PATENTS AND INNOVATION IN THE INTERNATIONAL CONTEXT

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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FOREWORD

Intellectual property rights regimes are intended to balance the need to reward inventors for new technologies and innovation and the need to diffuse technology for the benefit of society as a whole. Despite progress in harmonisation of intellectual property rights systems in recent years, particularly through the World Trade Organisation, there remain significant variations in the approaches taken by different countries, especially with regard to patents. In addition to varying filing rules, application procedures, disclosure practices and claim interpretations, there are also divergent levels of costs and enforcement. In an era of increasing globalisation of industries and their research activities, these differences tend to cause problems for international patenting, foreign research investments and collaborative international research. In order to stimulate continuing innovation and diffusion of technology on a global scale, further simplification and harmonisation of patent regimes is called for.

The analysis of patents and innovation at the international level is part of the work on international technology issues of the Working Group on Innovation and Technology Policy (TIP) of the OECD Committee for Scientific and Technological Policy (CSTP). This background report will contribute to identifying barriers to the implementation of the OECD Principles for Facilitating Technology Co-operation Involving Enterprises, adopted by the OECD Council in September 1995. These principles state that "*governments should maintain an effective intellectual property rights protection and enforcement regime*" and that "*the partners in the co-operation should come to an understanding on the protection of intellectual property rights, as well as fair and equitable contributions to projects, dissemination of information and access to and use of the results of the co-operation.*" They further instruct the CSTP to continue work in this area to determine what actions might be necessary to remove barriers inhibiting mutually-beneficial international technology co-operation involving enterprises.

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SUMMARY

Intellectual property is a generic term which refers to the rights to the products of human creativity, including scientific discoveries, industrial design, and literary and artistic works. Intellectual property policy is intended to set an equilibrium between two objectives: 1) rewarding creators and inventors for innovation, and 2) promoting access by business and the public to science, technology and culture. This paper discusses issues that emerge at the interface of patents and innovation, particularly in the international context. Patents protect the inventions that business exploits as a result of research and development and are an important incentive to research and development and to innovation in general. The term patent comes from the first *Letters Patent,* which granted an inventor or importer of a new technology the sole right to use it for a period sufficiently long to establish his business.

There are many significant differences among patent systems that emerged to meet the needs of national industrial systems when international trade considerations were less prominent than they are today. These differences relate to legal and regulatory frameworks as well as to the practical conditions of implementation and concern, in particular, the nature of the patentee and the date at which protection begins; the extent to which, and the moment at which, the new knowledge is disseminated and becomes publicly available; the ability of competitors to challenge a patent application or a new patent; the scope of protection and its duration; the cost and complexity of the patenting process; and the extent to which enforcement is ensured. These differences affect national innovation systems because they influence the conditions under which an invention becomes known and the ability of others to utilise the new knowledge in further research and development.

These national differences in patent regimes, together with the effects of information technology and increasing competition at the global level, raise issues regarding the efficacy of patenting in the current era. When considering the costs, complexity and levels of protection of patenting, firms might, for example, choose not to patent and use secrecy instead to protect innovations. They might hesitate to engage in joint international research ventures because of uncertainties in the assignment of patent rights among prospective partners. They might also refrain from foreign research investments due to problems in enforcement or awarding of patent rights. Exploitation of research results might be endangered by the use of patent laws as barriers to trade or by the patenting practices of firms that attempt to block technological developments by competitors. Small and medium-sized firms – whose future may hinge on the exploitation of one strategic patent – are especially vulnerable in view of their limited resources and reach. The vast majority of firms, even those that operate in a national or local context, are increasingly challenged by international competitors. These considerations represent powerful arguments towards some degree of homogenisation and simplification of the international patent environment, particularly to protect patent-holders and stimulate continuing innovation and diffusion of technology.

INTRODUCTION

Overview of intellectual property rights

Intellectual property rights are rights granted by state authority for certain products of intellectual effort and ingenuity. These rights are the subject of specific laws (statutes) enacted by parliaments or other state authority. In general, intellectual property policy may be defined as the setting of an equilibrium between two objectives: (a) rewarding or compensating creators and inventors for innovation; and (b) promoting the interests of business and the public at large in securing access to science, technology and culture. In order to stimulate innovation, this balance must be maintained. On a policy level, this translates into a need to grant innovators the rights that are necessary to recoup their investment without stifling competition for an unduly long period of time. However, information on innovations must also be made available to the public if the second objective is to be met.

In Article 2 of the *Convention Establishing the World Intellectual Property Organization*, signed at Stockholm on 14 July 1967, intellectual property is defined as including rights relating to:

- ◊ literary, artistic and scientific works;
- ◊ performances of performing artists, phonograms and broadcasts;
- ◊ inventions in all fields of human endeavour;
- ◊ scientific discoveries;
- ◊ industrial designs;
- ◊ trademarks, service marks, and commercial names and designations;
- ◊ protection against unfair competition; and
- ◊ all other rights resulting from intellectual property activity in the industrial, scientific, literary or artistic fields.

These can be grouped into six basic kinds of intellectual property rights (OECD, 1996). **Patents** relate to inventions. **Copyright** relates to literary or artistic works and also extends to engineering drawings, computer software and other areas beyond the sphere of the arts. **Designs** relate to shapes and configurations, including layout-designs (topographies) of integrated circuits. **Trademarks** relate to words or symbols applied to products or services to identify source or sponsorship. **Plant varieties protection** provides *sui generis* exclusive rights in plant varieties based on the model of the 1978 International Union for the Protection of New Varieties of Plant. Apart from copyrights, all the other mentioned rights must be applied for to the relevant national authority according to statutory law and procedures. **Trade secret protection** protects confidential ("undisclosed") information and does not require registration or formalities.

The term **industrial property** embraces protection of invention by means of patents, utility models (a form of protection for inventions that do not meet all the requirements of patentability or do not need full patent protection, that is considered to be very useful for small firms, in particular in Europe), protection of certain commercial interests by means of trademark law and law on trade (brand) names, and the law on protection of industrial designs. In addition, it includes the repression of unfair competition.

Trademarks, geographical indications and other business identifiers, while extremely important in practice – notably as regards trade in counterfeit goods, do not protect a product as such, but rather the relationship between that product (goods or services) and its maker/provider. The value lies in that relationship. This is illustrated by the use of the word "brand" as a quasi-synonym. With globalisation and the fact that so many large firms now operate at planetary scale, these perceptions are shifting. Trademarks, geographical indications or brand names are rapidly turning into vital assets for firms that operate on a transnational basis, and are increasingly involved in electronic commerce, where notoriety is a strategic resource and counterfeiting a significant danger.

Copyright used to be considered as a less important and somewhat "artistic" form of intellectual property, but has now become another major international factor in technological, scientific and trade development. It is the main tool for protection of the products of economic players such as the film, publishing and recording industries and, since the mid-1980s, also computer software which became universally protected by copyright. It is estimated that these so-called "*copyright*" industries together represent between 2 and 6 per cent of the GNP of most OECD countries.

Patents protect the inventions that business exploits as a result of research and development (R&D) efforts. Even though they are often combined with other forms of protection, patents have traditionally been considered as one of the main incentives for R&D. The various forms of intellectual property become more inter-related as a set of tools that firms can use individually or in combination in order to promote their strategic market objectives. As a result, intellectual property has been a growing concern in international fora; a brief overview of current work in this area at international level is provided in the Annex.

The intent of the present paper is to focus on the links between patents and innovation in the global economic system, particularly the effects of differences in national patent regimes. In this light, it does not intend to draw a systematic comparison of national patent systems but to identify those features that influence patenting and innovation at international level.

The nature of patents

The term patent comes from the first *Letters Patent* (literally "open letters") granted as early as the fourteenth century in England. Their purpose was to grant the inventor or importer of a new technology the sole right to use it for a period sufficiently long to establish his business. It was an exchange: the inventor/importer benefited from a head start while the State gained technological progress, greater industrial independence and increased export capacity (an early form of comparative advantage).

The Royal Letters granting the limited monopoly were open and carried the (wax) seal at the bottom – normal letters were *closed* with the seal. These *Letters Patent* constituted a notice to the public of the exclusive right. But as these royal privileges were sometimes abused, complaints in parliament led to the adoption of a statute indicating the conditions one had to fulfil to obtain the patent. From the very beginning, conditions imposed on applicants were that the "invention" be new in the kingdom (through importation or invention) and that it have some "benefit" for the State. The term was also limited. In the Statute of Monopolies of 1623, the maximum term was 14 years. Two of these three conditions are still applicable today, namely novelty and industrial application.

There are two alternative sets of terms to describe these three conditions in most national patent laws. The set of terms used in Article 27 of the 1993 Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement) to describe the conditions for patentability are that the invention be "*new,*

involve an inventive step and [be] capable of industrial application". In the footnote to the agreement, it is said that "*the terms 'inventive step' and 'capable of industrial application' may be deemed by a Member to be synonymous with the terms 'non-obvious' and 'useful' respectively*." As regards the term of protection, the international standard set by Article 33 of the TRIPS Agreement is now somewhat longer: 20 years from the filing date.

Another practice developed over the years concerning the best way to describe inventions and their practical applicability in patent documents. The results of this evolution are visible today and now enshrined in Article 29(1) of the TRIPS Agreement, which states that an applicant "*shall disclose the invention in a manner sufficiently clear and complete for the invention to be carried out by a person skilled in the art and may require the applicant to indicate the best mode for carrying out the invention known to the inventor*". This ensures that the invention can be exploited without undue difficulty by others after the expiration of the non-renewable exclusive right, since, as was already the case in the seventeenth century, patents are not renewable. However, in certain cases, they may be extended to compensate right-holders who had to wait before exploiting the invention due to regulatory approval processes (particularly in the pharmaceutical field).

