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OECD Patent Statistics Manual


*Chapter 6*

# The Use and Analysis of Citations in Patents

## 6.1. Introduction

The use of patent and non-patent citations as indicators of innovation has increased dramatically in the last decade. As citations indicate the S&T precedents in inventions, they make it possible to track knowledge. It is possible to identify the influence of particular inventions or particular sets of inventions and map their diffusion through the economy. In particular, the number of citations a patent receives has been found to reflect, on average, the technological and commercial importance of a patent, and thus helps to deal with the problem of the heterogeneity of patents' value.

Citations also make it possible to investigate connections between technologies, between science and technology, or between firms, industries, countries or regions. These linkages can be broken down in a variety of ways: by technical field, by type of entity (*e.g.* multinational or domestic firm, university, etc.), by inventor, etc.

This chapter describes the meaning of citations in patents and explains how they can be used to compile S&T indicators. It stresses in particular the issues to take into account when compiling indicators based on patent citations in order to analyse innovation. These guidelines can serve as building blocks for future improvements in the area.

## 6.2. What are citations?

Patent and non-patent citations are the references provided in the search report which are used to assess an invention's patentability and help to define the legitimacy of the claims of the new patent application. As they refer to the prior art, they indicate the knowledge that preceded the invention and may also be cited to show the lack of novelty of the citing invention. However, citations also indicate the legal boundaries on the claims of the patent application in question. They therefore serve an important legal function, since they delimit the scope of the property rights awarded by the patent. If a patent B cites patent A, it means that patent A represents a piece of previously existing knowledge upon which patent B builds or to which patent B relates, and over which B cannot have a claim. Hence citations may be used to preclude the issuance of a patent or limit the scope of the protection to what was specifically known at the time of filing the patent application.


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In most cases, citations are the product of an extensive search of the state of the art conducted by examiners in order to assess the degree of novelty and inventive steps of inventions (resulting in the "search report"), which is necessary to justify their patentability. Citations can also be used to refuse patent applications if the claimed invention appears not to be novel after confrontation with the state of the art. The search includes publicly available scientific or technical documents or any other testimony that constitutes a relevant precedent of the invention.

There are basically two kinds of citations. Patent references are citations to previous relevant technology protected by or described in other patents filed anywhere in the world, at any time, in any language. References categorised as non-patent literature (NPL) are scientific publications, conference proceedings, books, database guides, technical manuals, standards descriptions, etc.

## 6.3. Uses and applications of citations indicators

The potential of patent citation measures for policy analysis is tremendous. Three applications of patent citations dominate the innovation literature: *i)* the measurement of knowledge flows or spillovers (*e.g.* Jaffe *et al.*, 1993); *ii)* the measurement of patent quality (*e.g.* Harhoff *et al.*, 2002); and *iii)* the strategic behaviour of companies (*e.g.* Podolny *et al.*, 1996).

Backward citations – citations to previous patent documents – can help to track knowledge spillovers in technology. They make it possible to estimate the curve of obsolescence of technologies, the diffusion of knowledge emanating from specific inventions to institutions, areas, regions, etc. Yet patent and non-patent citations are in some cases a "noisy signal" of knowledge flows, as the inventor of the citing patent is not always aware of the existence of the one cited in the search report, as citations are frequently given by examiners or by patent attorneys (*e.g.* Jaffe *et al.*, 2000).[1]

Forward citations – the citations subsequently received by a patent – can be used to assess the technological impact of inventions, *e.g.* their cross-technology and/or geographical impact. The technological impact of inventions can indicate the economic importance of patents. The value of a patent and the number and quality of its forward citations have repeatedly been found to be correlated. Citation-weighted indicators (*e.g.* patent stocks of companies) have been seen to have a close relationship to economic indicators (market value of companies). It has been consistently reported that patents that receive more citations than the average are more likely to be renewed (Lanjouw *et al.*,1998) and opposed or litigated in tribunals (*e.g.* Lanjouw and Schankerman, 1997; Harhoff *et al.*, 2002).

## 6.4. Citation practices in patent offices

Citation practices differ across patent offices and indicators are not directly comparable. Owing to differences in disclosure obligations and examination procedures, European searches differ substantially from USPTO searches, and so do the citations generated in the two processes. This means that researchers wishing to employ patent citation analysis need to be aware of these differences.

Applicants to the USPTO are legally required to include a full list of prior art known or believed to be relevant ("duty of candour"). These are then evaluated and/or supplemented by the examiner. Examiners consider all disclosed prior art with few exceptions. There is a strong motive to provide references to prior art in the USPTO system, because failure to provide all relevant references can result in patent litigation and severe penalties.[2]

At the EPO no such requirement exists. The applicant or the applicant's patent attorney may cite prior art within the application document but this is optional.[3] Most citations in PCT and EPO publications (about 95%) are added by examiners in the search report. Although examiners are responsible for constructing the list of prior art references (provided in the search report) against which patentability is judged, they rely in part on the applicant's disclosure of prior art submitted with the patent application (*e.g.* at the EPO, this is done in the information disclosure statements).

Furthermore, the European search report should include (as references) the most important documents, or the earliest of equally important documents. According to EPO philosophy, a good search report contains all relevant information within a minimum number of citations.[4] Some have noted that certain applicants to the USPTO may provide more references than necessary (until the 2006 reform). This, combined with EPO examiners' minimalist approach, goes some way towards explaining the fact that the significantly greater average number of citations in USPTO than in EPO patents (see Table 6.1).[5]

At the JPO, patent examiners conduct the search of the prior art; however, applicants are also required to disclose information on prior art beforehand (in practice since September 2002 and in full force since May 2006). There is no limitation on the number of references to be included.

For EPO and PCT citations, the following issues must be considered (Webb *et al.*, 2005):

- Citations contained in international and/or regional search reports may differ. One problem concerns the (partial) substitute character of information contained in WO search reports (the international search reports).[6] If the EPO receives filings that were treated first by other ISAs (international search

Table 6.1. **Occurrence of patent and non-patent references (USPTO and EPO)**

| | | | | | |
|---|---|---|---|---|---|
| USPTO granted patents with application year between 1991 and 2001 | | | | | |
| Total number of patents (1) | 1 299 817 | Total number of references | 17 757 797 | | |
| Number of patents containing patent references | 1 173 593 (90%) | Number of patent references | 14 738 854 (83%) | Technology intensity. *With (1) as denominator* | 12.55 *11.33* |
| Number of patents containing non-patent references | 445 466 (34%) | Number of non-patent references | 3 018 943 (17%) | NPR intensity. *With (1) as denominator* | 6.77 *2.2* |
| EPO granted patents with application year between 1991 and 2001 | | | | | |
| Total number of patents (1) | 342 704 | Total number of references | 1 698 218 | | |
| Number of patents containing patent references | 334 413 (98%) | Number of patent references | 1 404 241 (83%) | Technology intensity. *With (1) as denominator* | 4.20 *4.09* |
| Number of patents containing non-patent references | 130 511 (38%) | Number of non-patent references | 293 977 (17%) | NPR intensity *With (1) as denominator* | 2.25 *0.86* |

*Source:* Callaert *et al.* (2006).

authorities), the EPO undertakes a supplementary search which is summarised in the supplementary search report.[7]

- This phenomenon is particularly important given that an increasing number of applicants file patents under PCT before entering the EPO process in the "regional phase". When this occurs, most citations appear in the international (WO) document rather than the EPO document. In order to count citations correctly, information from both the international and the European searches should be combined.

