difficult by language barriers, the distribution of information sources over a multitude of sources and - last but not least - the technical and legal expertise required. The increase of IP-related activities results in an increased and urgent need for tools to cross language barriers, as language differences are no excuse in cases of infringement. In this context, the major risk for an SME is that it will invest significant resources to enter a particular technological niche, only to discover later that a competitor has a patent in that market[69].

Fourth, subsidizations or **tax deduction schemes**.

> Establish R&D subsidies or R&D tax deductions to cover patent-related costs (maintenance fees and litigation costs) during the entire post-grant phase for all stakeholders (i.e. not only patent holders but also third parties).

6.6.3 Improvements in the enforcement capabilities

Survey respondents made a clear point on the fact that ex-post enforceability is a key component of the perceived quality of a patent system. The improvement in the enforceability can be achieved along different trajectories:

First, improve the quality of the litigation system through a **centralised court** exclusively dedicated to patents and appoint technical qualified judges.

> Encourage the centralised court to contribute to enhancing the reflexivity/transparency of judgments when dealing with patent litigation issues and provide for systematic scientific training of judges (i.e. providing them with additional technical skills or encouraging them to advance their knowledge on various scientific issues) and the appointment of technical judges from the field of the patent in question.

Second**,** reduce the costs of **access to justice.**

[68] See: http://www.ssiplaw.com/files/electronicfiling.pdf
[69] See: http://cordis.europa.eu/search/index.cfm?fuseaction=news.document&N_RCN=32137

Stimulate the use of alternative mechanism to reduce the costs of patent infringement, such as mediation and arbitration. A joint initiative with WIPO in this respect is highly recommended.

Third, reduce the cost and **duration of proceedings**.

According to Margiano (2009), major factors affecting the cost and duration of patent litigation include the following:

a) *Product's value to the business* – Analyse the financial impact of winning (and losing) the litigation. In consultation with the attorney, establish a target litigation budget based on these figures.
b) *Product's value to the adversary and their resources* – The adversary will conduct its own cost/benefit analysis. The greater the potential impact of the litigation on the adversary's business and the greater the resources of the adversary, the more costly and lengthy the litigation will likely be.
c) *Number of patents, defences and parties involved* – The more patents, defences asserted, and parties to the litigation, the more likely the litigation will cost more and last longer. To reduce costs, pursue only substantial claims and defences, and pool resources with similarly aligned parties.
d) *Volume of evidence* – The number of documents to be reviewed and witnesses to be deposed impacts the cost and duration of litigation.
e) Venue – Where a case is brought (i.e. which court) can affect duration. Some courts are busier than others; some venues are more favourable to one party or the other.
f) *Law firm and litigation strategy* – Patent litigation specialists can lead to more efficient and better results. There also are substantial differences in the billing rates between the very large law firms, and smaller specialised law firms.

Fourth, limit *ex-ante* the likelihood of trials due to **uncertainty on the patentability of the subject matter**.

Fix the patent subject matter by reference to the notions of industrial application (EPC) and of technicality (EPO case law). Establish a higher inventive step for high-tech fields.

Fifth, **speed up the opposition proceedings** in order to avoid uncertainty. The uncertainty during opposition procedure is aggravated if the patent holder enforces the opposed patent in court.

The primary problem with the opposition procedure is the time taken for a decision to be reached. An obviously weak patent can in principle go from application to grant within several months. It then takes approximately some years to obtain revocation in the first instance through the opposition procedure. If appealed, it will take additional years to obtain a final decision (Roox et al., 2008).

To conclude, the European intergovernmental patent regime allows to retain institutional arrangements within Member States and to prevent any moves to delegate responsibility outside the national sphere. This intergovernmental patent regime is characterised by a fragmented European Patent System of national translation, validation and enforcement. Stakeholders in this study consider some characteristics of fragmentation as failings of the system due to higher costs and uncertainty, and low quality.

How can problems caused by such a fragmentation be solved institutionally?

There is no single approach, but at least two options can be constructed.

Make a unitary title and a centralised patent court legitimate for competitiveness of the European single market and for innovation in the knowledge economy. This will provide policy coherence and cohesion by defining what the regime is and what it does in relation to the

economy. Agreements will succeed with a conviction of why Europe is lagging behind in terms of innovation and competitiveness in the knowledge economy. Over domestic negotiations, Member State absorb the concern of domestic actors and builds coalitions with them.

Allow for parallel regimes when there is a tension between strongly institutionalised differences across Member States, and a desire of policy makers and stakeholders to adapt common rules for mutual advantage in the European Patent System. One way of giving a chance to Member States that support a unitary title and a centralised patent court is by means of enhanced cooperation, which allows those Member States that wish to continue to work more closely together to do so. Parallel regimes and enhanced cooperation are therefore a strategy and not a final outcome. The ultimate goal would create a single institutional architecture by means of a unitary title and a centralised patent court for the single market of the EU provided that patent-related costs were lower and legal certainty raised.