The fundamental goals of the patent system are to promote the creation and diffusion of technology by providing an inventor with a limited monopoly (both in time and scope) over a technological solution in exchange for a full disclosure of the invention. Disclosure of inventions in patent applications is the sole source of patent information, and provides a global tool to assess the state-of-the-art in a given technology field. Patents give an inventor or other first user of a new technology (importer) the exclusive right to exploit the new technology in a specific territory, thus compensating his R&D efforts and resulting in innovation (directly or as a licenser). In the language of Article 28(1) of the TRIPS Agreement:

> *"A patent shall confer on its owner the following exclusive rights: where the subject matter of a patent is a product, to prevent third parties not having the owner's consent from the acts of: making, using, offering for sale, selling, or importing for these purposes that product; where the subject matter of a patent is a process, to prevent third parties not having the owner's consent from the act of using the process, and from the acts of: using, offering for sale, selling, or importing for these purposes at least the product obtained directly by that process."*

The first policy objective of patents is thus the creation of new technology, both by stimulating local (national) scientific research (applied to industry) and importation, in order to improve the national technological base. An efficient patent system is expected to contribute to innovation in three respects:

- ◊ A patent grants the right of exclusive use of an invention to the inventor for a certain period of time, thus allowing for recovery of initial investments (in particular R&D) costs. For this reason, the patent system acts as a stimulus for research and innovative activities.
- ◊ The period of time during which exclusive use is granted to the inventor creates a favourable economic environment for the development of the invention towards marketable products.
- ◊ The patent system establishes a framework for the collection, classification and dissemination of the world's largest store of technological information.

The second policy objective of patents is the diffusion of technology. This explains why the patent term is limited and non-renewable. It also explains the requirement that the invention and in particular its industrial application (or "embodiments") be disclosed fully in the application. In the same vein, patents are published and patent documentation (both existing and expired patents) constitute an excellent source

of technological information – the number of patents published each year world-wide exceeds 1.5 million. For a number of countries, patent documentation is viewed as an essential basis for transfers of technology and as a way to accelerate R&D efforts: researchers have access to the latest technological information from all countries and can build upon this universal intellectual "bank" of specialised knowledge.

Trends in global patenting

Although many firms still operate entirely within national markets, the growth of international trade and investment has lent increasing weight to international considerations in the development of patent systems. It can be expected to have greater and greater influence as various developments (such as electronic commerce) bring the world market within reach of a larger variety of actors. Today's rapid pace of economic integration at world level reinforces demands that differences between national patent systems be overcome to remove what are felt to be obstacles to the creation of a global environment that will be fully conducive to innovation. Patent systems can no longer be assessed in isolation from each other and slight discrepancies in their management styles may be sources of needless delays, friction and litigation. These problems become ever more acute as firms increasingly tend to develop strategies to market their products globally.

In a large number of countries covered by a European Patent Office international survey, the number of applications accepted (i.e. patents granted) was only slightly higher in 1994 for applications filed by residents, as compared to non-residents, the median ratios being 36.6 per cent and 31.7 per cent of applications by residents and non-residents respectively (EPO, 1995). However, due to delays between first applications by national and international actors in the granting of patents, this indicator may minimise the extent of internationalisation of patents.

In most OECD countries, a majority of applications are in fact filed by non-residents, as illustrated in **Table 1**: in 1994, the non-resident/resident ratio was lower than 1 in only three countries – including the United States (0.913) and Japan (0.16) – with a ratio of 1.88 for the OECD as a whole. These ratios had been steadily increasing since the beginning of the last decade. The increasingly global dimension of patenting is also illustrated by the increase in requests for international searches at EPO, JPO and USPTO, from 36 719 in 1994 to 41 564 in 1995 – a gain of 13.2 per cent (EPO, 1995). It is thus tempting to conclude that global actors are driving the patent system to higher levels of internationalisation. However, this evidence must be weighed against the fact that the trend may be amplified by various international mechanisms established under the Patent Cooperation Treaty (PCT) and the European Patent Office (EPO): these are intended to facilitate international filing of patent applications, but also provide incentives to file in a number of countries, for example to take advantage of "bulk rates". In addition, the figures quoted include applications that are not necessarily followed up in national offices. Still, many patent managers acknowledge that they are driven to higher degrees of internationalisation as a result of the globalisation of their own activities as well as the presence of new competitors on their traditional markets.

Yet patenting as such does not appear to have the same importance in all countries. According to available data, the number of patent applications varies significantly from one country to another. When measured against the population, the ratio of applications per person (thousands) varies from as low as 0.02 to 127.92, with a median value of 1.98. When levels of industrial activity are similar, this may be due to differences in the permissible range to be covered by a single patent, to different levels of awareness of the potential role of patent protection in successfully exploiting the industrial application of a new invention, or perhaps to conditions of access to patenting.

As noted above, applications in multiple countries are now considerably easier (and somewhat cheaper) owing to the recent mechanism put in place under the Patent Co-operation Treaty (PCT). As of 1 July 1997, 91 States were party to the PCT, which was concluded in 1970 and entered into force in 1978. Under the PCT system, administered by WIPO, an applicant files an international application which then enters a first "international" phase, during which one of the "International Search Authority" offices (that is, the patent offices of Australia, Austria, China, Japan, the Russian Federation, Spain, Sweden and the United States, as well as the European Patent Office) issues a report about the state of the art (Chapter 1 of the PCT). Afterwards, the applicant may ask for a preliminary international examination by the International Preliminary Examining Authority (Chapter 2 of the PCT). The list of "International Search Authority" units is the same as the list of "International Preliminary Examining Authority" units, except for Spain who still has not applied to the latter. Consequently, Spain does not conduct any preliminary international examinations, but only international search reports.

Patents are territorial in the sense that they are granted territory by territory, normally for each country. The fact that patent rights are essentially national in their orientation reflects national needs but becomes a source of complexity for those who must operate in an increasingly international framework. The current shift towards international applications (for multiple national patents) and regional patent offices is an encouraging sign in taking this into account. A number of regional patent offices have been created to alleviate the burden imposed on inventors and their successors in title. These include:

- ◊ Regional groupings (such as the *Subregional Integration Agreement of the ANDEAN Group Countries*, or the *Central Agreement for the Protection of Industrial Property*) to promote harmonisation of industrial property regimes in member countries. This is also a goal set in Chapter 17 of the North American Free Trade Agreement.
- ◊ The *African Regional Industrial Property Organisation* (ARIPO), established in its present form in 1985 to assist the governments of English-speaking Africa. Its tasks include the processing of applications for, and the granting of, patents.
- ◊ Its counterpart in French-speaking Africa is the *African Intellectual Property Organisation* (OAPI), established in its present form in 1982, with a broader charter that covers other aspects of intellectual property rights, including copyright.
- ◊ The *Eurasian Patent Organization*, established in 1994 in Moscow by members of the CIS, issues patents valid in all member States.
- ◊ The Munich-based *European Patent Office* (EPO), created after the entry into force of the European Patent Convention (EPC) in 1973, provides a single channel to apply for patents valid in some or all contracting States. The applicant may select all or several contracting States of the EPC, but the EPO does not, as such, issue a single European patent: it files applications with national offices. The creation of a single European patent has been under discussion for many years.

Table 1. Patent applications: residents vs. non-residents

Ratio non-resident/resident patent applications

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Australia	1.85	1.74	1.65	1.73	1.89	2.20	2.07	2.49	2.73	3.06	2.50	2.58	2.72	3.07
Austria	6.41	6.93	7.20	8.28	8.83	10.01	10.95	13.01	15.37	18.47	18.01	19.20	19.09	23.05
Belgium	18.64	18.65	21.60	22.97	25.87	26.83	36.92	41.37	41.53	46.75	56.80	55.92	46.52	56.86
Canada	12.07	12.06	11.75	12.20	12.18	11.84	10.53	10.41	10.58	13.78	16.08	14.22	11.91	15.16
Czech Republic	..	..	..	..	..	..	..	..	..	..	..	3.91	12.20 A	22.48
Denmark	5.75	5.57	5.46	7.28	8.62	8.22	7.62	8.26	8.54	26.95	32.01	31.17	33.16	33.33
Finland	2.58	2.45	2.53	2.71	3.05	3.27	3.49	3.79	4.53	5.07	5.21	6.15	6.03	7.27
France	3.27	3.39	3.37	3.65	3.50	3.67	3.74	4.24	4.65	5.19	4.96	5.20	5.16	5.53
Germany	1.21	1.29	1.28	1.32	1.31	1.36	1.46	1.60	1.81	2.08	1.89	1.86	1.81	1.81
Greece	1.48	1.53	1.57	1.61	1.81	3.36	7.32 T	35.61 T	37.49	47.24	..	97.19 A	99.77	..
Hungary	..	..	..	..	..	..	..	..	..	..	..	6.28	10.16	13.61
Iceland	5.64	3.44	1.94	2.50	3.38	3.17	3.29	6.88	4.83	6.65	2.91	4.32	3.29	4.86
Ireland	5.75	6.17	4.46	4.18	3.60	3.60	3.96	4.37	4.75	5.45	4.83	18.43 A	45.16	49.61
Italy	..	..	..	..	..	..	..	..	..	..	..	7.16	7.27	7.34
Japan	0.15	0.13	0.13	0.12	0.11	0.11	0.11	0.12	0.13	0.13	0.13	0.14	0.14	0.16
Mexico	..	..	..	..	..	..	..	..	..	..	..	12.62	13.85	18.96
Netherlands	10.48	10.63	11.22	12.64	12.72	14.04	14.02	14.22	15.17	17.89	26.36	25.56	26.46	28.25
New Zealand	2.35	2.58	2.42	3.01	2.94	3.27	3.69	4.51	4.54	4.82	3.61	3.41	9.04	12.54
Norway	7.02	7.27	6.64	6.26	6.28	6.58	8.37	9.44	8.86	12.11	12.37	13.65	13.41	16.52
Poland	..	..	..	..	..	..	..	..	..	..	..	..	4.17	5.97
Portugal	20.48	18.85	19.34	18.29	22.42	28.45	37.02	44.63	38.50	35.06	33.85	183.58 A	396.94	395.82
Spain	4.95	5.20	5.58	5.00	4.26	7.69	12.43 T	13.32	13.45	19.72	19.87	22.27	21.81	23.88
Sweden	4.86	4.76	4.90	6.03	6.53	7.42	8.31	10.26	11.94	13.52	12.78	12.93	11.50	11.96
Switzerland	4.64	4.52	4.77	5.94	6.58	7.23	7.54	9.00	9.77	11.65	13.12	13.12	13.53	14.60
Turkey	2.34	3.06	..	2.92	3.49	3.17	5.51	4.88	5.47	7.90	7.14	5.62	6.25	8.05
United Kingdom	1.98	2.04	2.16	2.43	2.41	2.47	2.62	2.85	3.25	3.67	3.53	3.73	3.77	4.03
United States	0.74	0.77	0.79	0.85	0.89	0.87	0.95	0.95	0.96	0.93	1.00	1.01	0.89	0.93
Total OECD	1.03	1.00	0.99	1.01	1.00	1.02	1.06 T	1.19	1.28	1.44	1.41	1.61 A	1.72	1.88
North America	0.85	0.88	0.91	0.97	1.02	1.00	1.07	1.06	1.06	1.07	1.14	1.16 A	1.04	1.05
European Union	1.60	1.70	1.77	1.95	1.97	2.12	2.29 T	2.57	2.98	3.74	3.68	3.78 A	4.08	4.38
Nordic countries	4.33	4.15	4.18	4.92	5.37	5.87	6.42	7.43	8.32	12.47	12.45	13.25	12.52	13.57

Notes:

A = Break in series with previous year for which data is available.

