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PROMOTION OF INVENTIVENESS IN DEVELOPING COUNTRIES THROUGH A MORE ADVANCED PATENT ADMINISTRATION *

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I. Introduction

Inventors are an important but largely underutilized national resource in many countries, particularly in most developing nations.

This article considers various means for restructuring patent administration in countries around the world to maximize the contribution of inventors to economic growth and sustained development.

The patent system, as the world has known it for over a century, fails to adequately promote inventiveness and support the growth of local companies in countries around the world. This is particularly true where local patent offices fail to meet the needs of local societies by not embracing high-speed information technology, by not providing quick and competent responses to patent requests, and by not adopting new technologies to analyze and support patent acquisition. The patent

[*474] system is meant to support inventors, but too often the reverse seems to be true, especially in developing countries which face growing numbers of applications and a diversity of new technologies.

The solution we see is to redesign the patent system around the world to better distribute the burden of patent examination among countries, relying on their comparative advantages in technological infrastructure, knowledge strength, and capacity to give timely international response in granting patents. Redesign will result in a stronger patent system in just a few years, with lower costs to inventors, greater speed in the granting of patents, greater certitude about innovation in all technologies, and a highly developed information system to direct research planning. Without the obligation to analyze all patents, most patent offices can concentrate on developing their information technology capacity to better access local and international databases in order to promote inventiveness in their countries. Consequently, both inventors and countries will benefit as more venture capital flows to these countries.

To this end, we offer recommendations for the optimum use of electronic information search and retrieval techniques, the expansion of regional digital databases, the reduction and delay of patent acquisition costs, and, with greatest emphasis, the adoption of a "rapid-patent system with delayed examination" in conjunction with a "system of reference" for granting patents. n1

Our recommendations can be implemented, for the most part, simply by adjusting national administrative practices. In some instances local legislation may also be necessary. This article suggests that a great deal can be done through unilateral action to enhance inventiveness without waiting for new international treaties.

II. The Global Context

Two paradoxes afflict patent administration around the world with particularly negative effects in developing countries. First, inventors must pay heavy legal fees to acquire patent protection at the very moment when all available financial resources are needed to develop raw inventions into useful products. Second, many countries apply scarce resources to conduct essentially redundant technical examinations of applications to determine whether inventions are new, and therefore patentworthy.

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It has been suggested that only one in ten patent applications results in commercial activity. n2 This ratio suggests a gross inefficiency in the expenditure of public resources on patent administration. At the same time, it is reasonable to extrapolate that for every patent application presented to a patent office in a developing country, there are as many or more inventions for which no application is ever filed. Most often, this occurs because patent acquisition costs are judged to be prohibitive relative, first, to the uncertainty of the outcome of the technical examination conducted by the patent office, and second, to the uncertain value of any patent that may be granted, given weak judicial enforcement and limitations of the rights created. This suggests a considerable loss of potentially valuable technology.

Looking at this loss from another perspective, we find that in many countries, particularly in major developing countries such as Brazil, China and India, the number of patent applications per capita poorly reflects the number of inventive minds per capita. Assuming that exceptionally inventive brains are more or less evenly distributed around the world, some countries seriously underutilize a vast natural resource.

These observations raise important issues for countries which are currently seeking to modernize their intellectual property systems, and in particular, the public administration of their patent systems.

A. Factors For Modernization

Several powerful factors propel countries to modernize their patent offices. Means for electronically creating, storing and retrieving digital information provide opportunities for more efficient and flexible patent office management. The nineteenth-century model of a paper-based patent office is being replaced by a model for the twenty-first century, one based upon computers. Add to this "Office on a Chip" the global interconnectedness provided by the Internet, and we have the reality of instant linkages among national patent offices and the potential for an "Office on the Web."

Regional trade agreements, such as the Andean Group, among others, testify to the increasing use of arrangements for common treatment of intellectual property across borders. These arrangements

[*476] extend the benefit of initial patent and trademark filings made in any participating country to all other member countries. This alone implies that patent and trademark registries of member nations need to be electronically connected.

Rapid expansion of the world's body of scientific and technical knowledge also encourages modernization of intellectual property offices. Historically, one of the preferred means for accessing the leading edge of inventive knowledge has been to monitor published patent applications. Today, as people try to learn what others have done, they increasingly bypass national patent publications to directly search online patent databases available through the Internet.