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8 List of tables

9 Annexes

9.1 Associations contacted to disseminate the survey to companies and PROs

Table 67 Associations contacted in order to disseminate PatQaul flyer

Association
DG Research Datawarehouse
IPR HelpDesk
Advanced Engineering Materials and Technologies
Advisory Council for Aeronautics Research in Europe
AGE - The European Older People's Platform
Agoria
AIPPI – International Association for the Protection of Intellectual Property
APPE - Association of Petrochemicals Producers in Europe
ASD – Aerospace & Defence Association of Europe
Association for Competitive Technology - SMEs in the IT sector
Auril
Businesseurope (The Confederation of European Business)
CEFIC – European Chemical Industry Council
CIAA – Confederation of the Food and Drink Industries in Europe
Digitaleurope
EAEPC – European Association of Euro-Pharmaceuticals Companies
EARMA - European Association of Research Managers & Administrators
EARTO - trade association of Europe's specialised research and technology organisations
EEN - Enterprise Europe Network Thuringen in Germany
EFPIA - European Federation of Pharmaceutical Industries and Associations
EIRMA - European Industrial Research Management Association
Embedded Computing Systems
EPIA- European Photovoltaic Industry Association
ESBA - European Small Business Alliance
EUCOMED The European Medical Technology Industry Association
EUnited aisbl
Eurochambers
EuropaBio European association for bioindustries
European association of automotive suppliers
European association of plastics manufacturers
European Automobile manufacturers association
European Biofuels Technology Platform

Association
European Biopharmaceutical Enterprises
European Construction Technology Platform
European Federation of Accountants and Auditors for SMEs
European Federation of Biotechnology
European Nanoelectronics Initiative Advisory Council
European Passive Components Industry Association
European Power Plant Suppliers Association
European Rail Research Advisory Council
European Road Transport Research Advisory Council
European Semiconductor Industry Association
European Space Technology Platform
European Steel Technology Platform
European Technology Platform for the Electricity Networks of the Future
European Technology Platform for Wind Energy
European Technology Platform on Smart Systems Integration
European Technology Platform on Sustainable Mineral Resources
Farm Animal Breeding and Reproduction Technology Platform
FEE - Fédération des Experts-comptables Européens
Fefana - Feed Additives and Premixtures Associations
Food for Life
Forest based sector Technology Platform
Future Manufacturing Technologies
Future Textiles and Clothing
Global Animal Health
HITECH Federation
Industrial Safety ETP
INSME - International Network for SME
Integral Satcom Initiative
IP Federation
LESI - Licensing Executives Society International
Mobile and Wireless Communications - eMobility
Nanotechnologies for Medical Applications
National Network for Technology Transfer
Netval
Networked and Electronic Media
Networked European Software and Services Initiative
NIA - Nanotechnology Industry Association
NORMAPME
ORGALIME - The European Engineering Industries Association
Photonics21
Photovoltaics
PIN-SME Pan European ICT & Ebusiness Network for SME
Plants for the Future
Plantum
Proton

Association
Red Otri
Renewable Heating & Cooling (RHC)
Réseau C.U.R.I.E.
Robotics
SME UNION
Sustainable Chemistry
Sustainable Nuclear Technology Platform - SNETP
Technologie Allianz
TII - Technology Innovation International
Toy Industries of Europe
UEAPME - European Association of Craft. Small and Medium-Sized Enterprises
UNION
VNO-NCW - MKB Nederland - Dutch employers organization
Water Supply and Sanitation Technology Platform
Waterborne ETP
Zero Emission Fossil Fuel Power Plants

9.2 The survey to the users of the European Patent System: Additional Summary Statistics

9.2.1 Additional list of the collected responses for the survey to companies

In this section we show all the responses collected in the survey to companies but not reported in the previous corresponding Chapter 2.4.

Table 68 Percentages of companies belonging to a group.

Answer Options	%
NO, it is an independent firm	54%
YES, it is part of a National group	15%
YES, it is part of a Multinational group	31%

Table 69 Percentages of patents that companies applied for or were granted in the last five years

Answer Options	%
No patent	17.9%
European patents (EPO)	72.0%
Patents granted by European national patent offices (EU27 and EPC member states)	52.8%
US patents (USPTO)	59.6%
Japan patents (JPO)	43.6%
International patents through the PCT procedure	66.1%
Other countries' patents	48.6%

Table 70 Percentages of the events companies were involved in the past five years.