T = Do not correspond exactly to the OECD recommendations.

Source: OECD.

Effects of technology

In addition to the universal impacts of the globalisation of markets, technological advances challenge traditional notions of intellectual appropriability, set new challenges for enforcement of protection and affect the very *modus operandi* of the intellectual protection system. Ever since its early beginnings at the dawn of the industrial age, the intellectual property rights system has had to adjust to changes in the technological and economic environment. New technologies, such as phonograms or wireless broadcasts, have required major adjustments to account for their IPR implications. The development of the modern technological system has also changed the nature of the actors involved; the individual inventor has become an exception and firms have become the major agents of innovation in our societies. Small firms in particular are major sources of technological advance. Most of them still retain a national rather than international outlook, but new technologies (such as information and communications technology that facilitate international activities ranging from strategic alliances to electronic commerce, and including transfers of technology) are rapidly affecting their competitive environment. Firms of all sizes are thus driven to pay more attention to the protection of inventions at the international level.

At the same time, due largely to technological developments, the scope of areas open for patent protection has steadily broadened over the years. The TRIPS Agreement has required member States to make patent protection available in all areas of technology without discrimination. Many problems remain, however, in implementing these notions.

The growing economic importance of computer software, for example, has been acknowledged and protection sought through the copyright system. Several important cases seemed to establish the rule that software was not patentable. The issue, however, is far from resolved and has become less clear-cut as software becomes more closely embedded into hardware, while computer programmes – to be distinguished from "software" - have been recognised to involve the "inventive leap" required for patenting. In this connection a "programme" is regarded as a series of coded instructions which may be used to control the operation of a computer or similar device, whereas the term "software" is broader and embraces not only a programme but also its supporting documentation. The European Union Directive on the Legal Protection of Computer Programs does not use the term "software". To give an example: IBM, in common with most other developers of programmes, protects the detailed expression of its programmes by copyright. However, approximately 3-5 per cent of these programmes contain new, non-obvious and useful functions which are protected by patents.

A further difficulty stems from the distinction between the detailed source code or object code – which is quite adequately protected by copyright – and broader ideas for software-based systems. It is the latter which cause the problem: should they be patentable even if they produce an end result which is not technical, bearing in mind that patents traditionally have only been granted for technical innovation. Additional evaluations are required to assess the benefits or the disadvantages to industry and commerce of broadening the scope of what can be patented. The industry itself is divided on the issue. A number of recent patents relate to financial services (i.e. credit card processing or international funds transfer) and might be the forerunners of growing demands to patent certain types of new services.

In the area of biotechnology, a number of issues have arisen in relation to the patenting of developments in genetic engineering and isolation of genes. The core of the controversy focuses on the patentability of living matter. The TRIPS Agreement excludes from patent protection plants and animals other than micro-organisms as well as biological processes for the production of plants and animals other than microbiological processes, although some elements of this exclusion will be reviewed before the end of the millennium. However, Article 27 of this Agreement does not compel Member States to adhere to it.

Therefore, a country may choose whether to allow the protection of plants and animals other than micro-organisms. With this major reservation taken into account, any country opting to exclude plant varieties from patent protection will be required to introduce an effective *sui generis* system of protection. Some Patent Offices, however, have tended to interpret the restrictions narrowly to exclude only specified varieties from the scope of patentability. For example, patents have been granted for the oncomouse in the United States and Europe, and the application at the EPO is undergoing an appeal process. Controversy continues, relating for example to the patentability of human genes, of plant and animal varieties that are not produced through microbiological processes.

New technologies may also affect the operations of patent systems. The emergence of global markets increasingly based on electronic infrastructures through public networks such as the Internet creates new threats of fraud and counterfeiting and therefore diminishes the effectiveness of patent protection, particularly in an unregulated environment. Marketing of unauthorised products, for example pharmaceuticals, becomes possible at a global scale when suppliers of counterfeited goods can offer their wares to customers around the world. These same networks provide opportunities for greater transparency in the patent system, for example through on-line access to information sources, to respond to growing international demands for more rapid access to information and reduction of procedural delays between filing and publication of patents.

While there are major gains in effectiveness to be achieved by increasing use of communications technologies, changes in the economy of the intellectual property system are expected to take place and affect the use of patents by industry. Patenting strategies of individual firms, for example, will increasingly be open for study by competitors: while individual patents are public documents that are available to the general public, access to the whole patent portfolio of a given firm has required a more elaborate search. Firms have in fact deployed much effort to avoid disclosure of their patent portfolios because these would have provided competitors with strategic information on their innovation strategies or even R&D priorities. Some firms have systematically avoided patenting in key areas, and preferred secrecy, rather than providing public information.

Digitalisation and the development of on-line systems for the patenting process radically modifies these rules of the patenting game. Many patent offices now make available to the public their entire collection of patents, some of which are available through on-line data bases or on the Internet, thus giving immediate, world-wide access to their patent documentation, generally via commercial on-line hosts (Box 1). The European Patent Office (EPO), the Japanese Patent Office (JPO) and the US Patent and Trademark Office (USPTO) make their data bases available on CD-ROM and on the Internet. Also, many countries have Internet web sites and patent databases on CD-ROM. Information made available on CD-ROMs facilitates search for patent information. These developments in information technology may affect the patent policies of firms and enhance the value of trade secrecy as an alternative to patenting.

Box 1. Status of online access to patent information

- The EPO does not make its patent data available on the Internet – and is unlikely to provide access to more than its register data pending revision of the EPO Patent Information Policy.

- The USPTO makes available bibliographic US patent data back to 1976, but has no plans to extend the time coverage or to make full text and images available. There is an AIDS database which contains images. Some USPTO patent data is available on the Internet via third parties.

- The JPO has recently made available English abstracts and bibliographic data from the latest published Japanese patents, as a test service through the Internet.

- Other patent offices (e.g. the Canadian) are starting to provide access to their patent data on a limited experimental basis.

Source: OECD.

NATIONAL DIFFERENCES IN PATENT REGIMES

First to file...

In spite of progress achieved through the TRIPS Agreement, differences among national patent systems remain a source of contention and can have important consequences for the innovation process. In part, these different systems have identical aims – to reward the inventor – but different approaches in establishing who the inventor is: the US system attempts to reward and protect the original inventor and the confidentiality of the invention until full protection is granted, while other systems have chosen an approach that allocates priority to the first applicant. The Japanese system is said to have been designed with the dissemination of technology as its main objective, with rapid publication, limitation of the scope of the patent, and compulsory licensing when needed for the exploitation of other patents.

The most significant difference in the patent systems of the OECD countries pertains to who is awarded a patent. In the case of conflicting applications (that is, applications concerning all or part of the same invention), a vast majority of OECD countries apply the so-called ***first-to-file*** rule which, as the term implies, will generally result in the first applicant having priority over any subsequent applicant. Its main advantage is its simplicity as it virtually eliminates cases of conflicting applications, while making provisions for challenge when an invention is "stolen". In some other countries, notably the United States, the applicable rule is known as ***first-to-invent***. The rule requires applicants, in the case of a conflict, to prove before the US Patent Office which of the applicants was first to invent. This system is based on the view that patents are supposed to reward innovation and, in that light, it is more equitable to grant the monopoly to the person who was first to innovate.

This rule has caused some problems, however, in forcing applicants and/or patentees to engage in conflict proceedings that are often costly and time-consuming. Another complaint advanced during the TRIPS negotiations and other fora was that the territory considered to determine inventive activity was basically that of the United States. This was viewed as a disadvantage by foreign inventors. However, this situation seems to have improved considerably since US implementation of the Uruguay Round results. Section 531 of the *Act to Implement the Results of the Uruguay Round of Multilateral Trade Negotiations*, Public Law 103-465 of 8 December 1994 (entry into force: 8 June 1995) amended section 104 of title 35 of the United States Code concerning inventions made abroad, to state that:

> *"... an applicant for a patent, or a patentee, may not establish a date of invention by reference to knowledge or use thereof, or other activity with respect thereto, in a foreign country other than a NAFTA country or a WTO member country..."*.

In practice, differences between first-to-file and first-to-invent countries tend to extend the period during which the validity of a new patent is not clearly established and thus create uncertainty: an applicant or a patentee never knows whether a competitor may suddenly appear claiming an earlier date for the same invention. This uncertainty affects investments and development efforts towards the production of commercial products and thus defeats one of the objectives of the patent system. Small and medium-sized

firms, that cannot take major risks and do not usually have the resources required when challenged by litigation, are especially concerned about continuing international differences in filing rules.

Disclosure

Novelty is a fundamental condition of patentability. An invention must be new, which is to say that the knowledge should not have existed prior to the relevant priority date by way of written or oral disclosure. The disclosure of an invention, that makes it part of prior art, may take place in three ways:

- ◊ by a description in published writing or in a publication;
- ◊ by a description in spoken words uttered in public;
- ◊ by the use of the invention in public or by putting the public in a position that any member of the public can use it.

Some countries (Australia, Russia and the United States) have established a grace period of 12 months that prevents a novelty-destroying effect in case of unavoidable or inadvertent disclosure by the inventor before the filing of a patent application. This is considered to be helpful for inventions that need to be tested in the eyes of the public. Also, industry-university collaboration prospects are affected because academic scientists feel the need to publish their results rapidly. Broader international acceptance of the grace period has thus been supported by some while others have pointed out the disadvantages to third parties, in particular due to an extension of the period of uncertainty.