Furthermore, international agreements, especially the TRIPs Agreement, n3 stimulate progress. Some countries interpret this treaty as requiring them to enhance their ability to examine patent applications. The treaty does require applications to be examined, but does not state how or by whom. Still, a number of countries are now unwisely preparing to conduct expanded technical examinations of applications.

We observe that the circumstances outlined above, in addition to other factors, compel countries to improve their intellectual property administrative capabilities. As modernization progresses, we have a rare opportunity to rethink the objectives of a patent system in the context of economic development, and to reconsider how those objectives can best be achieved.

B. The One-to-Ten Ratio

Since only about one in ten patent applications results in economic productivity, public administrators seem to conduct wasteful activity at a fairly high cost. In many countries, user fees - which place a heavy burden on inventors - support much of this activity. In other nations, public funds are used. In either case, available funds are applied to unproductive activity.

A variety of factors explain the one-to-ten ratio. Some patent applications are withdrawn because inventors subsequently produce better inventions. In an uncounted number of cases, inventors withdraw applications upon discovering that their inventions will not lead to

[*477] commercial success. Perhaps an invention, promising at the laboratory stage, cannot be developed to full-scale commercial application. In other cases, risk capital cannot be obtained to support development of the invention.

These factors do not suggest that patent applications should not be examined. Rather, they suggest that costly administrative burdens can be usefully reduced if much of the administrative activity required to process patent applications could be delayed until a later stage in the development of the invention. Then, enough would be known about the probable future of filed inventions to permit withdrawal of those which have lost viable potential. From this perspective, time limits established in the nineteenth century force administrative actions earlier than may be desirable. These arbitrary and artificial time limits need reconsideration. n4

The inefficient use (or misuse) of public and private funds, as indicated by the one-to-ten ratio, is particularly problematic in developing countries, where funds might be more usefully expended on other activities. For example, as elaborated below, a more effective use of those funds would be to provide widespread and early access to information search and retrieval services.

C. Patent Applications Never Filed

We believe that patent applications have never been filed for many worthwhile inventions, for a number of reasons.

One rationale for not filing is that subsequent research produces a better invention, so efforts to patent earlier inventions are abandoned. Or, a search of the relevant technical literature discloses similar prior art, creating doubt about the strength of any patent that might be granted.

Intuitively, however, we believe that one of the main reasons why patent applications are not filed is their cost relative to an uncertain outcome at the end of the patent examination process. Patent agents in many countries are familiar with innumerable clients who seek advice regarding their inventions, only to retreat without taking action when they learn how much it costs to obtain patents, particularly in foreign markets.

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In addition to patent acquisition costs, in countries with weak intellectual property protection, inventors have been discouraged from filing patent applications because of the dubious value of any patent they might obtain. Reasons for this discouragement often include over-broad authority for granting compulsory licenses, judicial system dysfunction, a short patent term, and restrictions on the ability of patent owners to enforce patent rights.

It is also probable that in nations with weak intellectual property systems, individuals do not recognize that they have made patentable inventions. While lack of recognition exists in every country to some degree, we believe it is particularly rampant in universities in developing countries where patent acquisition and licensing is not routine.

The economic losses resulting from the failure to develop inventions for which patents were never sought, and thus never introduced into the technical base of the individual country, can only be guessed at. We suspect losses are especially substantial in developing countries with relatively weak intellectual property systems. We can only observe, as noted above, that developed nations do not hold a monopoly over inventive genius. However, the character of a country's intellectual property regime strongly influences whether this particular national resource is mobilized or squandered.

We emphasize that any country desiring to grow its economy and sustain that growth should consider doing everything possible to encourage invention by local citizens, even to the point of subsidizing the cost of patent acquisition by individual (local) inventors. The record of economic growth derived from the genius of individual inventors is remarkable. Small companies often start with a patent as their only asset. Large companies do not spring into existence spontaneously. They grow from small companies.

III. Patent Examination

A. The Dilemma in Developing Countries

Despite the challenges described in the previous section, the number of patent applications filed in patent offices in developing countries is increasing. n5 In view of typically limited resources, this

[*479] growth raises questions about how these patent offices might best conduct patent examinations and simultaneously promote inventiveness among local citizens.