Until recently, most citation indicators were restricted to a single office: references from EPO patents to prior EPO patents or US references to US patents. For EPO patents, it has been pointed out that roughly three-quarters of the references are not used. Taking the full data into account may powerfully affect citation indicators. For instance, the inclusion of citations in the PCT international stage (WO) with European patent equivalents shifts the citation lag (time difference between the cited and the citing patents) significantly: the median lag shifts from 4.0 to 6.7 years; the maximum lag moves from 25.7 to 132 years (Harhoff *et al.*, 2006).

Several issues need to be taken into account when working with patent and non-patent citations. Some of the most important for counting citations are:

*Patent documents do not have a one-to-one relationship to inventions.* Citations to a patent can vary. A given invention can be covered by a number of documents issued by different national or supranational offices (Harhoff *et al.*, 2006).[8] A patent can be cited as a national or an international/regional patent publication or as one of its equivalents (at the USPTO, EPO or JPO). As explained in Chapter 4, all of the published patent applications from various countries and the

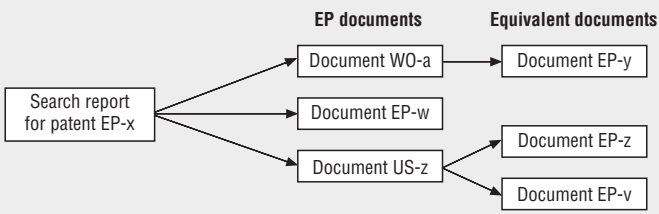
subsequently granted patents on an invention are commonly referred to as patent equivalents. A group of patent equivalents makes up a patent family; that is, a set of patents (or applications) filed in several countries to protect the same invention. They are related to each other by one or several common

## Box 6.1. **The problem of equivalents**

**The case of European patent citations (Harhoff *et al.*, 2006)**

Counts of European patent citations have been used in economic analysis in a number of cases, but rarely have these studies tackled the *problem of equivalents* (a patent that relates to the same invention and shares the same priority application as a patent from a different issuing authority; see Chapter 4 for definitions of patent families). The structure of this problem is described in the figure below. The search report for patent application EP-x references patent document WO-a, EP-w and US-z. However, document WO-a has an equivalent EP-y among EPO filed applications. The patent application underlying document US-z has two equivalents (EP-z and EP-v) within the EP system.

**Referencing of equivalent documents**




This pattern of referencing is in no way erroneous. Given time constraints, bottlenecks in documentation systems or simply language preferences, this is a frequently observed pattern. However, for a researcher who wishes to know how often particular patents (*e.g.* EP-y, EP-z or EP-x) have been cited in one of its (equivalent) incarnations, simply counting the uncorrected occurrence of references is misleading. Prior to the count, all non EP documents would have to be re labelled to their EP equivalent application number(s) in order to obtain correct counts of citations. More precisely, the rule that can be applied can be summarised as follows: *Let X and Z be different patent offices. A reference to an X system patent document should be taken as a valid citation count of a particular Z system patent if the X system document is an equivalent of the Z system patent.* In a significant number of cases, the referenced non EP document is linked to more than one EP equivalent, as indicated in the figure above. In these cases, fractional counts can be used, *i.e.* the citation counts and other statistics will weigh the incidence (or statistical data) of each of the multiple EP equivalents by the inverse of the number of multiple EP equivalents.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priority numbers. When these different citations are not taken into account, counts of citations are underestimated because citations of a given invention are spread across the different versions of a patent family.

At the EPO, referencing seeks to use the earliest and most easily available "incarnation" of an invention, preferably in the language of the applicant. In EPO documents, the majority (about three-quarters) of references refer to non-EP documents. In this regard, Michel and Bettels (2001) show that 90% of patent citations made by the EPO refer to EP patent documents (EPO), DE (Deutsches Patent- und markenamt – DPMA), GB (United Kingdom Intellectual Property Office), WO (WIPO) or US (USPTO) documents. Citation counts based only on EP documents are biased downwards. In the case of US patent citations, the problem also exists but to a much smaller extent as the USPTO mainly references USPTO documents. At the USPTO and the JPO, 90% or more of the references in the search reports refer to national documents (Michel and Bettels, 2001).

## 6.5. Citation-based indicators

### *6.5.1. Benchmarking citations*

Information on patent citations is meaningful only when used comparatively. There is no natural scale or value measurement associated with citation data, so the fact that a given patent has received 10 or 100 citations does not indicate whether or not that patent is "highly" cited. In other words, the evaluation of the citation intensity of an invention, an inventor, an institution, or any other group of reference, can only be made with reference to some "benchmark" citation intensity.

In principle, it is possible to identify and quantify the changes in citation intensity that are associated with various effects. However, it is not clear if the observed pattern is real or artefactual, and indicators can be therefore misinterpreted. Consider for instance, some of the stylised facts in USPTO patent citation data: *i)* the average number of citations received by patents in their first five years has been rising over time; *ii)* the average number of citations per patent has been rising over time; and *iii)* the observed citation-lag distributions for older cohorts have fatter "tails" than those of more recent cohorts.

With respect to the first, one might conclude either that more recent patent cohorts are more "fertile", or that the citation-lag distribution has shifted to the left (citations are coming sooner than they used to). Considering the second, one may think that there has been an artefactual change in the propensity to cite. But since the stock of patents available to be cited has been growing at a rapid (and accelerating) rate, this is not clear. The third, taken in isolation, seems to suggest that the citation-lag distribution has shifted to the

right. Without further assumptions one cannot know which of these competing scenarios is "correct", and hence one cannot make any statistical adjustments to the citation data, including adjustments for truncation of lifetime citations.

The determination of the appropriate benchmark is complicated by several phenomena that are inherent to the patent citation data (Hall *et al.*, 2001).

- First, *the number of citations received by any given patent is truncated* because only the citations received so far are known. More importantly, patents of different ages are subject to differing degrees of truncation. There has been less time to cite more recent patents.
- Second, *differences in patent examination practices* across time may produce differences in citation intensities that are unrelated to the true impact for which citations are used as a proxy. In the NBER USPTO patent citation data, the average patent issued in 1999 had over twice as many citations as the average patent issued in 1975 (10.7 *versus* 4.7).
- Third, the problem created by the increase in the number of citations per patent is exacerbated by the *fact that the number of patents issued has also been rising steeply* in several patent offices. Even if each patent issued had the same number of citations as in the past, the increase in the universe of "citing patents" would increase the total number of citations. The combination of more patents making more citations suggests a kind of citation "inflation" that may mean that later citations are less significant than earlier ones from a statistical perspective.
- And lastly, *the number of citations made (and received) per patent varies considerably by technological field or maturity of technology*. In general, traditional technological fields cite more and are cited less, whereas the emerging fields of computers and communications and drugs and medical are cited much more but cite somewhat less. The degree of dependence on past technology or "cumulativeness" determines the propensity to cite other patents; for instance, technologies such as semiconductors show typically higher backward citation intensity.[9]

Two generic approaches are used to deal with these problems. The first, *the fixed-effects approach*, involves scaling citation counts by dividing them by the average citation count for a group of patents to which the patent of interest belongs. This approach assumes that *all* sources of systematic variation over time in citation intensities are artefacts that should be removed before comparing the citation intensity of patents from different cohorts. That is, citation intensities are "re-scaled", *i.e.* expressed as ratios to the mean citation intensity for patents in the same cohort.