Novelty is also examined from a world-wide perspective. In other words, where an invention is imported, the State will grant the monopoly only if the invention was not disclosed anywhere in the world. In practice, however, since it would be difficult to file an application in all relevant countries quickly enough to avoid the objection of prior disclosure, the rule of the so-called "priority date" was established and enshrined in the *Paris Convention for the Protection of Industrial Property.* According to Article 4 of that Convention, a national filing date in one of the member countries of the Paris Union (that is, countries that have adhered to the Paris Convention) gives rise to a right of priority for a period of 12 months. In practice, it may be said that the filing date in subsequent countries is the same as in the country of the first filing, provided the later filing is made within 12 months of the first filing. The general principle has been recently reinforced, with the TRIPS Agreement requiring member countries not to discriminate in the availability of protection according to the place of invention.

One consequence has been to compel a number of countries – most notably the United States – to adjust to the new standard and take account of patent filing dates in all World Trade Organization Member countries. This in particular has placed non-US patent applicants on the same footing as US nationals, but has also made it necessary for them to comply with the first-to-invent US system. On the other hand, the United States had to adjust to the new duration standard set by TRIPS but introduced a new type of *Provisional Patent Application* for the establishment of the national priority system: under this provision, US inventors can secure their national and international priority by filing with the PTO a preliminary document such as a manuscript or a lecture. This change was in particular intended to support the inventive activities of scientists (Straus, 1997).

Another emerging source of difficulties might result from the development of new electronic communications media such as the Internet. Disclosure is traditionally viewed as *disclosure in tangible form* through writing or publication, but the intensive use of network-based communication by scientific groups and by business generates new forms of intangible writing: researchers, for example, communicate their findings through electronic messages that are not secure. The extent to which such

communication represents a “disclosure” is now open to question and has become a major concern for research managers. Early international understanding on this issue would be required to avoid discrepancies between solutions adopted in different countries.

Patent applications

Countries also have different practices in disclosure of patent applications. The United States keeps patent applications confidential until the patent is granted (which can be at least two years after filing), and will not disclose the application if the patent is not granted. In the European Patent Organisation and Japan, the application is published after 18 months. Early publication favours dissemination, use of the new knowledge and reduces the threat of subsequent litigation. Examination of the validity of the application is another important phase of the process. In the United States, all applications are examined automatically, while Japan and Europe do so only on request. In Japan, the request for examination must take place within seven years after the filing date of an application, and within six months after the publication of the search report in Europe.

In Japan, any person may file an opposition against a granted patent within six months of publication. In Europe, the possibility exists in several countries but this period is extended to within nine months of the granting of patent rights. The US procedure involves two steps that may lead to the cancellation of a patent – interference proceedings and re-examination: these are different from opposition procedures in that the former does not involve opponents and the latter may be requested by third-parties or the patentee throughout the lifetime of a granted patent. The interference procedure is intended to determine who was the first inventor, and is necessarily complex and costly.

Duration

The TRIPS Agreement of 1993 represents a major step forward towards greater homogeneity in international management of the patent system, including the term of protection granted through patents. It is generally agreed that the Agreement formulates a set of common rules that will go a long way towards removing cumbersome differences between national patent systems and creating a genuine international patent market that is expected to encourage broader and more rapid diffusion of innovation. The general principles underlying the TRIPS Agreement have met many long-standing industrial demands, in particular with respect to the scope, duration and level of protection in a number of areas:

- ◊ Patents shall be available for any inventions, whether products or processes, in all fields of technology, provided they are new, involve an inventive step and are capable of industrial application. Members may exclude inventions necessary to protect *ordre public* or morality, including to protect human, animal or plant life or to avoid serious prejudice to the environment: they may also further exclude diagnostic, therapeutic and surgical methods for the treatment of humans or animals, plants and animals other than micro-organisms, and essentially biological processes for the production of plants and animals other than non-biological and microbiological processes. However, members shall provide for the protection of plant varieties either by patents or by an effective *sui generis* system or by any combination thereof.
- ◊ Patents shall be available and patent rights enjoyable without discrimination as to the place of invention, the field of technology and whether products are imported or locally produced.

- ◊ Exclusive rights shall include, for products, the right to prevent third parties not having the owner's consent from the acts of: making, using, offering for sale, selling or importing for these purposes that product, and for processes the right to prevent third parties not having the owner's consent from the act of using the process and from the acts of: using, offering for sale, selling or importing for these purposes at least the product obtained directly by the process.
- ◊ Patent owners shall also have the right to assign, or transfer by succession, the patent and to conclude licensing contracts.
- ◊ The term of protection shall be at least 20 years from the date of the filing of the application.
- ◊ Patent protection must be provided for pharmaceutical and agricultural chemical products.

While the 20 year duration of patent protection is adopted in many countries and generally considered to be adequate, there remains at least one area of contention. Firms in the pharmaceutical sector criticise it as inappropriate in view of the length of time needed to secure marketing approval: numerous pharmacological, toxicological and clinical testing procedures are required in most countries which can take up to 12 years. In the United States, Japan and the European Union, provisions now exist to allow for an extension of patent protection by five years.

Interpretation of claims

One of the most difficult aspects of the drafting of a patent is in identifying the subject matter which is novel, and hence protectable, in light of a survey of prior art as disclosed in published patents and the technical literature. The principal claim of the patent will thus focus on the part or parts of the invention that qualify for patenting and will be spelled out in a document called specification. The part of the specification which defines the extent of the exclusive right is called the *claims*. The drafting of claims requires considerable skills: broad claims which extend to prior art are in principle invalid, and narrow claims may allow the invention to be "invented around" and will thus confer too little protection (Adams, 1997).

This issue is an important one from a patent enforcement perspective. In practice, disputes between patentees and infringers often relate to interpretation of claims: the wording of patent claims can never anticipate all contingencies. Once a patent has been published, all the competitors of the patentee have access to the details of the patent. They can then circumnavigate the immediate wording of the claims to achieve the same results by similar means. All the possible solutions that can be devised for these purposes cannot be anticipated when filing a patent. A large proportion of litigation cases revolve around the question of whether similarly acting features are equivalencies that are included into the patent's scope of protection. Hence the importance of the *doctrine of equivalence* acknowledged by some countries, that postulates that claims cover not only the elements that they explicitly express, but also equivalents that perform substantially the same function in substantially the same way and produce substantially the same result as the element expressed in the claim.

There are at present national differences in the acceptance of equivalents by the courts of Member countries. Demands for an international understanding on this point have often been expressed by patent attorneys and industry in order to ensure better global enforceability of patents. More generally, differences in national outlooks on patentability will have a strong impact on the formulation of claims. For example, a broad scope is allowed in the United States, while in the Japanese Patent Law the technical

scope of a patented invention will be determined on the basis of the statements of the patent claim. These different practices have been the source of complaints from both sides (GAO, 1993; Kamakawa, 1994).

Institutional profiles

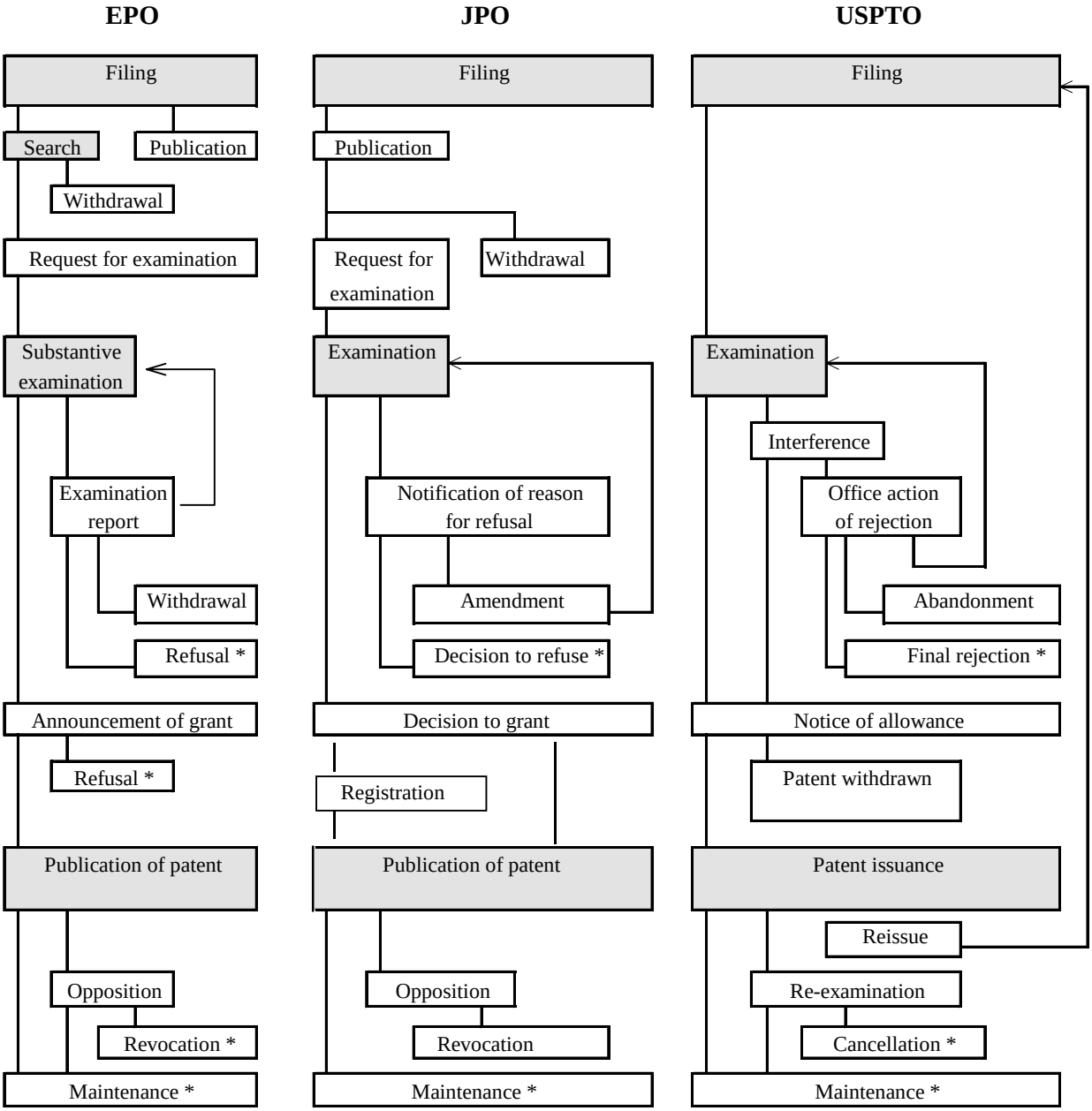
The operation of the patent system falls in most countries under the responsibility of a government institution, the Industrial Property Office, usually referred to as the Patent Office. Its precise position in government will vary: it may be under the Department of Commerce (or Trade), as in Japan, the United Kingdom and the United States, it may be with the Ministry of Justice, as in Germany, or it may be with intergovernmental Patent Offices such as the European Patent Office (EPO). Most Patent Offices, however, have faced new challenges in recent years due to budget pressures and rapid increases in workloads due to the rise in filing rates that have led offices to seek savings. Efforts have been deployed for these reasons to increase efficiency, including through process reengineering and automation.