Technical examination of a patent application involves a determination as to whether the invention claimed by the applicant is new relative to the world's scientific and technical knowledge. The strength of a patent depends primarily on the quality of the technical examination. If the technical examination is not well conducted, the resulting patent may be vulnerable to attack by competitors. More vitally, if the patent examination process is considered weak or questionable, patents that are granted will not stimulate the interest of private investors.

High-quality technical examinations require two elements. One is a competent patent examiner. The other is a means for effectively accessing the world's body of scientific and technical knowledge.

B. Examiners

To provide high-quality examinations, patent examiners ought to have a university education in relevant scientific and technical fields, preferably at the masters level or above. In addition, they must receive training in the art of conducting technical searches and examinations, practical skills that only patent offices can provide. This costly training must be continuous for high quality to be achieved and maintained.

In many developing countries, the patent office is underfunded, particularly in light of inflation. The number of national patent examiners varies widely. Pakistan, for example, has had only four professional examiners in recent years. ⁿ⁶ Peru has managed with only one examiner on the patent office staff. On the other hand, Brazil has had a cadre of as many as one hundred examiners, ⁿ⁷ but since salary levels have eroded with inflation, many of the most competent examiners have left government employment, casting doubt on the quality of patent examinations.

For those who manage patent administration in developing countries, it is difficult to determine the optimum number of patent examiners. When are there not enough? When are there too many?

[*480] What are the implications in either case? What might be done to achieve the best number? We examine several considerations.

First, few people are thoroughly acquainted with more than one field of science, or with everything in a single field. Fewer still are acquainted with all the streams of new knowledge emerging in such rapidly expanding fields as biotechnology, nano-technology, and superconductivity. The international patent classification system reflects more than 200 discrete inventive fields, and new fields are appearing and expanding. n8 This suggests a need for a minimum of 200 examiners, with at least one per field, if thorough patent examinations are to be conducted. More than one examiner would be warranted for fields receiving large numbers of applications. Correspondingly, some fields may receive too few applications to keep even one examiner busy. Whatever the absolute number of applications received, a patent agency needs approximately 200 examiners if all the fields of science in which inventions may be claimed are to receive competent technical examination.

It has been suggested that technical examinations can be conducted by contract examiners. Some small countries with scarce resources and a small number of applications have employed this technique. Typically, the patent office will pay a university science professor a fixed fee to conduct an examination for the patent office.

However, this practice raises questions about examination confidentiality and quality. n9

Trained, full-time patent examiners normally provide a higher level of credibility for at least three reasons. First, there is a higher likelihood that they will maintain patent applications in confidence until publication. Second, fixed-fee contract examiners may limit the time they devote to examinations, thus limiting the extent of their searches.

Third, patent office examiners offer a greater likelihood of high-quality examination because they have been trained to conduct examinations, and it is the only work they do. Outside contract examiners will be only as good as their familiarity with search techniques and their access to the world's body of scientific and technical information. Thus, contract examiners do not substitute well for trained patent office employees.

A second consideration when determining the appropriate number of patent examiners is establishing a benchmark for the number of examiners relative to the number of applications to be examined. Some applications take longer than others to examine, but rough guidelines can

[*481] be established by looking at the experience of patent offices that frequently conduct complete examinations.

The European Patent Office ("EPO") has engaged about 1,900 examiners in recent years (920 in Munich for technical examinations and 980 in The Hague and Berlin for searching). The United States Patent and Trademark Office ("USPTO") employs a cadre of approximately 2,300 examiners. The EPO received about 78,000 applications in 1995, while the USPTO received over 210,000. For further comparison, the British patent office received 18,600 applications between May, 1995 and April, 1996 while employing a staff of approximately 210 examiners.

To derive a benchmark from these figures, it is important to note that when the European system was created, the practice of using multiple examiners for each application was adopted. Discounting for this practice, and factoring in the global rate of withdrawn applications, the composite benchmark derived from the experience of these three patent offices is roughly eighty applications per examiner, per year.