To compare a 1990 patent with two citations to a 1985 patent with four citations, each is divided by the average number of citations received by other

patents in the same cohort. This rescaling purges the data of effects due to truncation, effects due to systematic changes over time in the propensity to cite, and effects due to changes in the number of patents making citations. Unfortunately, it also purges the data of any systematic movements over time in the importance or impact of patent cohorts. The advantage of this approach is that it does not require making assumptions about the underlying processes that may be driving differences in citation intensities across groups. The disadvantage is that, precisely because no structure is assumed, it does not distinguish between differences that are "real" and those that are likely to be artefactual.

The second or *quasi-structural approach* attempts to distinguish multiple effects on citation rates via econometric estimation. Once the different effects have been quantified, the researcher has the option to adjust the raw citation counts to remove one or more of the estimated effects. If the assumptions inherent in the econometric estimation are correct, this approach makes it possible to extract a stronger signal from the noisy citation data than the non-structural, fixed-effects approach (see Hall *et al.*, 2001, for further details on the estimation method).

### *6.5.2. Backward citation indicators*

Two groups of indicators can be constructed with citations. The first is indicators based on backward citations, which are useful to assess the degree of novelty of the invention and knowledge transfer patterns (*e.g.* citation networks). The second is impact-type indicators, based on forward citations. Beyond that, one can construct citation-based measures that may capture other aspects of the patented inventions, such as originality, generality, science-based (*e.g.* Trajtenberg *et al.*, 1997, Narin *et al.*, 1997; Sampat and Ziedonis, 2004).

*Technological cumulativeness* is defined by the frequency of self-citation of patents produced by a company's prior research. The identification of *self-citation* (applicant/assignee) has important implications, among other things, for the study of spillovers: presumably citations to patents that belong to the same assignee represent transfers of knowledge that are mostly internalised, whereas citations to patents of "others" are closer to the pure notion of (diffused) spillovers. It is more convenient to exclude self-citations (when information on consolidated patent data by applicant is available) when investigating the knowledge transfer and/or citation impact of inventions.

A common measure of *cumulativeness* at the level of the company is the sum of backward citations made to patents the firm owns over the total patents owned by the firm (at a given time *t*). According to Malerba and

Orsenigo (1995), cumulativeness implies that leading innovators have an edge over laggards and the former may continue to lead in the future.

*Citation lags*. The term "citation lag" refers to the time between a characteristic date of the referencing patent application and a characteristic date of the cited document. The lag is then the time difference between the application, publication or grant year of the citing patent, and that of the cited patents. Citation lags can be computed in various ways, *e.g.* based on priority, application or publication dates. Citation lags can be looked at backwards and forward. The lag measure computed in the OECD EPO citation dataset is defined as the time between the publication of the cited patent application (in general, patent or non-patent literature cannot be cited before it is published, except for an invention applied for by the same applicant) and the publication date of the referencing search report (Webb *et al.*, 2005). Some implications of this choice need to be pointed out:

- For most of the cited patent documents originating at European patent offices or the JPO, publication (including the disclosure of search results to the public at large in the case of the EPO) occurs exactly 18 months after the priority date. Hence, for the computation of citation lags of European or Japanese patents, it does not matter if one chooses the date of the search report (the priority date for Japanese patents) or the date of the publication of the application. One may take as reference the priority date of the citing patent and the publication date of the cited patent.
- If the cited document is a US patent that was only pursued within the United States, the earliest publication date until November 2000 was the grant date, and applicants can still use this rule if they wish. If the cited US patent has an international equivalent, the corresponding international application is again published 18 months after the US priority date.[10]
- Patent documents with an international search report published by WIPO and a supplementary search report published by the EPO or another ISA have multiple publication dates. If the referenced documents have no overlap, the lag can be computed with respect to the date of publication of the relevant search report. If the international search report and the EPO supplementary search report reference the same document, the later entry can be dropped from the list and the earliest publication date of the two search reports can be used to compute the citation lag.

*Technology cycle time (TCT)*: Based on the measure of citation lags, a company-level indicator can be computed. The technology cycle time indicates speed of innovation or how fast the technology is turning over, defined as the *median age* in years of the patent references cited on the front page of the company's patents. Companies with shorter cycle times than their competitors are advancing more quickly from prior to current technology. In

semiconductors, cycle times are short (three to four years); in shipbuilding they are long (more than ten years). The average is eight years.

### 6.5.3. *Forward citation indicators*

*Forward citations per patent*. This is considered as a measure of the technological impact of inventions. Several studies have shown that the number of citations a patent receives is associated with its technological importance and social value (Trajtenberg, 1990; Scherer *et al*., 1999) and is correlated with the renewal of patents, the estimated economic value of inventions and the probability of the patent being litigated or opposed (Lanjouw and Schankerman, 1999; Harhoff *et al.,* 2002).

The *citation impact* is the count of forward citations expressed as a relative term (see the disadvantages of using this approach when comparing indicators over time in Section 6.5.1). It is the number of times a patent is cited relative to the number of citations received on average by a patent in the same technology field (four-digit IPC subclass) and with the same invention date (priority year). This approach allows for controlling for differences in citation frequency across technology fields and the truncation effect related to time (earlier patents having an intrinsically lower probability of being cited, see Hall *et al*., 2001).

The *generality of a patent* is built as a Herfindahl index (Trajtenberg *et al*., 1997; Hall *et al*., 2001): Generality $= 1 - \sum_i^{ni} s_{ij}^{\ 2}$, where $s_{ij}$ denotes the percentage of citations received by patent *i* that belong to patent class *j*, out of $n_i$ patent classes.[11] A high generality score suggests that the patent had a widespread impact, since it influenced subsequent innovations in a variety of fields. The *geographical impact* of a patent can be built in a similar way (1-Herfindahl index of geographical concentration), *i.e.* across the different countries of origin of inventors in the citing patents. The *originality* of a patent can be defined in the same way, except that it refers to backward citations. Thus, if a patent cites previous patents that belong to a narrow set of technologies the originality score will be low, whereas citing patents in a wide range of fields would give a high score.