Answer Options	%
One or more patent applications at the EPO have been rejected by the examiner	74.6%
A patent granted to the company by the EPO has been amended or revoked after an opposition procedure by a third party	48.4%
The company has filed an opposition procedure to another patent applicant.	64.3%
The company has been involved in a patent infringement case as defendant.	45.2%

Answer Options	%
The company has been involved in a patent infringement case as plaintiff	35.7%

Figure 15 Percentages of the average number of European countries (EU27) in which companies' EPO patents have been validated and renewed for at least one year

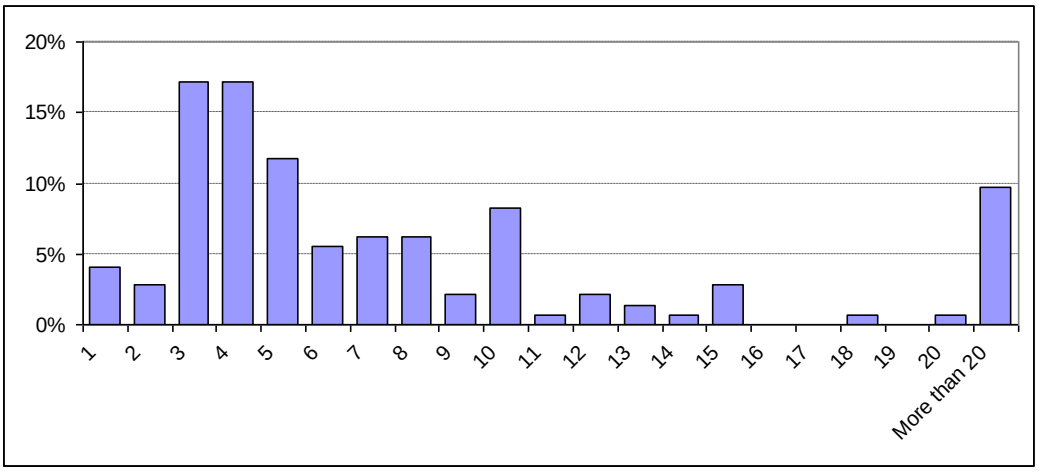

Table 71 Percentages of the most common filing procedures when companies apply for a patent at the EPO ("Other" item has been selected by 13% of the respondents).

Answer Options	%
The company first filings are mostly at the National Patent Office and then at the EPO	45.1%
The company files application directly at the EPO	13.6%
The company first filings are mostly through the PCT procedure and then the company selects the EPO as International Search Authority.	24.1%
The company first filings are mostly at one non-EPC country National Patent Office and then extended to the EPO.	4.3%

Table 72 Relevance of the possible reasons for the preferred filing strategy when companies generally do not apply directly to the EPO ("Other" item has received an average rating of 2.80). (Rating Scale: 4=High relevance; 1=No relevance)

Answer Options	% of 3 and 4	Avg Rating
The company files first at national patent office due to national law requirements: first filings abroad are not generally admitted	34%	2.05
Obtain an early priority and postpone the application to the EPO while collecting data on the technological and market value of the patented innovation	82%	3.27
Obtain an early priority and postpone the translation costs and other fees at the EPO.	76%	3.06
Obtain a search report / preliminary assessment of patentability from the National Patent Office at a lower cost than the EPO.	64%	2.77

Answer Options	% of 3 and 4	Avg Rating
This filing strategy is based on the procedure adopted by our patent attorneys.	29%	1.96
The company files first at national patent office to benefit from national initiatives supporting patenting	20%	1.70

Table 73 Perceived relevance in business of activities concerning the management of the company's patent portfolio (Rating Scale: 4=High relevance; 1=No relevance)

Answer Options	% of 3 and 4	Avg Rating
Constant monitoring of newly granted patents to detect possible infringing patents	69%	2.99
Monitoring of infringing activities by third parties (not endowed with patents)	64%	2.84
Monitoring of complementary and potentially blocking patents.	75%	3.09
Monitoring the emergence of new technological standards for which the company owns essential patents	61%	2.74

Table 74 Level of agreement on and expected impact on the quality of the European Patent System of the statement: "The current enforcement system may favour the emergence of 'patent trolls' in Europe".

Answer Options	% of 3 and 4	Avg Rating
Agreement (1=Strongly Agree; 4=Strongly Disagree)	58%	2.64
Impact on the quality of the European System (1=High impact; 4=No impact)	59%	2.67

Table 75 Level of agreement on and expected impact on the quality of the European Patent System of the statement: "Patent applicants often apply for multiple patents around a single invention in order to create 'fences' that are expected to dissuade competitor from entering their technological domain".

Answer Options	% of 3 and 4	Avg Rating
Agreement (1=Strongly Agree; 4=Strongly Disagree)	79%	3.13
Impact on the quality of the European System (1=High impact; 4=No impact)	60%	2.73

Table 76 Level of agreement on and expected impact on the quality of the European Patent System of the statement: "Patent applicants tend to delay the examination process so to increase the uncertainty for third parties".

Answer Options	% of 3 and 4	Avg Rating
Agreement (1=Strongly Agree; 4=Strongly Disagree)	61%	2.80
Impact on the quality of the European System (1=High impact; 4=No impact)	60%	2.75

Table 77 Percentages of the responses to the question “Do you think that the quality of the system might be improved by peer-to-patent review?” (“Other” option item has been selected by 18.8% of the respondents)

Answer Options	%
NO, because competitors might have a too strong incentive to act opportunistically and flood the examiner by providing too much documentation.	**18.8%**
NO, because only large corporations have sufficient resources to monitor effectively the patent system and participate in the evaluation process, with a negative impact for SMEs.	**33.0%**
YES, the involvement of third parties will reduce the probability that invalid patents are granted.	**29.5%**