The estimate above illustrates the dilemma for most developing nations. Countries receiving only several hundred - even several thousand - applications a year cannot justify employing enough examiners to cover all the scientific fields in which applications may be presented. Even Brazil, with one hundred examiners and a large number of applications, may not have enough examiners to provide competent examination in all application fields.

Beyond raw numbers, however, not all applications received by a patent office need to be subjected to technical examination, for two reasons. First, a large and increasing proportion of applications received by most patent offices are the result of Patent Cooperation Treaty ("PCT") designations. This means that applications will automatically be searched and examined by one of the international examination centers designated under the PCT. Second, a large proportion of applications filed in most countries pertain to inventions which have also been submitted to, and which will be examined by, one of the PCT-designated international examination centers, even though they are not

[*482] formally PCT applications. n12 We develop the implications of this point below.

The cost of recruiting, preparing and maintaining a group of competent examiners raises difficult questions for policy makers, particularly when relatively low-cost, high-quality PCT examination is available as an alternative to relatively high-cost, potentially lower-quality local examination. Higher costs of largely redundant examinations are difficult to justify, particularly if national policy objectives include desires to expand patent office services to include information retrieval and to encourage more inventions by individual citizens.

C. Access To Global Information

Because patents can only be granted for new inventions, the second ingredient necessary to conduct thorough technical examinations is access to the world's body of scientific and technical information. For examiners around the world, access is possible from three primary sources: the historical files of national patent offices, the growing number of CD-ROM materials generated by some of the major examination centers and the various electronic databases accessible through a rapidly advancing array of search engines. Our survey shows a swift advance through three generations of search techniques since 1990.

1. Old-Style Searching: Paper Records

Historical files held by patent offices in most developing countries are repositories of applications filed and patents granted over many years. They may also contain supplemental technical literature. These are typically cumbersome paper records through which searching is

[*483] slow and uncertain. While veteran examiners adroitly use these files, new examiners may find access more difficult. Fortunately, in many offices, paper files have been scanned into computer storage, and can be accessed by electronic means. Still, searching may be difficult. Even if these electronic files become fully and readily accessible to individuals outside the local patent office, they will not constitute the entire body of the world's scientific and technical literature.

2. The First Generation: CD-ROM

Around 1990, a new means of partial access to the global body of technical literature became available through published patent applications on CD-ROM, provided by various sources, including the World Intellectual Property Organization ("WIPO"). n13 A complete library today would consist of hundreds of discs, and the number constantly grows. The most recent discs are made available as soon as is practicable, but a delay of at least a few months in reporting the most recently published patent applications normally occurs.

The CD-ROMs contain complete patent applications as distinguished from summaries or abstracts. They comprise applications which are published in many countries eighteen months after they are filed, whether or not they have been examined or granted patents. The EPO is usually an early source for these applications.

Although CD-ROM searching has been the backbone of examination in recent years, its status is changing rapidly. It is now old technology, vintage 1991. In early practice, examiners used keyword search tools to locate relevant abstracts, often resulting in the identification of hundreds of references. Once identified, examiners found the corresponding full applications on the CD-ROM, likely printing them out to read on hard copy rather than directly reading applications on the computer screen. Originally, these applications were then searched electronically only after being scanned, which converted them to a medium capable of keyword searching. Today, applications themselves can be searched electronically.

Another limitation of CD-ROM search technology is that even the best hardware allows only one disc to be searched at a time, which makes searching inefficient.

Moreover, patent applications are not the only resource which must be searched when examining a patent application (or when planning

[*484] research or writing a patent application). A great body of non-patent literature is also relevant as prior art. Non-patent literature mainly consists of papers published by university science researchers but also includes other sources, and must also be searched to obtain a complete determination of prior art. CD-ROMs contain only patent applications, not surrounding technical literature.

3. The Second Generation: Electronic Databases and Keyword Searches

Thus, a second generation of advanced searching techniques has been developed to access global technical information using electronic means. Reliance on electronic databases or digital libraries permits far more comprehensive and efficient searching than could be performed using older search techniques and technologies. Increasingly, prior art searches can be performed by electronic means, with the Internet providing a convenient access vehicle. The cost of such access has been decreasing to the point where it should not be an obstacle to high-quality examination by the patent offices of most developing nations.