Some considerations must be taken into account when calculating this type of indicator:

- The originality and generality measures depend upon the patent classification system: a finer classification would give higher measures and a coarser system lower ones. Thus a finer classification within a field (*e.g.* in terms of number of three-digit patent classes), will likely result, other things being equal, in higher originality and generality measures, and one may regard that as an artefact of the classification system.
- As shown by Hall *et al.* (2001), the generality measure is biased upward when the number of patents on which it is based is small. Basically, if there

is some "true" probability of a random patent being in one of many classes, the true concentration may be low; if very few patents are actually observed, they can only be in a few classes, and the measured concentration will be high. The indicator needs to be adjusted by the size of observations.[12]

At the company level, several indicators are used to measure the impact of patents (Narin, 2000):

- *Current Impact Index (CII):* The number of times a company's previous five years of patents are cited in the current year, relative to all patents in the US patent system, indicates patent portfolio quality. A value of 1.0 represents average citation frequency; a value of 2.0 represents twice the average citation frequency; and 0.25 represents 25% of the average citation frequency. This allows benchmarking a company's technological quality against other companies and against the average for the technology. CIIs vary by technology area. For example, they are high in semiconductors, biotechnology and pharmaceuticals, and low in glass, clay and cement, and textiles. The CII has been found to be predictive of a company's stock market performance.
- *Technology strength (TS):* Quality-weighted portfolio size, defined as the number of patents multiplied by the current impact index. Using TS one may find that although one company has more patents, a second may be technologically more powerful because its patents are of better quality. Companies with highly cited patents may be more advanced than their competitors and have more valuable patent portfolios.
- *The Citation Performance Index:* This consists in computing a relative index comparing the number of patents found in the most highly cited (*e.g.* 10%) for a particular country (entity) with those of the world (or other reference). This indicator also measures the impact of the quality of the patents of a certain reference group. For a country, the formula for the indicators is the percentage of country *i*'s patents appearing among the most cited 10% relative to the same percentage for the world's patents.

## 6.6. Non-patent literature

Science linkage indicators are based on counts of references to the non-patent literature considered as scientific. The identification of "scientific" non-patent references provides insights into technologies that are closer to scientific R&D and thus more dependent on the progress of scientific knowledge. There is some recognition that non-patent references are useful for investigating the interplay between science and technology. The average level of non-patent references has frequently been used as a proxy for quantifying the relationship of a technology field with a scientific domain (Narin *et al.*, 1997; Meyer, 2000; Verbeeck *et al.*, 2002). The more scientific references are found in patents, the closer the technology is considered to be to basic research. The analysis of

science linkages in patents can be extended to important policy topics, notably the influence of science on new emerging technology domains or the value of science for industry (*e.g.* the impact on the economic value of companies).

However, non-patent references need to be treated with caution and some contextual elements should be taken into account when interpreting these indicators. As noted in Section 6.4, differences among patent offices in terms of examination procedures may influence the number and type of references cited. At the EPO, as references come essentially from the examiner's revision of the prior art, it has been argued that citations rarely reflect or coincide with the science used by inventors. Other researchers indicate that non-patent references rarely represent a unidirectional direct link to science and that it is difficult to establish causation between the citing patent and the cited article (Tijssen, 2002).

Non-patent literature (NPL) consists not only of peer-reviewed scientific papers but also includes other types of publications: conference proceedings, databases (DNA structures, gene sequences, chemical compounds, etc.) and other relevant literature (translation guides, statistical manuals, etc.). Table 6.2 displays the occurrence of journal and non-journal sources in USPTO and EPO references and Table 6.3 reports the types of non-journal sources. Among the non-journal sources, conference proceedings, industry-related documents and databases are the most frequently cited. References to non-scientific documents such as "patent abstracts" and commercial online patent database services should be removed for the purposes of analysis of science linkage in patents.

Table 6.2. **Occurrence of USPTO and EPO journal and non-journal references**
Observed values (row percentages in brackets)

| | Journal | Non-journal | Total NPRs |
|---|---|---|---|
| USPTO | 2 766 (55%) | 22 42 (45%) | 5 008 |
| EPO | 3 218 (64%) | 1 803 (36%) | 5 021 |
| Total | 5 984 | 4 045 | 10 029 |

*Source:* Callaert *et al.* (2006).

An analysis of over 540 000 international patent applications (filed under the Patent Cooperation Treaty) published by the EPO shows that in the last 15 years the IPC sub-classes with a higher than average share of citations to NPL (over 15%) are mainly in the fields of biotechnology, pharmaceuticals, other fine organic chemistry and ICT (Figure 6.1).[13] Higher shares of NPL in citations occur in countries whose international patenting activity is more concentrated in these high-activity or emerging technology fields (Figure 6.1). For example, Indian inventors have a recent history of international patenting activity and a

Table 6.3. **Occurrence of USPTO and EPO non-journal sources**
Observed values (column percentages in brackets)

| | USPTO | EPO | Total |
|---|---|---|---|
| Conference proceedings | 381 (17%) | 612 (34%) | 993 |
| Industry-related documents | 560 (25%) | 304 (17%) | 864 |
| Books | 333 (15%) | 186 (10%) | 519 |
| Reference books/databases | 234 (10%) | 600 (33%) | 834 |
| Patent-related documents | 327 (15%) | 46 (3%) | 373 |
| Research/technical reports | 138 (6%) | 27 (2%) | 165 |
| Newspapers | 106 (5%) | 10 (0%) | 116 |
| Unclear/other | 163 (7%) | 18 (1%) | 181 |
| **Total** | **2 242 (100%)** | **1 803 (100%)** | **4 045** |

*Source:* Callaert *et al.* (2006).

relatively high proportion of their applications are in biotechnology and pharmaceuticals, which have closer links to science.

For 1990-2004, about 55% of citations in biotechnology-related international patents are to NPL. There is little cross-country variation; this suggests some general homogeneity in the rate of technological progress but hides some structural differences among countries. For ICT (Figure 6.2), the average share is about 18% and varies across countries in a range of 10 to 25%. Low shares suggest that recent ICT innovations are based more on existing technology while high shares suggest that certain countries still benefit from scientific R&D in ICT.

Once non-patent references with a scientific content have been identified, the influence of science can be disentangled in a more substantive manner. With the aid of databases on scientific publication, scientific disciplines and affiliations of the authors and institutions can be linked to patent information. Linking the technology domain of the citing patent to the science field of the cited publication, for instance, results in matrices which represent the presence of specific scientific disciplines and relate them to different technological domains (Schmoch, 1997; Verbeek *et al.*, 2002).

A simple indicator at the company level is the average number of science references cited on the front page of the company's patents. Strong science linkages indicate that a company is building its technology on advances in science ("closeness to science"). High-technology companies tend to have more science linkages than their competitors and science linkages have been found to be predictive of a company's stock market performance (*e.g.* Nagaoka, 2007).