List of selected free text comments: the addressed themes are particularly relevant and recurrent among the whole set of collected remarks:

Legal certainty, centralised litigation system and information availability (including language issue) is the key to the strength and cost-efficiency of the patent system
The European patent system suffers from a disbalance between national market size and cost. The Patent system as a whole suffers froma too low level of disclosure of inventive step and a too low "innovative hight", both favorising the apperance of "patent Trolls". The patent grant procedure shoudl be centralized (eliminate national patents in EU) and be reduced in complexity. The current patent system has become a road block for inovation instead of protecting innovation. Customers prefere to use "old technology" rather than to risk possible patent infringment litigation. The risk of R&D investmen is increased du to possible patent infringment risk in addition of the inherent R&D risk. Only large corporations or "patent Trolls" can effectively enfoce a patent portfolio. A fundamental shift in the idea of the "patent for an idea" to a "patent for a industrialized product / process" has to be made if our regaion shoudl remain cometitive agains regions with virtually no patent enforcement (like China). Further patent offices should nto be financed by the patent fees, otherwise there is a motivation to grant many patents rather than good patents.
At the moment it is my strong feeling that the present system has the demand for novelty and inventive step set at a lower level than eg 30 years ago. it is then up to the industry to make the opposition, and that is OK. But for a SME it will be too costly to oppose to all you want to, so we have to select our fights. We have to concentrate to the ones that really is hurting us, but not all that we could oppose.
The recently changes in the Implementing Regulations of the EPC are unnecessary complex, partially unclear (especially Rule 36(1)a) EPC) and might not achieve the objective to "raise the bar" or to prevent the misuse of filing divisional applications. It can hardly be understood, why the numerous changes of the fees since the EPC 2000 have been implemented (if that continues, a fee ticker on the EPO homepage might be useful).
The perceived benefits of the patent system, in providing a time-limited monopoly in return for disclosure of innovations is now overshadowed with the practical barriers - particularly to SMEs - posed by the sheer volume of often trivial or incremental patents (often unknown, due to being in the application process); the low barriers to fraud (where someone other than the true inventor registers the patent); the excessive commercial benefits that accrue when the patent monopoly is combined with an international standard as essential IP; and the high costs and risks associated with taking cases against infringement, means that other than satisfying proforma requirements, the patent system as currently constructed largely acts against the SME sector and has a neutral to negative impact on innovation.
Assignees often try to hide their idea behind an uncomprehensible language. The analysis of such patents costs a lot of time. A clear description should be fundamental condition for a patent grant.
Overall I am quite satisfied with the European Patent System. although I find EPO a bit slow (patents filed in 2004 have not yet been examined, and I can say the same for even older patents of competitors). I am very interested in Community Patent. Personally, I strongly support English as only language for patents.

EU Patent would benefit the most by becoming a Community Patent system like the Community Trade mark and Design system (under OHIM)
The main factor affecting patent quality is the performance of the examiners, i.e. the thoroughness of their searches and the depth of their argumentations. The ever increasing productivity pressure has resulted in less and less time for carrying out these tasks properly and has disincentivised quality-consciousness among many examiners. As a consequence there is now a lack of consistency and homogeneity in quality standards within the EPO
The patent system was created to protect and foster innovation. The EPO is not as effective as the US system in that sense since it is too costly and unflexible. Only large corporations that might invest a lot of money and resources in prosecution might afford a good patent portfolio. This makes EPO system good for large European corporations protecting from third country imitators, but does not help innovative SMEs at all, therefore missing an essential 'correction' effect inherent to the intended nature of a patent system. The costs of an EPO patent over its entire lifetime is a disaster (5 top countries validated) compared to US (x5 to x8 costs). Europe needs an effective unified enforcement system which is valid across all EU countries. Without an effective enforcement system patent system becomes useless.

Table 78 Percentages of the most relevant motives claimed by companies which do not hold any patent to explain their decision not to apply for a patent covering patentable innovations.

Answer Options	%
The duration of the granting process is too long compared to the lifecycle of the technology	**15.2%**
Patents are not effective in preventing imitation of the company's products or services	**57.6%**
The current cost for enforcing patents is too high for the company.	**45.5%**
The cost of patent attorneys to manage the application of patents in the European system is too high.	**18.2%**
The fees for patent application, validation and renewal are too high	**21.2%**
The actual validity of granted patents is uncertain	**6.1%**
The company exports to countries with limited IPR protection	**6.1%**
The industry of the company is overcrowded with patents	**9.1%**
The company had bad past experiences with the patent system, such as litigations	**6.1%**

9.2.2 Additional list of the collected responses: survey to universities and PROs

This section presents all the responses collected in the survey to PROs and Universities but not reported in the previous corresponding Chapter 2.5.

Table 79 Percentages of patents that organisations applied for or were granted in the last five years

Answer Options	%
No patent	18.7%
European patents (EPO)	63.6%
Patents granted by European national patent offices (EU27 and EPC member states)	47.7%
US patents (USPTO)	43.0%
Japan patents (JPO)	25.2%
International patents through the PCT procedure	52.3%
Other countries' patents	30.8%

In the following Table 80 it is possible to note a use of copyrights larger than companies do and accordingly to the type of institution analysed in this survey a smaller relevance of typically firm-specific tools (secrecy, fast time-to-market, customer lock-in, etc.)