At the same time, reliance on private electronic databases is increasing. Until recently, the official databases of the EPO and the USPTO, freely accessible on the Internet, contained only abstracts of patent applications. Now, some private commercial databases contain complete published applications, along with surrounding technical and scientific literature. Hence, full-text searching is possible through private search services.

Second-generation techniques for searching these electronic databases have relied on keyword searches. Again, the number of references produced will vary depending on the parameters used. References identified by keyword searching must then be examined individually, but keyword searching inside of these references increases search efficiency.

4. The Third Generation: Electronic Databases and Linguistic Algorithms

The process of searching electronic databases is also becoming more efficient as private firms compete to create more effective search engines. Accordingly, a third generation of more sophisticated search services is now coming into use. Private online search and retrieval services use sophisticated linguistic algorithms to select only those references directly relevant to the searched topic. These advanced search

[*485] tools permit identification of relevant subject matter through location of word patterns rather than key words alone. n14 Such tools can be applied to the most comprehensive electronic databases, both private and public.

The result of third-generation search techniques is greater efficiency than was available from any of the earlier methods for searching databases. These tools will broaden the user audience and make searching easier, not only for patent examining, but also for business planning, research program design and patent application preparation.

Additionally, these tools will be increasingly available to the wider public for conducting technical literature searches. In the near future, we can anticipate that more industrialists and agronomists, as well as academic researchers, will begin to use these search tools to assist their business and research planning. Many will bypass the national patent office.

This brief survey of information access methods suggests that the ability to search electronic databases is improving and becoming the preferred method of access because of the ease of use, ability to respond more efficiently to precise inquiries and the breadth of available database materials.

IV. Promoting Inventiveness - Four Recommendations

As we noted at the outset, a population's creativity supplies a potent natural resource for a developing country. How can this creativity be directed to producing inventions which strengthen and expand the national economy? Some countries have experienced significant economic gains when their citizens have been encouraged to invent. We suggest that patent administration be partially redesigned to maximize this national resource.

A redesigned system includes the following critical elements. It should be relatively easy for local nationals to plan novel and fruitful research programs through better access to technical information and larger databases from which to draw knowledge. Further, better access should enable these nationals to seek patents with a high probability of being granted. These patents should have high quality at a low cost relative to the risks assumed in obtaining them.

Acquiring a high-quality patent enhances an inventor's ability to attract risk capital, which is critical if individual inventors are to develop their raw inventions into commercial products or processes. Inventions

[*486] either gain life or die in the development phase. Tiny firms get their starts during this phase and sometimes grow into big companies, increasing employment and contributing to the national economy. High-quality patents also enhance existing companies because they provide greater incentive for these companies to devote their own resources to researching and developing inventions.

For individual inventors, patent acquisition costs should not limit their ability to turn inventions into commercial products. A method for enabling such development is to reduce the public administration costs of the patent system. Another option is to postpone the costs which the inventor must pay to prosecute a patent.

Reducing acquisition costs and assuring patents of high quality through competent examination are elements the government should provide. Applying for a patent is the work of the inventor. Nevertheless, the government can make the process easier for applicants, in various ways, such as assisting their own inventors to submit patent applications abroad.

Next, we present four recommendations to encourage inventiveness through a more advanced patent administration in developing countries. These recommendations would introduce higher quality and greater flexibility in the way patents are obtained. n15

A. Early Knowledge Access

The most crucial point in an inventor's work usually occurs at the beginning of the investigational research phase, rather than when his or her patent application is examined. When inventors select the direction for their research, they need to know what others have done so that their work will not be redundant. Later, after inventions are made, lawyers who prepare the patent applications have a similar need to know what others have done so they can procure strong patents. High-quality patents attract risk capital, which supports the development of inventions for useful economic activity.

As the world's body of technical knowledge rapidly increases, the challenge of learning what others have done becomes more difficult.

Today, inventors in developing countries such as Brazil and India make research decisions without knowing the full scope of prior developments. n16 Similarly, patent applications are often written without adequate

[*487] knowledge of work done by others. As a consequence, technical examination of patent applications by national patent offices becomes somewhat of a lottery, leaving inventors and potential investors uncertain as to whether inventions will be granted patents and how durable the granted patents will be.