Figure 6.1. **Share of NPL in citations in search reports of PCT patent applications**
1990-2004, by IPC sub-class[1]

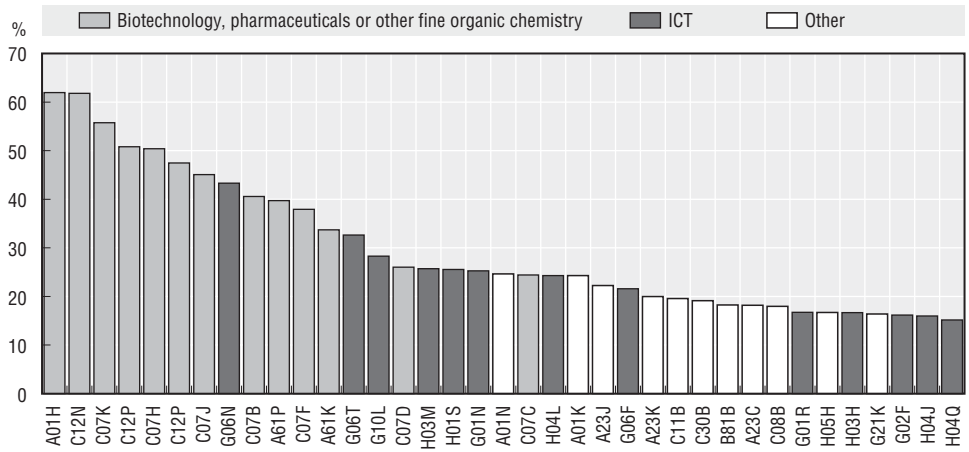



Figure 6.2. **Share of NPL in citations – all patents**
1990-2004, by country of inventor[2]

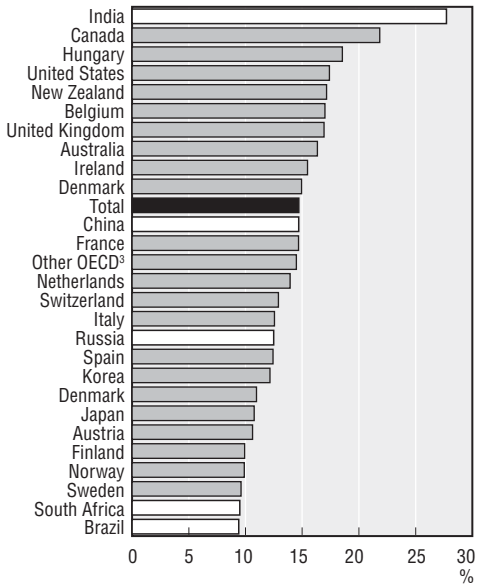
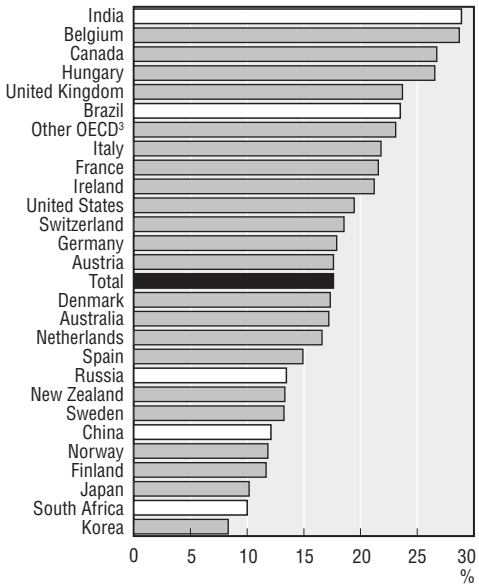



Figure 6.3. **Share of NPL in citations – ICT**
1990-2004, by country of inventor[2]




1. Only those IPC sub-classes (out of over 600) with a share of NPL citations greater than the average (14.7%) and with more than 150 patent applications published in the period 1990-2004.
2. Fractional counts used when there is more than one inventor on the patent application.
3. Other OECD includes the Czech Republic, Greece, Iceland, Luxembourg, Mexico, Poland, Portugal, the Slovak Republic and Turkey.

*Source: OECD-EPO Patent Citations Database.*

## 6.7. Other indicators based on the categories of citations (EPO and PCT search reports)

PCT and EPO search reports assign codes to the references constituting the prior art of an invention (Schmoch, 1993). EPO publications include information on five different types of citations: *i)* added by examiners during the search (whether or not provided by the applicant); *ii)* provided by the applicant but not used in the search report; *iii)* added during examination; *iv)* provided during opposition proceedings; and *v)* other. All documents cited are identified by a particular letter in the first column of the search report representing the cited category (combinations of codes are possible). See Table 6.4 for definitions of citation categories.

Table 6.4. **Citation categories at the EPO and PCT**

| | |
|---|---|
| **X** | Particularly relevant documents when taken alone (a claimed invention cannot be considered novel or cannot be considered to involve an inventive step). |
| **Y** | Particularly relevant if combined with another document of the same category. |
| **A** | Documents defining the general state of the art. |
| **O** | Documents referring to non-written disclosure. |
| **P** | Intermediate documents (documents published between the date of filing and the priority date). |
| **T** | Documents relating to theory or principle underlying the invention (documents which were published after the filing date and are not in conflict with the application, but were cited for a better understanding of the invention). |
| **E** | Potentially conflicting patent documents, published on or after the filing date of the underlying invention. |
| **D** | Document already cited in the application (provided by the applicant). |
| **L** | Document cited for other reasons (*e.g.* a document which may cast doubt on a priority claim). |

*Source: EPO Guidelines for Examination in the European Patent Office*, 2003 (176 ff.).

This categorisation can be helpful for building more refined citation indicators, such as indicators on patents with the capacity of blocking other inventions (based on X, Y and E categories). The categories X and Y, which designate the citation to a relevant document in the prior art, are very important for assessing the patentability of a new invention and can compromise the grant of a patent. X-type references are the most important in this respect. If an application receives an X classification, this indicates that the claimed invention does not meet, wholly or in part, the requirements of novelty or of inventive step, and that one claim at least needs to be modified in order not to interfere with the legal boundaries of existing inventions. As a result, when looking at granted patents with these categories of backward citations, the claims that appear have been, in most cases, modified during the granting process. In the search report, the search officer or examiner indicates to which claim or claims of the application the prior art applies.

Documents cited by the applicant (type D) should be considered in the search report if they are decisive in terms of the state of the art or are necessary to understand the application. Citations submitted by the applicant which do not fulfil these requirements may be disregarded by the examiner. Type A references merely provide technical background information (state of the art). The fact that a patent is frequently cited as invalidating some or all of the claims of other patent applications may also reflect strategic behaviour on the part of patent holders, who design their applications in broad terms in order to bar or reduce the patentability of follow-up inventions by competitors.