Table 80 Please provide an evaluation of the effectiveness of the following tools to protect inventions and intellectual property in your organisation (Rating scale: 1 = low effectiveness – 4 = high effectiveness)

Answer Options	% of 3 and 4	Rating Average
Patents	88%	3.37
Utility Models	32%	2.05
Design Models	31%	2.10
Copyright	65%	2.84
Trademarks	60%	2.63
Industrial secrecy	54%	2.65
Use of complementary assets	25%	2.09
Strategical 'lock-in' of customers	32%	2.12
Fast time-to-market and product development cycles	59%	2.63
Retention of highly skilled personnel subject to non-disclosure clauses in employment contracts	44%	2.23

Answer Options	% of 3 and 4	Rating Average
Inclusion of technology within a standard	47%	2.47

For the following Table 81 it is important to stress that only a small number of universities and PROs answered (34 replies), meaning that the proposed items are not common in respondents' organisations.

Table 81 Percentages of the events organisations were involved in the past five years

Answer Options	%
One or more patent applications at the EPO have been rejected by the examiner	85.3%
A patent granted to the organisation by the EPO has been amended or revoked after an opposition procedure by a third party	29.4%
The organisation has filed an opposition procedure to another patent applicant.	14.7%
The organisation has been involved in a patent infringement case as defendant.	8.8%
The organisation has been involved in a patent infringement case as plaintiff	11.8

Figure 16 Percentages of the average number of European countries (EU27) in which organisations' EPO patents have been validated and renewed for at least one year

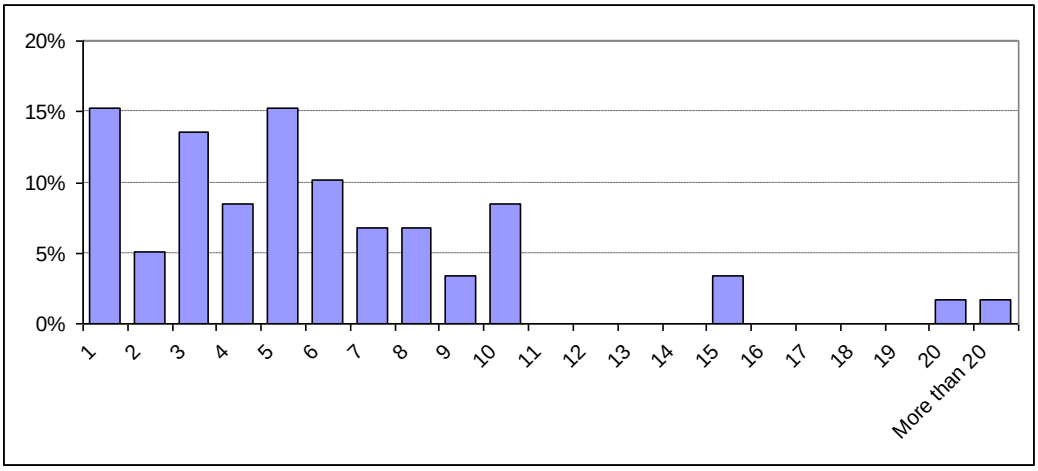

Table 82 Percentages of the most common filing procedures when organisations apply for a patent at the EPO ("Other" item has been selected by 6.8% of the respondents)

Answer Options	%
The organisation first filings are mostly at the National Patent Office and then at the EPO	50.7%
The organisation files application directly at the EPO	16.4%
The organisation first filings are mostly through the PCT procedure and then the organisation selects the EPO as International Search Authority.	23.3%
The organisation first filings are mostly at one non-EPC country National Patent Office and then extended to the EPO.	2.7%

Table 83 84 Relevance of the possible reasons for the preferred filing strategy when organisations generally do not apply directly to the EPO (Rating Scale: 4=High relevance; 1=No relevance)

Answer Options	% of 3 and 4	Avg Rating
The organisation files first at national patent office due to national law requirements: first filings abroad are not generally admitted	37%	2.10
Obtain an early priority and postpone the application to the EPO while collecting data on the technological and market value of the patented innovation	76%	3.17
Obtain an early priority and postpone the translation costs and other fees at the EPO.	76%	3.08
Obtain a search report / preliminary assessment of patentability from the National Patent Office at a lower cost than the EPO.	57%	2.74
This filing strategy is based on the procedure adopted by our patent attorneys.	43%	2.30
The organisation files first at national patent office to benefit from national initiatives supporting patenting	35%	2.08

Table 85 Comparative evaluation of satisfaction with the substantive examination services in the selected patent offices: (Rating scale: 1 = very poor – 4 = very good). Note: Asian POs received very few responses.