The patent office of the future will need to be more of an electronic information search and retrieval center rather than a repository for paper files. By assisting the public in worldwide technical information searches, the patent office will be a place of education, connectivity and overall competence in electronic information access. Some countries, Brazil and Peru among them, have begun developing this competence, but still need continued progress to provide a competitive service to the relevant public.

This relevant public includes not only those who have made inventions, but also those who would like to make inventions. For instance, corporate research directors and their equivalents in small and micro-firms, as well as academic research administrators, have an interest in information access. While some will be able to bypass the local patent office by independently achieving sophisticated access, many would benefit from assistance provided by the local patent office. n17 A demand for such services would spur further adjustment of the capabilities of most local patent offices. Emphasis would shift towards assisting access to global databases, rather than the limited databases already available.

Another potential group of users includes government agencies that provide public funds to support various research efforts. In Brazil, for example, several federal agencies disburse funds to promote research in academic and business circles, without ready knowledge of which funding requests repeat research done elsewhere. Thus, some officials have expressed interest in more advanced access to information technology.

For many countries, redesigning the local patent office to create a sophisticated center for data searching and retrieval furthers national goals of enhancing technical competence in a competitive global context. Governments may choose to house patent offices and the search and retrieval services separately, perhaps within a ministry of science and technology or of industry, within information centers established by industry associations, or within university communities.

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For these reasons, we recommend that in these early decisive moments, developing countries take steps to provide inventors and patent lawyers with effective access to the broadest collections of the world's technical literature and patent applications. These steps include: 1) computerization of the patent office or other suitable entity, enabling access to appropriate information search and retrieval services, 2) provision of services to citizens, possibly on a subsidized basis for those needing financial assistance, 3) training for citizens directly accessing information services from their own computers and 4) incorporation of locally developed technology information into globally available digital databases accessible by these services.

We do not presume in this article to outline any of the details for developing such information search and retrieval services. However, we stress that this service should be at the leading edge of new search techniques.

B. Linguistic Databases

Presently, the European Patent Office has what is probably the most complete database of patent applications in various languages. Broader private databases exist that contain not only patent applications but also technical literature. Nonetheless, no database systematically - or even partially - gathers patent applications and technical literature available only in the Iberian languages, Portuguese and Spanish. The same limitation probably occurs in other regions and linguistic areas. Consequently, patent examinations conducted by PCT-designated search and examination centers are incomplete. Databases that incorporate the valuable technology described only in these languages need to be created. We focus on the Iberian-language countries to illustrate this recommendation.

The need for a comprehensive linguistic database exists within Brazil and most other Iberian-language countries. The Andean Group of countries, whose common arrangements for intellectual property contemplate linkages between their patent and trademark offices, and the MERCOSUL 18 countries that have no common approach to patent protection, would benefit from such a database. In support of this recommendation, we note the information technology implications of the recent increase in investments made by Portuguese and Spanish investors in banks, telephone companies and other industries in Brazil, Argentina, Chile and other Latin American countries.

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Compiling linguistic databases builds upon the preceding recommendation regarding early knowledge access, and the two recommendations presented below for adoption of a reference system for granting patents and of a deferred-examination, rapid-patent system.

As a first step toward advancing this recommendation, the governments of Brazil and other interested countries should confer with the World Bank and the World Intellectual Property Organization to develop a plan for the creation of an Iberian- language database. This would involve: 1) establishment of technical standards for creation of the database format, 2) cooperation among the patent offices of the Iberian-language countries to contribute their national patent records, 3) establishment of an approach for inclusion of non-patent technical literature and 4) identification of the means to facilitate the creation, operation, growth and maintenance of the database. In turn, the Iberian-language database could serve as a model for other regional or linguistic databases.

Collecting non-patent technical literature presents special concerns. Much of this literature is published in professional, copyright-protected journals available to subscribers only. The unintended effect of the subscription system precludes all except subscribers from relevant technical knowledge, in contrast to the open, public nature of the patent system. To foster the financial integrity of these journals and the professional, scientific and technical associations that generate them, while maintaining global availability of this literature by means of the proposed database, a hierarchical database structure may be desired.