### *Notes*

1. In a survey of patentees and inventors, around one-half of all patent citations (in a cohort of 1 993 patentees at the USPTO) were found not to correspond to any perceived communication, or even to a perceptible technological relationship between the inventions (*e.g.* Jaffe *et al.*, 2000).
2. Published applications of the USPTO (called pre-grant publications) include the applicant's citations but they do not include those of the examiner. The latter are only published if and when the patent is granted.
3. For further details, see the *Guidelines for Examination in the European Patent Office,* updated regularly. Following a general section, the guidelines are divided into five sections comprising among others, guidelines for formalities, guidelines for search, and guidelines for substantive examination.
4. If the search results in several documents of equal relevance, the search report should normally contain no more than one of them. The choice of citation is made on the basis of the examiner's expert knowledge. In case of two documents of equal relevance, one of which was published before the date of priority and the other published between priority date and filing date, the search examiner should choose the earlier one.
5. As shown by Callaert *et al.* (2007) in a comparative study of USPTO and EPO patents, these differences are noticeable both in terms of the occurrence and the type of the reference cited. USPTO patents include on average about three times as many patent references than EPO patents. As regards non-patent literature, 34% of USPTO patents contain non-patent references whereas they are 38% at the EPO. They also find that journal references are more prominent in EPO patents (64% of non-patent references are journal references compared to 54% in USPTO patents).
6. For patents which later enter the regional phase at the EPO, the EPO acts as the ISA. Formally, the international search report has a different function from the search report issued by the EPO for applications filed directly at the EPO. Practically, there are few differences. International search reports for WO documents are generated by one of 12 ISAs. These are the patent offices of Australia, Austria, China, Finland, Japan, Korea, Russia, Spain, Sweden, the United States and the European Patent Office.
7. For further information see the *PCT International Search and Preliminary Examination Guidelines* of the WIPO; *www.wipo.int/pct/en/texts/pdf/ispe.pdf* .
8. In the context of EPO patent citations, if an invention is protected in more than one country and, therefore, several documents belong to a single patent family, the examiner should preferably cite the patent document in the language of the

application. The choice is also affected by the languages with which the examiner is familiar. When patent documents are not referenced as European, but as equivalent documents issued by other patent offices such as WIPO, USPTO, DPMA and others, citation counts will typically inform the analyst about the source of references, but not about the importance of particular inventions.

9. The propensity to cite also differs over time and across technological areas. Citations in computers and communications arrive fastest, followed by electric and electronics, and drugs and medical technologies (Hall *et al.*, 2001).

10. Under the American Inventors Protection Act (AIPA) enacted 29 November 1999, all patents which seek some form of patent protection outside the United States are published by the USPTO 18 months after the US priority date. That does not change the timing of the earliest publication, but the publication is available from the USPTO and will show up in the data even if European equivalents of the US patent are not detected.

11. If a patent is cited by subsequent patents that belong to a wide range of fields the measure will be high (close to one), whereas if most citations are concentrated in a few fields it will be low (close to zero).

12. The methodology to calculate the magnitude of the bias – and to correct the bias – are reported in Hall *et al.* (2001).

13. This is consistent with other observed patterns of science-industry linkages in these fields, such as university spin-offs, industry-university co-operation on R&D and the tendency for biotechnology companies to cluster around universities.

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# Acronyms

| | |
|---|---|
| **AFA** | Activity of Foreign Affiliates Database |
| **ARIPO** | African Regional Intellectual Property Organization |
| **BEA** | Bureau of Economic Analysis (United States) |
| **CAFC** | Court of Appeals of the Federal Circuit (United States) |
| **CIP** | Continuation-in-Part |
| **CIPO** | Canadian Intellectual Property Office |
| **DPMA** | Deutsches Patent- und Markenamt (Germany) |
| **ECLA** | European Classification System |
| **EPC** | European Patent Convention |
| **EPLA** | European Patent Litigation Agreement |
| **EPO** | European Patent Office |
| **EU** | European Union |
| **FhG-ISI** | Fraunhofer Institute for Systems and Innovation Research |
| **GATT** | General Agreement on Trade and Tariffs |
| **ICT** | Information and communication technologies |
| **IIP** | Institute of Intellectual Property (Japan) |
| **INID** | Internationally agreed numbers for the identification of bibliographic data |
| **INPI** | Institut National de la Propriété Intellectuelle (France) |
| **IPC** | International Patent Classification |
| **IPRP** | International preliminary report on patentability |
| **ISA** | International search authorities |
| **ISIC** | International Standard Industrial Classification |
| **ISR** | International search report |
| **NACE** | Classification of Economic Activities in the European Community |
| **NAICS** | North American Industry Classification System |
| **NBER** | National Bureau of Economic Research (United States) |
| **NISTEP** | National Institute of Science and Technology Policy (Japan) |
| **NSF** | National Science Foundation (United States) |
| **NUTS** | Nomenclature of territorial units for statistics (*Nomenclature des unités territoriales statistiques*) |
| **OECD** | Organisation for Economic Co-operation and Development |
| **OST** | Observatoire des Sciences et des Techniques (France) |

| | |
|---|---|
| **PATSTAT** | Worldwide Statistical Patent Database (EPO) |
| **PCT** | Patent Co-operation Treaty |
| **SIC** | Standard Industrial Classification |
| **SIPO** | State Intellectual Property Office of the People's Republic of China |
| **SMEs** | Small and medium-sized enterprises |
| **STAN** | Structural Analysis Database |
| **TL** | Territorial level |
| **TRIPS** | Trade-related intellectual property rights |
| **USPC** | United States Patent Classification System |
| **USPTO** | United States Patent and Trademark Office |
| **WIPO** | World Intellectual Property Organization |
| **WOISA** | Written opinion of the international search authorities |
| **WTO** | World Trade Organization |

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# Glossary

**Appeal:** A procedure by which the applicant or patent holder can request reversal of a decision taken by the patent office.

- *USPTO:* An applicant for a patent dissatisfied with the primary examiner's decision in the second rejection of his or her claims may appeal to the Board of Patent Appeals and Interferences (BPAI) for review of the examiner's rejection. The Board is a body of the USPTO which reviews adverse decisions of examiners in patent applications and determines priority and patentability of invention in interferences. Decisions of the Board can be further appealed to the *Court of Appeals for the Federal Circuit* (CAFC) or to a district court.
- *EPO:* Decisions of the first instances of the EPO can be *appealed* before the Boards of Appeal of the EPO, in a *judicial* procedure (proper to an administrative court), as opposed to an *administrative* procedure. These boards act as the final instances in the *granting* and *opposition* procedures before the EPO. In addition to the Boards of Appeal, the European Patent Office has an Enlarged Board of Appeal. This instance takes decisions only when the *case law* of the Boards of Appeal becomes inconsistent or when an important point of law arises.
- *JPO:* An applicant who receives a rejection can appeal. The panels consist of three or five trial examiners in the Appeals Department of the JPO. Decisions of the panels can be further appealed to the Intellectual Property High Court, a special branch within the Tokyo High Court.

**Applicant:** The holder of the legal rights and obligations on a patent application. It is most often a company, a university or an individual.

**Application date:** The date on which the patent office received the completed patent application. A unique number is assigned to a patent application when it is filed.

**Assignee:** In the United States, the person(s) or corporate body to whom all or limited rights under a patent are legally transferred by the inventor (equivalent to "applicant" in this context).

**Citations:** References to the prior art in patent documents. Citations may be made by the examiner or the applicant. They comprise a list of references which are believed to be relevant prior art and which may have contributed to defining the scope of the claims of the application. References can be made to

other patents, to technical journals, textbooks, handbooks and other sources. *USPTO:* Applicants before the USPTO are required to disclose prior art known to them that is material to patentability; *EPO:* No such obligation for the applicant; *JPO:* The requirement for disclosure of information on prior art documents was introduced as of 1 September 2002 and entered into full force on 1 May 2006.

**Claim(s):** Definition of the scope of the invention and the aspects of the invention for which legal protection is sought.