A question open to debate is the extent to which the rapid acceleration of demands has undermined the efficiency of patenting. The more ambitious the tasks set for the Patent Office in a given country, the greater the risk of diminished ability to cope effectively with the rapidly surging flow of applications. Based on available data, the world-wide demand for patent rights rose from 1 538 480 to 2 302 500 between 1990 and 1994, an increase of 50 per cent corresponding to a 12 per cent increase per year. Between 1993 and 1994, each invention for which one patent was sought led to 2.61 subsequent filings for patent rights in another geographic area, against 1.78 three years earlier (EPO, 1995). This surge results from the ongoing internationalisation of patent rights and illustrates the mounting pressure to which many national patent systems need to adjust. It is worth recalling here that many of the countries confronted with the rising tide of patent demand also need to cope with the challenge of the transition to full implementation of the TRIPS Agreement.

Procedures

The main task of a Patent Office in any country is to receive patent applications and decide in each case whether a patent should be granted or refused. As illustrated in **Figure 1**, the steps involved are not necessarily similar in the European Patent Office, the Japanese Patent Office and the US Patent Office. Another task is to deal with the renewal of the patents granted. Also, the Office has a function of dissemination of technological information to the general public; this becomes more and more demanding in the general context of internationalisation and rapid technological advance. Yet, speedy patent procedures are increasingly important since the company first commercialising a product has a significant advantage in gaining market share.

Figure 1. Major procedure phases in patent offices



Notes: *Decision may be appealed
EPO = European Patent Office; JPO = Japanese Patent Office; USPTO = US Patent Office

Source: European Patent Office (1995).

A number of important differences between national patent procedures still exist among OECD countries and can generate uncertainties with regard to the validity of patents pending or granted. The major procedures carried out by Patent Offices include:

- ◊ ***Examination as to form***: the Patent Office needs to check that the requisite formalities (ranging from format of paper to inclusion of elements such as the request, description and claims, and including payment of fees) have been complied with, and decide if there is need for correction by the applicant or if the application should be refused.
- ◊ ***Publication of the application***, including the assignment of a serial number and of a classification symbol according to the relevant sub-division of the International Patent Classification, which is prescribed in some countries but not in others (for example, the United States). As noted above, there are significant differences between national practices in this respect: in the EPO and JPO, the application is published 18 months after the date of filing or priority date at the latest, without regard as to whether the application has already been examined. In the USPTO, applications are not published. This has prompted criticism from abroad that applying firms can use a number of procedural means to delay patent granting – and hence publication – thus extending the period during which their competitors remain unaware of a pending patent, often referred to in such instance as a "*submarine patent*". The implementation of an 18-month publication requirement in the United States is currently under consideration.
- ◊ ***Examination as to substance,*** which in some cases is prescribed to determine if the invention is patentable: this examination may be implemented by the staff of the Office, possibly with the assistance of experts, or may be undertaken under the Patent Co-operation Treaty by another major Patent Office, in particular through WIPO, as a service offered to developing countries. In the EPO, the examination is done in two phases: first a search is done to establish the state of the art with respect to the invention; second, the inventive step and industrial applicability are examined in the substantive examination. In the procedure adopted by the JPO and USPTO**,** the search and substantive examination are undertaken in one phase. Another major difference is that filing a demand with EPO is taken to imply a request for a search, but not for substantive examination that must be specifically requested within six months of the publication of the application. Filing with JPO does not imply a request for examination that may be filed up to seven years after the filing. Filing with USPTO is taken to imply a request for examination.
- ◊ ***Opposition procedure***, which is provided by the legislation of many countries: the published application may be challenged by a third-party whose claim can then be assessed in light of the results of its own search that seeks to establish that the invention is already in the state of the art.
- ◊ ***Refusal or grant of patent***.
- ◊ ***Maintenance***: while patents have a duration of validity of usually 20 years, they need to be "maintained", with the payment of an annual fee (roughly triennial in the United States), the amount of which may increase as one approaches the end of the maximum term of protection.
- ◊ ***Compulsory licences***: the Office will usually hear demands for, and pronounce on, compulsory licenses, subject to some control by the court.

◊ ***Patent information services*** are also provided by Patent Offices and have been viewed as increasingly important for technology diffusion, thus requiring major investment in information processing and communications technologies **(Box 2**).

Box 2. Automation in a patent office: the case of Japan

- In the Japanese Patent Office, the implementation of a *paperless system* was initiated in 1984, featuring the comprehensive computerisation of all aspects of the patent process. The aim was the speedy and accurate processing of applications and the granting of rights. When fully in place, the system will allow all patent documents to be processed as part of a data base through all stages of the patenting process. The system also allows for on-line access for communication between the Patent Office and applicants.
- In December 1992, the JPO became the first in the world to automate its entranceway by accepting on-line applications in electronic form. At present, almost all applications are received in electronic form (two thirds through on-line facilities, one-third through floppy disks). CD-ROMs are also used extensively for publication and information dissemination purposes.

It is difficult to evaluate and compare the effectiveness of major patent granting phases in different Patent Offices. The number of pending applications awaiting action at the next step gives an indication about the workload in the three major offices from 1994 to 1995 (EPO, 1995):

◊ The pendency for search in the EPO increased in numbers from 44 300 to 50 200 (13 per cent) and in months from 12.1 to 14.7; the number of pending applications awaiting a request for examination by the applicant decreased at the same time 12 600 to 12 100 (4 per cent).

◊ In the JPO, this number is much higher at 2 132 000 due to the longer period (seven years) allowed to request an examination.

◊ The number of pending applications in examination decreased in EPO to about 124 000, while the pendency in months increased slightly to 24.7 months.

◊ In the USPTO, the average time for either abandoning or issuing an application was 20.8 months in 1996.

Enforcement

Another problem is the difficulty of enforcing patent rights at both the national and international levels once the common legal and regulatory frameworks have been put in place. In some countries, the means of enforcing existing patent rights may be inadequate. And in some cases, countries may seek to support domestic industry by protective measures based on unclear and loose legal structures for litigation by foreign firms. Efforts have been made in the TRIPS Agreement to impose standards concerning the enforcement of intellectual property rights (Part III: Articles 41 to 61). All enforcement procedures must meet a number of general obligations in order to ensure effectiveness and due process. In addition, the Agreement provides for general safeguards, injunctions, damages, border measures, provisional measures and criminal penalties to ensure fair, effective and equitable proceedings.

Even though the TRIPS Agreement is a ground-breaking accord, many provisions are worded in a fairly general manner and may give rise to interpretative problems. Right-holders, in particular firms that do business in many countries, are aware of difficulties in enforcing patent claims in foreign jurisdictions. In addition, enforcement difficulties are enhanced by the transition period available to many countries before full implementation of the TRIPS Agreement. Entry into force was in principle set at 1 January 1996, but

developing countries and countries in the process of transformation to a market free-enterprise economy have been allowed an implementation delay of four years. Furthermore, developing countries which are obliged to extend product patent protection to types of products not previously patentable in that country (as is often the case with pharmaceuticals) may avail themselves of an additional five years. There are growing demands for closer monitoring of progress achieved in these countries towards implementation of the Agreement within the allowed transition period. Some countries are already said to be lagging behind, raising the threat of major losses for firms that hold patents that could not be enforced at the expected time in these countries. These uncertainties affect investment decisions, including priorities in research and development.

In many cases, even the full implementation of the TRIPS Agreement will not necessarily be sufficient to allow for successful litigation against infringement of patents. The Agreement sets no obligation on Members to put in place a judicial system for intellectual property enforcement distinct from that for the enforcement of law in general, and differences in this respect contribute to the disparity of approaches in the developed world. In countries with new intellectual property systems, the judiciary may, in many cases, not yet have acquired sufficient practice and experience to deal effectively with this type of highly specialised litigation. And in all cases, a patent infringement lawsuit is expensive.

A typical lawsuit would begin by an application for injunctive relief to stop use of the allegedly infringing product or process, and then continue to a phase where the validity of the patent may be questioned. If the patent is considered valid and infringed, damages may then be assessed. In addition, the judicial process may last a few years and the result is always uncertain. The patent claims scope (i.e. the technology area to which the monopoly applies) may be limited by interpretation or the patent may simply be considered invalid. In the case of a process patent, the difficulty in obtaining evidence of infringement is greater, and the burden of proof sometimes onerous. In many cases, evidence must be deduced by examining an otherwise non-infringing product allegedly making use of the protected process. This is again complicated when the lawsuit involves going to courts in foreign jurisdictions, with possible added difficulties linked to the language and local customs.

There are demands for specific provisions that would reduce the difficulties and costs of IPR-related litigation, particularly at the international level, perhaps through more systematic rules on mediation and arbitration. Many countries have national associations of arbitrators, such as the Chartered Institute of Arbitrators (CIArb) in the United Kingdom, which is affiliated to the International Chamber of Commerce (ICC) operating under the International Court of Arbitration. The ICC has also made available model terms for arbitration clauses in contracts. Arbitration could become more systematic, however, to assess the extent of damage suffered by the right-holder and to determine whether infringements fall within the scope of claims. The latter is at present a frequent cause for litigation. In the patent area, it is however difficult – if not impossible – to arbitrate on the validity of the rights themselves, since this falls within the sphere of the law and the courts. The public interest in fact demands a ruling in such cases. It is therefore important that legal systems be simplified and made more accessible. Internationalisation to achieve greater uniformity should be promoted with care not to have the opposite effect.