Answer Options	% of 3 and 4	Sub. Exam. Rating Avg.	Overall eval. Rating Avg.
National patent office (country of your company)	56%	2.83	na
EPO (European Patent Office)	84%	3.23	2.93
USPTO (U.S.A.)	46%	2.74	2.72
JPO (Japan)	(60%)	(2.70)	(3.00)
KIPO (Republic of Korea)	(45%)	(2.36)	(1.90)
SIPO (China)	(32%)	(2.18)	(1.73)

Table 86 Perceived relevance in business of activities concerning the management of the organisation's patent portfolio (Rating Scale: 4=High relevance; 1=No relevance)

Answer Options	% of 3 and 4	Avg Rating
Constant monitoring of newly granted patents to detect possible infringing patents	45%	2.37
Monitoring of infringing activities by third parties (not endowed with patents)	35%	2.17
Monitoring of complementary and potentially blocking patents.	66%	2.75
Monitoring the emergence of new technological standards for which the organisation owns essential patents	72%	2.97

For the following two questions (Table 87 and Table 88) the responses provided by universities and PROs are higher than those of companies, signalling a higher perception of the issues described in each of the questions. On the contrary, the third question of such set (Table 89) received the same ratings companies provided.

Table 87 Level of agreement on and expected impact on the quality of the European Patent System of the statement: "The current enforcement system may favour the emergence of 'patent trolls' in Europe".

Answer Options	% of 3 and 4	Avg Rating
Agreement (1=Strongly Agree; 4=Strongly Disagree)	**67%**	**2.80**
Impact on the quality of the European System (1=High impact; 4=No impact)	**71%**	**2.91**

Table 88 Level of agreement on and expected impact on the quality of the European Patent System of the statement: "Patent applicants often apply for multiple patents around a single invention in order to create 'fences' that are expected to dissuade competitor from entering their technological domain".

Answer Options	% of 3 and 4	Avg Rating
Agreement (1=Strongly Agree; 4=Strongly Disagree)	**87%**	**3.31**
Impact on the quality of the European System (1=High impact; 4=No impact)	**78%**	**3.02**

Table 89 Level of agreement on and expected impact on the quality of the European Patent System of the statement: "Patent applicants tend to delay the examination process so to increase the uncertainty for third parties".

Answer Options	% of 3 and 4	Avg Rating
Agreement (1=Strongly Agree; 4=Strongly Disagree)	**66%**	**2.79**
Impact on the quality of the European System (1=High impact; 4=No impact)	**60%**	**2.77**

Concerning the question on the awareness of the "peer-to-patent review" experiment established in the U.S. and Australia, a large part (76%) of the surveyed PROs and universities stated they are not aware of it.

Table 90 Percentages of the responses to the question "Do you think that the quality of the system might be improved by peer-to-patent review?" ("Other" item has been selected by 7.8% of the respondents but they all stated that they are not aware of the experiment)

Answer Options	%
NO, because competitors might have a too strong incentive to act opportunistically and flood the examiner by providing too much documentation.	**15.7%**
NO, because only large corporations have sufficient resources to monitor effectively the patent system and participate in the evaluation process, with a negative impact for SMEs.	**47.1%**

Answer Options	%
YES, the involvement of third parties will reduce the probability that invalid patents are granted.	**29.4%**

9.3 Methodological notes related to chapter 5

Activity A1: Contact Details
Together with the Commission services, we selected patent offices to be addressed in this exercise (pilot, survey and interviews). As a preparation for this exercise, we developed cover letters together with the Commission services to engage patent offices in the pilot and survey by asking them whether they would participate in this exercise. The aim of the cover letters was to obtain the commitment to take part in the pilot and survey. We continued contact with these offices until we had a sample.

Activity A2: Pilot, Survey And Interview Protocol
As preparation for the survey, we developed a draft questionnaire. The objective of the survey is to undertake a general overview of existing mechanisms that support patent quality enhancement in selected patent offices across Europe. The aim is to gather examples of practices at both the national and international levels and their assessments already made on these schemes.

Because of the sample size, we developed an open questionnaire. To obtain a reasonable rate of response, the number of questions was crucial. We selected a limited number of questions to be answered in less than 30 minutes.

The development of the questionnaire for the pilot and survey consisted of five steps:

- Step 1: Review of latest insights on patent quality mechanisms in the literature.
- Step 2: The previous insights were contrasted with the patent quality mechanisms outlined on the websites of patent authorities. The aim was to uncover the underlying dimensions of the mechanisms.
- Step 3: Once dimensions were identified, generic questions were raised to give coherence to questions and to elicit instrumental aspects of patent quality mechanisms.
- Step 4: A pilot, survey questionnaires and an interview protocol were developed.
- Step 5: The pilot was tested by two patent authorities to ensure that the questions were suitable for gathering the required information, to find problems, potential inconsistencies and real-time demand for its application. The final version of the questionnaire was approved by the Commission services.
- The next step was to conduct the survey in full scale and proceed to reporting.

Activity A3: Implementation Of The Survey
Questionnaires were submitted by email. If there was no response within a week after the first email, then a reminder was sent. We gathered the requested information via email from the participants who committed to the exercise. We ensured that all contacts were followed up thoroughly, and we provided feedback to the respondents when necessary. Apart from the initial communications via email, we contacted some participants via telephone.