**Continuation(s)** *(USPTO)***:** Second or subsequent applications for the same invention claimed in a prior non-provisional application and filed before the first application is abandoned or patented. Continuations must claim the same invention as the original application to gain the benefit of the parent filing date. At the time of filing the claims are often the same but the claims may change during prosecution so that they are not exactly the same but not patentably distinct. There are three types of continuing applications: division, continuation and continuation-in-part.

**Designated countries:** In international and regional patent systems, countries in which patent applicants wish to protect their invention if/when the patent is granted. International application filing automatically includes the designation for all PCT contracting countries that are bound by the PCT on the international filing date (since 2004). A similar rule will apply to the EPO from April 2009, as European patent applications designate all contracting states as in the PCT procedure.

**Direct European route (application):** A patent application filed under Article 75 EPC (also known as an "Euro-Direct application"). With the direct European route, the entire European patent grant procedure is governed by the EPC alone while with the Euro-PCT route, the first phase of the grant procedure (the international phase), is subject to the PCT.

**Division:** If the patent office decides that an application covers too broad an area to be considered as a single patent, the application is split into one or more divisional applications, which may or may not be pursued by the applicant. A division can also be requested at the initiative of the applicant.

**Equivalent:** A patent that protects the same invention and shares the same priority application as a patent from a different issuing authority.

**Euro-PCT route:** A way to obtain a European patent by designating the EPO in a PCT application (Article 11 PCT). The first phase of the grant procedure (the international phase) is subject to the PCT, while the regional phase before the EPO as designated or elected office is governed primarily by the EPC.

- **Euro-PCT application** – international phase (or Euro-PCT application or PCT international): A PCT application designating the EPO [Article 150(3) EPC]. With

the Euro-PCT route, the first phase of the grant procedure (international phase) is subject to the PCT, while the regional phase before the EPO as designated or elected office is governed primarily by the EPC.

- **Euro-PCT application – regional phase (or PCT regional):** PCT application entering the European (or regional) phase once the applicant has fulfilled the conditions under Article 22 or 39 PCT, Article 158 and Rule 107 EPC.

**Euro-PCT search (or PCT Chapter I):** Search carried out by the EPO acting as International Searching Authority for a Euro-PCT application in the international phase (Article 16 PCT).

**European patent:** A European patent can be obtained for all EPC countries by filing a single application at the EPO in one of the three official languages (English, French or German). European patents granted by the EPO have the same legal rights and are subject to the same conditions as national patents (granted by the national patent office). It is important to note that a granted European patent is a "bundle" of national patents, which must be validated at the national patent office in order to be effective in member countries. The validation process may include submission of a translation of the specification, payment of fees and other formalities of the national patent office (once a European patent is granted, competence is transferred to the national patent offices).

**European Patent Convention (EPC):** The Convention on the Grant of European Patents was signed in Munich in 1973 and entered into force in 1977. It is a multilateral treaty instituting the European Patent Organisation and providing an autonomous legal system according to which European patents are granted. The EPC provides a legal framework for the granting of European patents, via a single, harmonised procedure before the European Patent Office. It enables the patent applicant, by means of a single procedure, to obtain a patent in some or all of the contracting states. As of January 2008 there are 34 EPC member countries. In addition, extension agreements exist with five countries, offering the possibility to extend European patents to those countries upon request. EPC member countries are Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Monaco, the Netherlands, Norway, Poland, Portugal, Romania, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom. EPC extension countries are Albania, Bosnia and Herzegovina, Croatia, Former Yugoslav Republic of Macedonia, and Serbia.

**European Patent Office (EPO):** The European Patent Office (a regional patent office) was created by the EPC to grant European patents, based on a centralised examination procedure. By filing a single European patent application in one of the three official languages (English, French or German), it is possible to

obtain patent rights in all EPC member and extension countries. The EPO is not an institution of the European Union.

**Family:** a set of patents (or applications) filed in several countries to protect the same invention. They are related to each other by one or several common priority numbers. There are different definitions of patent families (*e.g.* triadic patent families, extended families including continuations, etc.). Depending on the use sought, a different family concept can be chosen, *e.g.* equivalents, triadic family or trilateral family.

**First to file:** A patent system in which the first inventor to file a patent application for a specific invention is entitled to the patent. This law is increasingly becoming the standard for countries adhering to the Trade-related Aspects of Intellectual Property (TRIPs) guidelines. In the EPO and the JPO, patents are awarded on a first-to-file basis, whereas in the USPTO the patent is awarded on the first to invent basis.

**First to invent** *(USPTO)***:** A system in which a patent is awarded to the first person who made the invention, even if another person filed for a patent before the person who invented first.

**Grant:** A patent application does not automatically give the applicant a temporary right against infringement. A patent has to be granted for it to be effective and enforceable against infringement.

**Grant date:** The date when the patent office issues a patent to the applicant.

**Infringement:** Unauthorised making, using, offering for sale or selling any patented invention in the country in which the patent is enforceable or importing that invention into said country during the term of the patent.

**Intellectual property rights (IPR):** The exclusive legal rights associated with creative work, commercial symbols or inventions. There are four main types of intellectual property: patents, trademarks, design and copyrights.

**International patent application:** See "PCT application". A patent application filed under the Patent Cooperation Treaty (PCT) is commonly referred to as an "international patent application". However, international patent (PCT) applications do not result in the issuance of "international patents" (*i.e.* at present, there is no global patent system that issues and enforces international patents). The decision of whether to grant or reject a patent filed under PCT rests with the national or regional (*e.g.* EPO) patent offices.

**International Patent Classification (IPC):** The IPC is based on an international multilateral treaty administered by WIPO. The IPC is an internationally recognised patent classification system, which provides a common classification for patents according to technology groups. The IPC is a hierarchical system in which the whole area of technology is divided into eight sections broken down into classes, subclasses and groups. IPC is periodically revised in order to

improve the system and to take account of technical development. The eighth edition of the IPC entered into force on 1 January 2006.

**International Searching Authority (ISA):** An office with competence to carry out the international search for a PCT application. It may be either a national office (Australia, Austria, Canada, China, Finland, Japan, Korea, the Russian Federation, Spain, Sweden, the United States) or an intergovernmental organisation (EPO), (Article 16 PCT, Article 154 EPC).

**Inventive step:** At the EPO and JPO, an invention is considered to include an inventive step if it is not obvious to a person skilled in the art. Inventive step is one of the criteria (along notably with novelty and industrial applicability) that need to be fulfilled in order to obtain a patent. See also "non-obviousness"*(USPTO)*.

**Inventor country:** Country of residence of the inventor.

**Japan Patent Office (JPO):** The JPO administers the examination and granting of patent rights in Japan. The JPO is an agency of the Ministry of Economy, Trade and Industry (METI).

**Lapse:** The date when a patent is no longer valid in a country or system owing to failure to pay renewal (maintenance) fees. Often the patent can be reinstated within a limited period.

**Licence:** The means by which the owner of a patent gives permission to another party to carry out an action which, without such permission, would infringe the patent. A licence can thus allow another party to legitimately manufacture, use or sell an invention protected by a patent. In return, the patent owner will usually receive royalty payments. A licence, which can be exclusive or non-exclusive, does not transfer the ownership of the invention to the licensee.