PATENTS AND INNOVATION

Patents vs. secrecy

It is generally acknowledged in industry that patenting strategies have always differed from firm to firm and from one branch to another. Some firms (such as Michelin in France) have a long established tradition of preferring secrecy and avoiding patenting whenever possible: this is viewed as necessary to prevent competitors from anticipating future products and market moves. Some branches (for example, pharmaceuticals and more generally, chemicals) tend to set a high priority on patents. According to the European Patent Office, an increasing proportion of patent applications relate to high technology areas (computers and automated business equipment; micro-organisms and genetic engineering; aviation; communication technologies; semi-conductors; and lasers) (EPO, 1995). At the aggregate level, an overall rule seems to be that the higher the R&D investment in a given sector, the greater the likelihood of "*patent-prone*" behaviour. More detailed analysis, however, brings to light additional factors. One such factor is the ease with which a product can be reverse engineered: if this is simple, patent protection will probably be preferred. There is also a strategic relationship between patents and other decisions (marketing, product replacement, etc.). It is in this light that the results presented below should be assessed.

A recent survey of the American manufacturing sector shed some light on the current industrial view of patents as one of the instruments to protect innovation rents. The study showed that secrecy ranked first (over patents, lead time, sales and service or manufacturing complexity) among 14 of the 43 industries surveyed as a method for product innovation protection, and 28 out of 43, or 65 per cent, for process innovation protection (Cohen *et al*., 1996). Similarly, in a 1994 survey of German small and medium-sized enterprises with in-house R&D activities, only one third of the respondents said they used patents to protect their intellectual property. Another third relied on secrecy, pointing to the high cost of litigation. The last third answered that they introduced innovations faster than their competitors, the life-cycle of their products being on average not much longer than the time required for a successful patent application in Europe (about 2.5 to 3.5 years) (Fest, 1996). Another survey, carried out in France in 1991 by the Industry Ministry, also revealed limited and uneven recourse to patents: only 10 per cent of innovating firms regarded patents as a very important source of innovation (Guellec *et al*., 1996).

One striking result is the ascendancy over the past decade of secrecy as one of the two key mechanisms (along with lead time) for protecting competitive advantages in product innovation, and its ascendancy over lead time in protecting process innovation. Patents are used in addition to one of these two instruments, and their value is thus not likely to equal the private value of an innovation, but only an increment to the return that would have been realised to one or several other instruments. There were differences between branches (with patents assessed as almost as important as secrecy in pharmaceuticals). Nevertheless, the relative importance of patenting seems to have declined overall. The reasons were not clear, although one hypothesis was that legal costs associated with patents have risen dramatically since the early 1980s and might have raised the threshold before which firms will apply for a patent. If this is the case, the growing relevance of global considerations and the complexities and costs associated with international patent protection might still diminish the relative importance attached to

patents and encourage the use of other modes of protection for innovation. Additional assessments are required, however, to clarify the extent to which these trends reflect technological and marketing shifts or inadequacies of the patent system.

Cost of patents

Trends in the costs of patenting may have a major impact on the innovation strategies of firms at the national and, even more so, at the international level. There appear to be wide divergences at the national or regional level in the costs of obtaining and maintaining patents**.** In spite of a sharp reduction of EPO fees (about 30 per cent) that took place on 1 July 1997, the cost of obtaining European patent protection is usually said to be much higher than in the United States and Japan. Part of this difference is due to translation expenses that are required to ensure disclosure in the language of the country where the patent is filed, but other costs related to Representation and Patent Office fees are also involved, as well as requirements in respect of unity of inventions that may require different numbers of patents to be filed in each region for the same invention. The subject has generated much controversy, and there is no accepted quantitative assessment that would allow for more precise evaluation of differences.

While the costs of patenting are usually considered to be lowest in the United States, enforcement costs of intellectual property rights through litigation are considered extremely high as compared to Europe and Japan mainly due to different legal structures. In the United States, significant costs and intricate procedures (e.g. discovery) are imposed on firms when their patents are infringed. A typical lawsuit for an ordinary claim costs anywhere between US$ 25 000 and US$ 200 000. A large lawsuit may be much more expensive, particularly if appeals are added to the cost of the initial (first instance) phase. Some estimates of patent infringement litigation in the United States are of the order of US$ 1 million, which effectively bars most small firms from coping effectively (Straus, 1997). This could be compared to less than US$ 600 000 in Europe.

There is no question that the differences between the costs incurred for patent filing under different national systems are not negligible for patentees. In practice, however, there are many other related expenditures that considerably increase the price of intellectual property protection, the more so when globalisation requires the development of patenting strategies world-wide. The direct costs involve, for example, translation and attorney's fees as well as yearly maintenance. Large firms that own a sizeable portfolio of patents also need to develop management and data processing structures. They must make provision for possible litigation in several countries. The implications might be far-reaching: for example, all research laboratories maintained by large firms that take patents in the United States now need to adjust their bookkeeping practices world-wide to meet US requirements, which might be essential if an infringement case is filed against them.

The costs of patenting, patent maintenance and patent management are rising steadily. The key question, for inventors and Patent Offices alike is: *does the protection thus achieved really deserve the investment*? A significant change in innovation patterns involves an increase in incremental improvements that are developed on a continuing basis in many sectors, such as information technology, biotechnology and pharmaceuticals. *Should patents be filed systematically at each step*? In these areas, this has not necessarily been the prevailing practice of most firms in the past. However, management has now become more fully aware of the value of patents as a source of income and a strategic asset in establishing co-operation with other firms, so that patenting is increasingly encouraged. It can be expected that the number of patents filed will continue to grow rapidly. For example, a large information technology firm reported 900 patents filed in the home country in 1996 and expected more in 1997, with a corresponding growth in international filings.

Patent Offices might find it more and more difficult to handle the growing numbers of applications while the costs of patenting for firms might lead them to explore other protection strategies. The future evolution of the patent system might thus be determined by the structure of the direct and indirect costs at international level. Industry recommends some levelling and lowering of these costs through reducing enforcement costs in the United States while lowering the cost of patenting in Europe (IRDAC, 1996). This would particularly aid smaller, technology-based firms which are crucial for innovation, economic growth and employment.

Assignment of patent rights

The patent system was originally developed for individual independent inventors. Today's inventions are almost always generated within specific institutional environments – firms, university departments and institutes, hospitals, government research establishments, etc. The system has had to adjust to this situation. In principle, an invention belongs to the inventors. In practice, when the inventor is employed, a distinction is usually made between *service inventions* and *free inventions*. The former are made as part of the conditions of employment or based on the experience of the employer. The latter are unrelated to the employee's tasks or to the employer's experience and activities. Service inventions can be claimed by the employer. These distinctions underpin general approaches to the assignment of property rights to an invention made by an employee. Many countries have, however, adapted these principles to account for the special case of research workers. Differences between national systems may be significant in this respect, but perhaps less so than differences between institutional practices: within each country, the solutions chosen by firms, universities or other research organisations will often vary extensively.

This can be illustrated by the example of academic researchers. Under most first-to-file regimes in Member countries, inventions made by academic staff are not exempted from the general principle that assigns patent rights to the employer. There is such an exemption in only a small number of countries (such as Denmark, Norway, Germany and Sweden), but the employer may still have a right to a reasonable share of the proceeds earned from the invention. The exemption from the general rule will, however, not apply to non-academic researchers, for example working in institutions such as the Max-Planck-Gesellschaft, etc. Under first-to-invent systems such as in the United States, inventions quite logically belong in principle to the inventors. Employment contracts, in particular of academic staff, will often compel the employee to transfer patent ownership to the employer, or at least to transfer the exploitation rights for the patents resulting from service inventions.

The practical consequences are that when the employer has an active interest in patenting inventions, internal regulations and contractual arrangements will be in force in any case to provide the institution with the means to at least share in the proceeds and often regulate publication, exploitation and licensing. In cases of research conducted with the support of firms, industry-university arrangements usually assign specific rights to the academic institution.

A special case to be mentioned here occurs when government has been involved in the funding of the research that has resulted in an invention. Since 1980, US federal law allows beneficiaries (universities as well as small businesses) to elect to retain title to inventions produced under such conditions, in order to encourage exploitation. Large businesses were given similar favourable treatment in 1983 by regulation although foreign companies may be excluded, but are usually permitted to retain a royalty-free license in their own inventions. In Japan, where the government held all patent rights arising from sponsored research, the situation changed in 1994 – with private companies (including foreign ones) allowed to retain at least 50 per cent of the rights.

Due to these different systems and practices for the assignment of patent rights, several problems may thus arise in the conduct and exploitation of research:

- ◊ In the case of academic research, conflicts may arise as a result of the researchers' need to share findings with colleagues and publish results while the university and its business partners are keen to prevent premature disclosure of a potentially patentable discovery.
- ◊ In practice, researchers operate under very diverse conditions with respect to industrial property rights: contractual arrangements between employers and employees may involve different configurations with respect to the right to file for a patent, the acknowledgement of the inventor's role, the allocation of rights of exploitation, licensing, distribution of returns, etc. This may affect the sharing of background knowledge in research groups.
- ◊ This complexity is increased by the fact that not all of the academic population involved in research belong to the "academic staff": postgraduate students, for example, are usually entirely free to retain full control of their inventions.
- ◊ In the case of research consortia, especially at the international level, involving a number of researchers with different institutional backgrounds, it is not always easy to determine the extent to which an individual is empowered to make commitments with regard to the assignment of patent at the conclusion of the work.
- ◊ Several Member countries (in particular the United States) permit licensing by joint owners of patents without accounting to each other, but the differences between the patent regimes under which each participant in a research team operates might be a source of conflict rather than an incentive for continued co-operation.
- ◊ The conflicting requirements of future commercial interests and academic values are not easy to reconcile within the academic world. Not all universities that hold patents have developed proactive policies to seek exploitation; conversely, exploitation might be sought at the cost of allowing interference of commercial considerations with the academic environment; finally, the quest for long-term, "*no strings attached*", support from firms in exchange for licensing may not always be conducive to the selection of the more promising development and marketing opportunity.