Activity A4: Reporting The Pilot And Survey
The WP4 Interim Report was submitted within five months of the date of signature of the contract by the contracting parties. The document included an overview of initiatives in the EU

to improve patent quality and any assessments that have been performed on their effectiveness.

The WP4 Draft Final Study WP4 will be submitted within 12 months of the date of signature of the contract of the contracting parties. The document will include an overview of initiatives by patent offices in the EU to improve patent quality and any assessments that have been performed on their contribution to enhancing quality and the results of the interviews. This document will identify any aspects of quality that could be improved with better implementation of quality schemes.

Table 91. Mode[70] mechanism use against low-quality patents

1.1. EXAMINATION PROCESS	
1.1.1. develop further patent classifications beyond current IPC/ECLA standards	mechanism not used
1.1.2. communicate with the applicants by email and telephone on a more informal basis	mechanism currently in use
1.1.3. increase of the number of examiners per work unit demand	mechanism not used
1.1.4. targeted increase of patent examiners to allow more time for casework in subject matters where quality can be improved	mechanism not used
1.1.5. re-examination of patent cases prior to a decision to grant is reached	mechanism not used
1.1.6. mechanisms to maintain the competence of patent examiners, e.g. training and training materials	mechanism currently in use
1.1.7. exchange of information among patent examiners	mechanism currently in use
1.1.8. operational quality control with feedback to individual examiners from peer reviewers on samples of searches and examinations	These mechanisms were not listed in the survey and became included as others, which is why we need to ask the following in the interview if A: mechanism used in the past and not anymore B: mechanism currently in use C: mechanism foreseen to be used in the near future D: mechanism not used
1.1.9. concentrated examination	
1.1.10. development of guidelines for examination	
1.2. QUALITY ASSURANCE	
1.2.1. internal auditing to improve patent quality	mechanism currently in use
1.2.2. external auditing of patent quality	mechanism not used
1.2.3. management and product quality certification (ISO or similar)	mechanism currently in use
1.2.4. apply/use codes of practice for quality assurance	mechanism currently in use
1.2.5. randomly select patent applications for review of search quality	mechanism currently in use

[70] The value that occurs most frequently in a given set of data.

1.2.6. randomly select granted patents for review of quality of examination	mechanism currently in use
1.2.7. standardise search practices into codified manuals	mechanism currently in use
1.2.8. product audits of a sample of searches and a sample of granted patents	These mechanisms were not listed in the survey and became included as others, which is why we need to ask in the interview if A: mechanism used in the past and not anymore B: mechanism currently in use C: mechanism foreseen to be used in the near future D: mechanism not used
1.2.9. user satisfaction surveys	
1.2.10. double examination by another examiner	
1.3. INVOLVEMENT OF THIRD PARTIES	
1.3.1. efforts to increase the participation of third parties to aid examination	mechanism not used
1.3.2. efforts to increase participation of third parties in post-grant review	mechanism not used
1.3.3. create and make available to prospective inventors a more powerful search tool for prior art	mechanism currently in use
1.3.4. administrative opinion on claim scope on infringement or validity issues	mechanism not used
1.3.5. codes of practice and of moral conduct for applicants and patent attorneys that discourage improper uses of the patent system	mechanism not used
1.3.6. mechanisms for customer feedback	mechanism currently in use
1.3.7. post-grant opposition and intervention	These mechanisms were not listed in the survey and became included as others, which is why we need to ask in the interview if A: mechanism used in the past and not anymore B: mechanism currently in use C: mechanism foreseen to be used in the near future D: mechanism not used
1.3.8. compulsory training of (future) patent attorneys and legal regulation of the profession of patent attorney	
1.3.9. patent quality awareness campaigns for (future) applicants	
1.4. PATENT PROCEDURES	
1.4.1. allow deferred examination of patent applications	mechanism not used
1.4.2. increase filing fees to reduce the number of poor quality patent applications	mechanism not used
1.4.3. increase immediate filtering of patents that clearly do not match the criteria upon filing (e.g. refusal to search patent application, accelerated refusal of non-patentable inventions)	mechanism not used
1.4.4. provide preliminary opinions on patentability to encourage early amendment or withdrawal	mechanism currently in use
1.5. CO-OPERATION AMONG GRANTING OFFICES	
1.5.1. standardise practices on patent quality with other patent offices	mechanism currently in use

1.5.2. exchange of information among the NPO and EPO examiners	mechanism currently in use
1.5.3. exchange of information with patent offices in third countries (JPO, USPTO)	mechanism currently in use
1.5.4. share/reuse the searches done by other offices	mechanism currently in use
1.5.5. use patent classification common to other offices (supplementary to the International Patent Classification key)	mechanism currently in use
1.5.6. use well-functioning, machine-translated documents	mechanism currently in use
1.5.7. harmonise quality management standards	These mechanisms were not listed in the survey and became included as others, which is why we need to ask in the interview if A: mechanism used in the past and not anymore B: mechanism currently in use C: mechanism foreseen to be used in the near future D: mechanism not used
1.5.8. harmonise product quality standards	