**National application**: A patent application that is filed at a national patent office according to a national procedure.

**Novelty:** An invention cannot be patented if certain disclosures of the invention have been made.

**Non-obviousness** *(USPTO)***:** Something is obvious if the differences between the subject matter to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person with ordinary skills in the art to which said subject matter pertains. See also "inventive step"*(EPO, JPO)*.

**Opposition:** This is a procedure usually before the issuing patent office, initiated by third parties to invalidate a patent:

- *EPO:* Opposition to the grant of a European patent can be filed within nine months of the mention of the grant in the European Patent Bulletin.

- *JPO:* Opposition to a grant could be filed within six months of the issue of the grant before the reform of appeals for invalidation was introduced in January 2004.

**Paris Convention:** The Paris Convention for the Protection of Industrial Property was established in 1883 and is generally referred to the Paris Convention. It established the system of priority rights, under which applicants have up to 12 months from first filing their patent application (usually in their own country) in which to make further subsequent applications in each signatory country and claim the original priority date. There are 172 countries party to the treaty (March 2008).

**Patent:** A patent is an intellectual property right issued by authorised bodies which gives its owner the legal right to prevent others from using, manufacturing, selling, importing, etc., in the country or countries concerned, for up to 20 years from the filing date. Patents are granted to firms, individuals or other entities as long as the invention satisfies the conditions for patentability: novelty, non-obviousness and industrial applicability. A patent is known as a utility patent in the United States.

**Patent Cooperation Treaty (PCT):** As of March 2008, there were 138 countries party to the treaty, which was signed in 1970 and entered into force in 1978, enabling a patent applicant, by means of a single procedure, to obtain a patent in some or all of the contracting states. The PCT provides the possibility to seek patent rights in a large number of countries by filing a single international application (PCT application) with a single patent office (receiving office). PCT applications do not result in the issuance of "international patents". The decision on whether to grant or reject patent rights rests with national or regional patent offices. The PCT procedure consists of two main phases: *i*) an "international phase"; and *ii*) a PCT "national/regional phase". PCT applications are administered by the World Intellectual Property Organization (WIPO).

**PCT international search:** A search carried out by a designated office (international searching authority) for PCT applications.

**Pending application:** An application has been made at the patent office, but no decision has been taken on whether to grant or reject the patent application

**Prior art:** Previously used or published technology that may be referred to in a patent application or examination report. In a broad sense, this is technology that is relevant to an invention and was publicly available (*e.g.* described in a publication or offered for sale) at the time an invention was made, In a narrow sense, it is any technology that would invalidate a patent or limit its scope. The process of prosecuting a patent or interpreting its claims largely consists of identifying relevant prior art and distinguishing the claimed invention from that prior art. The objective of the search process is to identify patent and non-

patent documents constituting the relevant prior art in order to determine whether the invention is novel and includes an inventive step.

**Priority country:** Country where the patent is first filed worldwide before being extended to other countries. See "Paris Convention".

**Priority date:** The priority date is the first date of filing of a patent application, anywhere in the world (usually in the applicant's domestic patent office), to protect an invention. The priority date is used to determine the novelty of the invention, which implies that it is an important concept in patent procedures. Among procedural data, priority date can be considered as the closest date to the date of invention. In the United States the date of conception comes into play during interferences.

**Priority rights:** see "Paris Convention".

**Processing time:** Duration of a process in the patent procedure (*e.g.* search, examination, grant, and possible opposition and appeal).

**Publication:** In most countries, a patent application is published 18 months after the priority date:

- *EPO:* All patent applications are published in this manner, whether the patents have been granted or not.
- *JPO:* Patent applications that are no longer pending in the JPO, *e.g.* granted, withdrawn, waived or rejected, are not published. While official patent gazettes are only published in Japanese, the abstracts and bibliographic data of most of the unexamined patent applications are translated into English, and are published as the Patent Abstracts of Japan (PAJ).
- *USPTO:* Prior to a change in rules under the American Inventors Protection Act of 1999, USPTO patent applications were held in confidence until a patent was granted. Patent applications filed at the USPTO on or after 29 November 2000 are required to be published 18 months after the priority date. However, there are certain exceptions for the publication of pending patents. For example, an applicant can ask (upon filing) for the patent not to be published by certifying that the invention disclosed in the application has not and will not be the subject of an application filed in another country. Also, if the patent is no longer pending or subject to a secrecy order, then the application will not be published.

**Renewal fees:** Once a patent is granted, annual renewal fees are payable to patent offices to keep the patent in force. In the USPTO they are referred to as "maintenance fees". In most offices, renewal fees are due every year. USPTO-granted (utility) patents are subjected to maintenance fees which are due three-and-a-half years, seven-and-a-half years, and eleven-and-a-half years from the date of the original patent grant.

**Request for examination:** Patent applications filed at the EPO and JPO do not automatically enter the examination process. The applicant has to submit a request for examination within six months of the transmission of the search report at the EPO, and within three years of filing at the JPO. Patent applications filed at the USPTO are automatically examined by a patent examiner without the need for a separate request by the applicant.

**Revocation:** A patent is revoked if after it has been granted by the patent office, it is deemed invalid by a higher authority (appeal body within the patent office or a court).

**Search report:** The search report is a list of citations of all published prior art documents which are relevant to the patent application. The search process, conducted by a patent examiner, seeks to identify patent and non-patent documents constituting the relevant prior art to be taken into account in determining whether the invention is novel and includes an inventive step.

**Triadic patent families:** The triadic patent families are defined at the OECD as a set of patents taken at the European Patent Office (EPO) and the Japan Patent Office (JPO) and granted by the US Patent and Trademark Office (USPTO) which share one or more priorities. Triadic patent families are consolidated to eliminate double counting of patents filed at different offices (*i.e.* regrouping all the interrelated priorities in EPO, JPO and USPTO patent documents).

**Trilateral patent families:** A trilateral patent family is part of a filtered subset of patent families for which there is evidence of patenting activity in all trilateral blocs. It is then similar to a triadic family, except that it would also include applications filed in any EPC state that do not go to the EPO (in addition to going to the JPO and USPTO). Trilateral patent families are usually counted in terms of individual priorities, without consolidation.

**United States Patent and Trademark Office (USPTO):** The USPTO administers the examination and granting of patent rights in the United States. It falls under the jurisdiction of the US Department of Commerce.

**Utility model:** This type of patent, also known as a "petty patent", is available in some countries. It usually involves less stringent patentability requirements than a traditional patent, it is cheaper to obtain and it is valid for a shorter time period.

**Withdrawal:** Under the European Patent Convention, the applicant can withdraw an application at any stage of the procedure either by informing the office or by abstaining from one or more of the following: pay fees in due time, file a request for examination within the given time period, or reply in due time to any communication within the examination procedure.

**World Intellectual Property Organization (WIPO):** An intergovernmental organisation responsible for the administration of various multilateral treaties dealing with the legal and administrative aspects of intellectual property. In the patent area, the WIPO is notably in charge of administering the Paris Convention, the Patent Cooperation Treaty (PCT) and the International Patent Classification system (IPC).

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