These patenting problems linked to research are to a large extent illustrations of the difficulties of reconciling the different perspectives of scientists and market actors. There is no question, however, that the growing importance of research implies major changes, leading to more and more intense interfaces between research and commercial strategies. Patents, and more extensively all forms of intellectual property protection, are at the core of the required adjustments, because:

- ◊ innovation places greater emphasis on the interactive and collective aspects of innovation, and on the exploitation of existing knowledge bases;
- ◊ the traditional forms of intellectual property protection may not yet have adjusted rapidly enough, in particular to take into account the greater diversity of interests involved;
- ◊ intellectual protection systems do not provide at the international level, and often at the national level, the full range of incentives required by different forms and patterns of innovation that are characterised by continuous incremental improvements of products and processes, co-operation between competitors in the sharing of knowledge, novelty based on the recombination of existing knowledge, and increased importance of fluctuation configurations of collective research (Foray, 1994).

Joint international research

Differences in patent rights will affect international research collaboration, in spite of the fact that joint research ventures are more likely to form at the pre-competitive stage, when existing and expected property rights are small and spillovers hard to contain. At present, when international R&D consortia are formed, the procedure to protect any useable outcome is often agreed in advance. Property rights are usually established with respect to the existing knowledge that is shared between partners (*background knowledge*) and the expected results of the effort (*foreground knowledge*). In view of the variety of conceivable situations (not to mention fluctuations, when the background knowledge of a venture is the foreground of another, or when the partner in a given venture is a competitor in another), such IPR concerns are often addressed through *ad hoc* contractual arrangements rather than by reference to a specific legal or regulatory system.

In many cases (for example, under the EC project ESPRIT), the background knowledge is licensed to the co-participants. Foreground knowledge can be owned by the venture and subsequently licensed to participants (for example, in the case of Japan's Very Large Scale Integration project or the US Microelectronics and Computer Technology Corporation) (Cameron, 1997). A central concern is to prevent leaks of the background and foreground knowledge that would provide competitors (*freeloaders*) with opportunities to access benefits without having had to share in the burden of the venture (Park, 1997). Problems may arise when major sources of difficulty have not been anticipated. This will often be the case when the results of the research have broader or narrower scope than expected, when firms change strategies in mid-course with respect to development and marketing or when vital appropriated background information has not been shared, perhaps because of a lack of recognition of its relevance.

Specific examples of potential sources of conflict in international research due to unclear or conflicting patent practices may include:

- ◊ A relevant patent is not declared as part of the background, because the rules in some countries such as the United States do not require declaration of pending patents.
- ◊ An important background patent is subsequently found to have been the object of an exclusive licence to a firm that is not part of the venture.
- ◊ The research results may be found to have so many patents associated with them that licensing fees would be excessive in relation to market prospects unless all participants agree, for example, to share licensing fees.

With regard to filing rules, the country where the first application is filed is not a crucial factor to prefer first-to-invent to first-to-file, since (a) patents must be obtained for all relevant territories and (b) the application filed in one country will benefit from the priority date in other countries. If collaborative R&D involving researchers from a country with a first-to-invent rule as well as from first-to-file rule countries leads to a patentable invention, the different systems would, however, establish different dates for the validity of the patent rights.

Since there has been world agreement on a 20 year duration counted from the application date, this means that the patent may expire one year earlier in the home country as a result of the international provisions, on the setting of the "priority date". One solution is for international research agreements to recognise a common base for setting priority dates. At present, the reality of the situation is that caution will usually dictate the choice of the least favourable priority date regime – a solution that both industry and academic researchers may find unsatisfactory for different reasons: the former will often complain that the delays

are not sufficient for the development of well-informed patenting strategies, while the latter may feel constrained by the need not to disclose their results through publication.

A number of more general legal and regulatory framework conditions affect the operations, viability and outcomes of research ventures at the international level. They include the fiscal regimes that apply to intellectual property rights and licensing, the impacts of national and regional competition laws, and technology transfer regulations. For example, although most governments encourage joint ventures in research, various aspects (ranging from distribution of rights and licensing restrictions to marketing agreements) may be seen as contraventions to anti-trust laws (Cameron, 1997). What is permitted or not in this context is not always clear and may vary from country to country; the extent to which these conditions affect international research ventures is not known.

Foreign investment and trade

Another issue that often arises in this context concerns the principle of territorial jurisdiction. For reasons of national security, among others, some countries require enterprises incorporated under their jurisdiction to file the inventions first in that country, regardless of the location of the business or research in question. Other governments require companies to file first with them, regardless of their corporate nationalities, as long as the invention was made in their jurisdiction. Such conflicting requirements can result in legal uncertainty when a research facility of a globalised company in a foreign country makes a patentable invention. In addition, the increasing use of electronic communication and data exchange in the *global research village* make it possible for networks of researchers from a variety of countries to jointly produce patentable inventions. This again raises uncertainly about territorial jurisdiction for patents and underscores the need for greater harmonisation.

More generally, questions may arise with respect to the effects of differences between national patent systems on foreign research investments. In the past, there is no question that these differences have had an important influence on the geographical distribution of R&D efforts of major firms, and on decisions to file patents and exploit them in some countries rather than in others. Intellectual property rights regimes have been cited as one factor considered by multinationals when making decisions concerning investment in foreign research facilities. It is likely that weak patent protection in a given country will continue to limit the research activities of local subsidiaries. The successful conclusion of the transition to full implementation of the TRIPS Agreement might reduce the importance of these considerations in the countries concerned.

Variations in intellectual property rights regimes can also pose non-tariff barriers to trade. Procedures imposed on foreigners filing an application for patent rights or attempting to obtain legal recognition of their rights may be complex and expensive. When applied non-discriminately these procedures may be equated with technical barriers to trade. When they become excessive, they may amount to *de facto* protection of national innovators from competition from foreign competitors. The lines of demarcation between the two are not always easy to define. Patents have become assets in global competition, and are being used as such by patentees. The new trend is towards selective patenting in key strategic areas, coupled with selective licensing against huge fees. These emerging industrial strategies will always have an element of selective strategies in the choice of allies and competitors, with fluctuations over time to reflect evolving innovation strategies, shifting competitive advantages and changing market targets.

Strategic use of patents

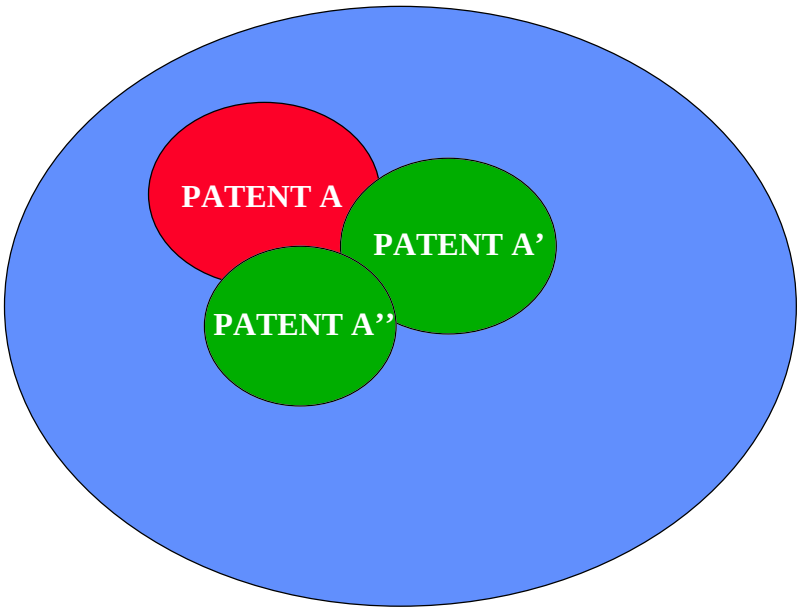
While the original objectives of the patent system are fairly clear and still applicable today, use of the patent system has evolved and now aims not only to protect a particular invention (product or process), but can also be used for a variety of strategic reasons, such as to "*reserve*" as wide a part of a given business sector or technology domain as possible. In fact, when patent protection is used, it may not be to protect an invention as such, but rather to "reserve" an area in which the patentee wishes to establish or strengthen a competitive advantage. A patent may also be used to reinforce a lead time by delaying the market entry of a competitor. Once informed that a patent is pending or has been granted, a competitor would have to be very careful before making a product (or using a process) which could infringe on the patent.

One strategy is to use patents for blocking certain technical areas. A typical patent covers a very precise area within a certain technology domain. In this scenario, the patentee claims a privilege of limited duration in exchange for disclosing the invention. He enjoys a legal monopoly over the patent term (usually 20 years from filing). However, at the expiration of the patent, he will have to accept competition from other firms using the same invention or perhaps building or improving on it. These competitors might actually use new patents to protect such improvements – this is also possible while the patent is still valid, but using a patented technology to add to it requires the patentee's authorisation. In the case of stand-alone patents, it is also expected that the patentee will try to "work" or profit from the invention.

In the blocking scenario, the patentee will usually want to work his main invention, but seeks to keep competitors out of the field surrounding that invention, either to avoid having to face competition from a competing yet not infringing product (this might diminish his image as leader in that particular area) or simply to make it more (legally) difficult to invent around his invention (**Figure 2**). The patentee usually has no intention (at least originally) to work the area covered by the additional patents (A' and A''). In a recent US study, 82 per cent of respondents indicated blocking as a motive for patenting (Cohen *et al*., 1996).

Cases of such strategic use of the patent system have prompted demands by a number of countries, mostly developing ones, to impose on patent owners an obligation to work the patent in exchange for protection. Here, the patentee is *forced* to put the invention's application or "embodiment" (whether product or process) at the disposal of the market; otherwise he forfeits his right. Closely related to requirements to work a patent is the question of compulsory or non-voluntary licenses, since one of the sanctions for non-working in certain countries is the issuance of a license without the right holder's consent. Article 31 of the TRIPS Agreement allows signatories to issue compulsory licenses, but imposes conditions, mostly of a procedural nature, before the license is granted. Article 30 imposes a general condition that any exception to patent rights must "*not unreasonably conflict with a normal exploitation of the patent and [ ] not unreasonably prejudice the legitimate interests of the patent owner, taking account of the legitimate interests of third parties.*"

Figure 2. The blocking scenario in patent strategy



If one looks at the patent system as an equilibrium between, on the one hand, a limited monopoly (both in time and scope) to reward technological innovation and, on the other, full disclosure of a new invention and its industrial applicability, forcing a patentee to work the invention and/or exercising a wide-ranging right to issue non-voluntary licenses may be considered as *additional* conditions, thus tipping the balance towards the "public interest" or the interest of actual or potential competitors. Exclusions from patentability, particularly in key markets, will also tend to reduce the attractiveness of patents. This change of paradigm in the patent system could render patents (and the unavoidable disclosure) of less and less value.