Table 92 Mode[71] mechanism effect against low-quality patents

1.1. EXAMINATION PROCESS	
1.1.1. develop further patent classifications beyond current IPC/ECLA standards	neutral impact on improving patent quality
1.1.2. communicate with the applicants by email and telephone on a more informal basis	positive impact on improving patent quality
1.1.3. general increase of the number of examiners per work unit demand	positive impact on improving patent quality
1.1.4. targeted increase of patent examiners to allow more time for casework in subject matter where quality can be improved	unknown impact on improving patent quality
1.1.5. re-examination of patent cases prior to a decision to grant is taken	positive impact on improving patent quality
1.1.6. mechanisms to maintain the competence of patent examiners, e.g. training and training materials	positive impact on improving patent quality
1.1.7. exchange of information among patent examiners	positive impact on improving patent quality
1.1.8. operational quality control with feedback to individual examiners from peer reviewers on samples of searches and examinations	These mechanisms were not listed in the survey and became included as others, which is why we need to ask in the interview if (-): negative impact on improving patent quality, (0): neutral impact on improving patent quality, (+): positive impact on improving patent quality (u): unknown impact on improving patent quality
1.1.9. concentrated examination	
1.1.10. development of guidelines for examination	

[71] The value that occurs most frequently in a given set of data.

1.2. QUALITY ASSURANCE	
1.2.1. internal auditing to improve patent quality	positive impact on improving patent quality
1.2.2. external auditing of patent quality	neutral impact on improving patent quality
1.2.3. management and product quality certification (ISO or similar)	positive impact on improving patent quality
1.2.4. apply/use codes of practice for quality assurance	positive impact on improving patent quality
1.2.5. randomly select patent applications for review of search quality	positive impact on improving patent quality
1.2.6. randomly select granted patents for review of quality of examination	positive impact on improving patent quality
1.2.7. standardise search practices into codified manuals	positive impact on improving patent quality
1.2.8. product audits of a sample of searches and a sample of granted patents	These mechanisms were not listed in the survey and became included as others, which is why we need to ask in the interview if (-): negative impact on improving patent quality, (0): neutral impact on improving patent quality, (+): positive impact on improving patent quality (u): unknown impact on improving patent quality
1.2.9. user satisfaction surveys	
1.2.10. double examination by another examiner	
1.3. INVOLVEMENT OF THIRD PARTIES	
1.3.1. efforts to increase the participation of third parties to aid examination	positive impact on improving patent quality
1.3.2. efforts to increase participation of third parties in post-grant review	neutral impact on improving patent quality
1.3.3. create and make available to prospective inventors a more powerful search tool for prior art	positive impact on improving patent quality
1.3.4. administrative opinion on claim scope on infringement or validity issues	positive or neutral impact on improving patent quality
1.3.5. codes of practice and of moral conduct for applicants and patent attorneys that discourage improper uses of the patent system	positive impact on improving patent quality
1.3.6. mechanisms for customer feedback	positive impact on improving patent quality
1.3.7. post-grant opposition and intervention	These mechanisms were not listed in the survey and became included as others, which is why we need to ask in the interview if (-): negative impact on improving patent quality, (0): neutral impact on improving patent quality, (+): positive impact on improving patent quality (u): unknown impact on improving patent quality
1.3.8. compulsory training of (future) patent attorneys and legal regulation of the profession of patent attorney	
1.3.9. patent quality awareness campaigns for (future) applicants	
1.4. PATENT PROCEDURES	
1.4.1. allow deferred examination of patent	negative impact on improving patent

applications	quality
1.4.2. increase filing fees to reduce the number of poor-quality patent applications	neutral impact on improving patent quality
1.4.3. increase immediate filtering of patents that clearly do not match the criteria upon filing (e.g. refusal to search patent applications, accelerated refusal of non-patentable inventions)	neutral impact on improving patent quality
1.4.4. provide preliminary opinions on patentability to encourage early amendment or withdrawal	positive impact on improving patent quality
1.5. CO-OPERATION AMONG GRANTING OFFICES	
1.5.1. standardise practices on patent quality with other patent offices	positive impact on improving patent quality
1.5.2. exchange of information among the NPO and EPO examiners	positive impact on improving patent quality
1.5.3. exchange of information with patent offices in third countries (JPO, USPTO)	positive impact on improving patent quality
1.5.4. share/reuse the searches done by other offices	positive impact on improving patent quality
1.5.5. use patent classification common to other offices (supplementary to the International Patent Classification key)	positive impact on improving patent quality
1.5.6. use well-functioning, machine-translated documents	positive impact on improving patent quality
1.5.7. harmonise quality management standards	These mechanisms were not listed in the survey and became included as others, which is why we need to ask in the interview if (-): negative impact on improving patent quality, (0): neutral impact on improving patent quality, (+): positive impact on improving patent quality (u): unknown impact on improving patent quality
1.5.8. harmonise product quality standards	