This is particularly true if more industries see secrecy as the preferred form of protection. If an additional burden, namely mandatory working, were placed on right-holders, the effect could be to incite inventors to use other forms of protection such as secrecy, that may prove effective when the lead time required is short, which is usually the case in many sectors at a time of rapid technological change. Patents could then become a last resort and this would be counter-productive as it could reduce the disclosure currently made through patent applications and, as a consequence, the value of future patent information. In other words, if fewer inventions are protected by patents because secrecy is preferred, the resulting lack of technological transparency may have negative long-term effects on the development of the industrial base and research itself.

A counter-balancing factor that has acquired increasing importance in branches such as information technology and pharmaceuticals is the fact that patents are increasingly used as *trump cards*, with companies filing for protection to use them as currency to negotiate licensing or alliances with competitors rather than to undertake direct exploitation of the invention.

In this sense, a major new development has been, since the early 1980s, the creation of a global market for knowledge, with two consequences: on the one hand, mounting pressure toward better protection at the

international level; on the other, a sharp increase in the number of patent applications. This is reported to have had a marked effect in increasing the size of patent portfolios in firms. These involve increasing management costs, however, and more confidential arrangements based on exchange of know-how might be preferred in more mature technological areas where the distribution of forces among established competitors is unlikely to fluctuate drastically. However, patenting strategies need to be set against the fuller background of a whole system of industrial protection instruments, that includes copyright, trademarks, brand names, secrecy, standards, etc. Many firms in the information technology sector, for example, will primarily rely on proprietary standards as the main source of protection for the equipment they supply. Increasingly, it seems that firms have learned to use strategically the whole range of available IPR instruments: in a global market where notoriety is a key asset, patent protection might be less decisive than ownership of a brand name.

To optimise innovation, an appropriate patent policy should factor in all these considerations, including the shortening life-cycle of recent technological developments. Balance must be maintained between the innovation and diffusion functions of patents, and the protection of the public interest to avoid the abuse of a monopoly. Attempts to tip the scales one way or the other will affect the attractiveness of the forms of protection concerned for the inventor or society.

Small and medium-sized enterprises

All of the various problems outlined above will be especially acute for small and medium-size firms that lack the expertise, management skills, foreign reach and resources that larger corporations can master. A study in several EU countries has shown that more than two-thirds of all patent litigation brought before the courts are filed by small and medium-sized enterprises (SMEs). This underscores the importance of patent protection and efficient legal enforcement instruments for smaller businesses and entrepreneurs to defend their innovations against infringement at national and international levels. In contrast, and compared with the number of patents they own, larger firms and corporate enterprises file fewer patent infringement suits to protect their innovations. Apparently, they have other means of defence commensurate with their greater market power (Fest, 1996). Also, as noted below, IPR instruments are not necessarily their preferred system for protecting inventions.

Settlements of conflicts out of court are a frequent feature in cases of litigation among large competitors. When small firms struggle against larger ones, such settlements usually occur after the start of the litigation process, because small firms rapidly exhaust their resources. The main problems encountered by these small firms are: 1) uncertainty, in the context of existing practices in the national patent system, as to the real value of the small number of strategic patents their future is based on; 2) high costs and practical difficulties of patent filing and patent maintenance internationally; and the high costs and uncertain outcomes of litigation.

These difficulties have been recognised to some extent in the United States, where small businesses are charged patent fees at a reduced rate of 50 per cent. But the overall direct and indirect costs of protection remain very high. The extent to which patent systems can adapt to overcome these problems is not clear. It should also be borne in mind that patenting is but one form of industrial protection. A broad systemic analysis of the new trends in the use of the various tools available might be required, to better assess the ways in which small firms – that are a major potential source of innovation – can take full advantage of them.

ANNEX: ROLE OF INTERGOVERNMENTAL ORGANISATIONS

World Trade Organisation (WTO)

Intellectual property was one of the new areas successfully addressed in the Uruguay Round of multilateral trade negotiations and the resulting *Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS)*. The Agreement was a landmark achievement in the field, setting out for the first time minimum standards for a number of key aspects of intellectual property and domestic enforcement procedures. Intellectual property is here defined as: (a) Copyright and Related Rights, (b) Trademarks, (c) Geographical Indications, (d) Industrial Designs, (e) Patents, (f) Layout-Designs (Topographies) of Integrated Circuits, and (g) Protection of Undisclosed Information. In the future, World Trade Organisation (WTO) efforts in the field of intellectual property will be largely directed to the implementation and administration of the TRIPS Agreement.

The TRIPS Agreement aimed at addressing the inadequacies stemming from the coexistence of broad discrepancies between intellectual property rights protection systems in different countries. It contains a comprehensive set of rules establishing minimum standards for the protection of intellectual property and for the first time sets out performance-oriented obligations in respect of enforcement procedures. Contested issues are subject to a multilateral dispute settlement procedure. The TRIPS Agreement extended patentability in all fields of technology; in addition to products, patentability now also covers processes including the product obtained by the process in question. The statutory duration of a patent's life shall not end before the expiration of a period of 20 years counted from the filing date. Any discrimination as to the place of invention, the field of technology and the production site (domestic vs. imports) is not allowed, and the use of compulsory licensing is restricted to a narrow set of jurisdictions.

Another important feature of the Agreement is that the WTO will constitute a forum for further negotiations in the area of intellectual property in several areas, including with regard to patents: i) the review, after four years, of the option to exclude from patentability certain plant and animal inventions; and ii) the examination of the applicability to TRIPS of non-violation complaints under the dispute settlement process.

World Intellectual Property Organization (WIPO)

The main role of the World Intellectual Property Organization (WIPO) is as a world-wide registration authority for industrial property rights. Its outstanding achievements since its inception in 1968 are in this field: the 1970 Patent Co-operation Treaty, the 1989 Protocol to the Madrid Agreement Concerning the International Registration of Marks and the 1994 Trademark Law Treaty are all examples of instruments designed to make it easier to obtain international protection for industrial property rights. However, some other norm-setting treaties concluded under its auspices have not had a significant impact. The 1971 Convention for the Protection of Producers of Phonograms Against the Unauthorised Duplication of Their Phonograms and 1974 Convention Relating to the Distribution of Programme-Carrying Signals Transmitted by Satellite, ratified by 20 States, are limited in scope. Efforts such as the draft Patent Law Treaty and various endeavours in the trademark area have not yielded significant results to date. The two

major treaties that WIPO administers, the *Paris Convention for the Protection of Industrial Property* and the *Berne Convention for the Protection of Literary and Artistic Works*, were last revised in 1967 and 1971 respectively and were both amended in 1979.

WIPO, due in part to its comprehensive membership, will continue to play a key role in agreements on intellectual property rights. With 164 member states, reaching consensus on important issues is the aspect of its work which is most important, but most time-consuming. In addition, its relations with industry are funnelled through non-governmental organisations (NGOs), with some 100 in attendance at many meetings.

United Nations Education, Science and Cultural Organisation (UNESCO)

The United Nations Education, Science and Cultural Organisation (UNESCO) has traditionally been active in the promotion of scientific research and access to cultural material. As such, it has played a significant role in raising awareness of the importance of intellectual property, notably in developing countries. It administers the *Universal Copyright Convention* (UCC), signed in 1954 and revised in 1971. The UCC incorporates standards lower than those of the Berne Convention, which made it easier to accept for a number of countries. The importance of the UCC has greatly decreased, however, owing to the adherence to the Berne Convention of the United States and more than 20 other countries in recent years and the conclusion of the TRIPS Agreement (which incorporated by reference the substance of the Berne Convention, in particular as regards WTO Members not party to that instrument). Its importance as a forum to discuss issues with a great number of countries and representatives of users as well as right-holders should not be underestimated.

Organisation for Economic Co-operation and Development (OECD)

The OECD, primarily the Directorate for Science, Technology and Industry (DSTI), has several ongoing projects relating to intellectual property rights. The OECD has traditionally provided analytical support to the work of other international organisations as well as developed guidelines in specific fields such as information technology and biotechnology. The following are the main IPR-related activities of the DSTI, which are co-ordinated by an internal steering group:

> **Working Party on Biotechnology –** The Working Party on Biotechnology of the Committee for Scientific and Technological Policy (CSTP) maintains an interest in the role of intellectual property rights in maintaining the incentive for research, development and investment in biotechnology-related activities. It has completed a survey on *Intellectual Property, Technology Transfer and Genetic Resources* (OECD, 1996*b*) and is working with the Trade Committee on trade-related issues in biotechnology.
>
> **Working Party on Innovation and Technology Policy** (TIP) **–** The CSTP Working Party on Innovation and Technology Policy has identified intellectual property rights issues as a major area of interest in its work on international technology issues. The TIP is analysing the relationship between patents and innovation in the international context, particularly: a) the innovative effects of differences in national patent regimes and b) patent problems arising in the context of joint international research activities. This analysis is to contribute to the implementation of the *OECD Principles on Facilitating International Technology Co-operation Involving Enterprises.*

Committee for Information, Computer and Communications Policy (ICCP) – The ICCP is conducting analysis of areas relating to intellectual property protection with regard to information and communications technologies. This includes means for protecting privacy, security and intellectual property on information networks, the development of cryptography guidelines and approaches to securing copyright protection for digital information and computer software.

Industry Committee – The Industry Committee is analysing industrial property issues, particularly how infringement of intellectual property rights may affect industrial competitiveness. This work is intended to assess the extent and costs of infringement of industrial property rights such as trademarks, patents and designs, with an emphasis on counterfeiting; to evaluate the effects on industrial competitiveness; and, in a later stage, to identify the best preventive practices.

STI Statistics and Indicators – The Economic Analysis and Statistics Division (EAS) collects statistics on patents in the OECD countries as an indicator of scientific and technological development and in measuring international technology balance of payments. This work is based on the 1994 Patent Manual on "*Using Patent Data as Science and Technology Indicators*". EAS continues to explore means of improving and extending analysis of patents as performance indicators for innovation (OECD, 1996*a*).

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