Abstracts of journal articles could be included in the main Iberian-language database, and full journal articles could be included in a second database, accessible upon payment of an incremental fee. At a future level, a tollgate fee for downloading specific articles could be assessed.

Once regional and linguistic databases are initiated, private companies that provide search mechanisms for digital databases will adapt their existing linguistic algorithms to enable searching in Spanish and Portuguese, and subsequently in other languages. We also recommend that the World Bank and WIPO to develop a plan that ensures adaptation of the latest linguistic algorithms for searching Iberian and other language databases. n19

We stress again the desirability of making the most advanced search capabilities for the most comprehensive databases available to a wide range of potential inventors in developing countries, because early

[*490] knowledge access can guide research directions and decisions. Individuals, small teams, micro-firms, university research scientists, government research laboratories, agricultural research stations and established private companies will undoubtedly benefit from early and more information.

It would be a wise use of public funds for governments to subsidize the cost of local access to these databases where appropriate, as it currently does in university science research programs. Although such services appear fairly reasonable and decreasing in cost, they still may be beyond the reach of many potential users.

C. Rapid Patents/Delayed Examination

The nineteenth-century patent office model, which still prevails in most countries, gives patent applicants little flexibility with regard to the timing of their patent acquisition costs. As noted in Appendix I, the Patent Cooperation Treaty has introduced some leeway for those filing in multiple countries because the cost of proceeding with applications in the additional countries can be postponed until after the international search and preliminary examination. This permits some major costs to be put off by twelve to eighteen months beyond the deadlines which would arise without the PCT option. Even so, the PCT does not permit avoidance of those multi-country costs, only a delay. n20

Earlier, we noted that as a worldwide average, perhaps only one patent in ten leads to commercial activity. This suggests a considerable deadweight loss for patent administration systems. As a result, we recommend a new, burden-reducing option for patent administration.

The option consists of extending authority to national patent offices to grant patents immediately after an examination of the formalities of the patent application with immediate publication, without requiring a prior technical examination. Technical examination would be conducted later, at a time selected by the patent holder. n21

The applicant could postpone the technical examination indefinitely or could request this examination immediately after the patent grant. Also, the patent office would be given the authority to order a technical examination if certain events occurred, such as local litigation challenging the patent or an enforcement action by the patent holder. Completion of the examination would not, however, be a

[*491] prerequisite for commencing enforcement proceedings. In addition, after the grant, an interested third party would be permitted to request patent examination, to deter filings without merit intended only to interdict applications by serious researchers.

This recommendation gives the patent seeker a degree of flexibility in incurring and paying certain patent acquisition costs.

However, the cost of preparing and filing the original patent application cannot be postponed under this recommendation. Initial patent costs chiefly entail legal fees accrued in preparing the application, in addition to whatever official fees must be paid when the application is filed. We recommend that the official fees charged at this point be kept nominal in order to keep costs to the inventor as low as possible at the beginning of the patent acquisition process. More substantial fees can be imposed with greater justification at a later stage, when the inventor is closer to or has achieved commercial activity, and is thus better able to sustain additional costs.

The flexibility offered to patent seekers under this recommendation is responsive to the typical circumstances of inventors just after invention. As they evaluate their options, they may find that an invention is so obviously promising that they are immediately ready to seek risk capital to support the further technical work that will be necessary to prepare the invention for commercial success. In this case, the inventor may desire the earliest possible technical examination, because providers of risk capital normally require assurances that a patent in which they have invested will stand up to validity and infringement challenges.

Then again, if the patent application has been prepared based on access to the high-quality information discussed above under our first two recommendations, investors may be considerably more willing to offer risk capital without waiting for the conclusion of an official technical examination of the patent application. In fact, the local patent office might enhance that prospect by certifying individuals who have been trained in the use of the most advanced (linguistic algorithm) search techniques. Certification would further shift emphasis from the moment when official technical examination has been completed to the moment of patent application preparation.

On the other hand, if an inventor has funds available for independently developing the invention, he or she may be reluctant to tap the risk capital market or his own funds to pay for patent acquisition costs until the invention's commercial potential is more certain.

Whatever the inventor's circumstances, the rapid-patent/delayed- examination concept gives the inventor greater flexibility to more fully

[*492] control the timing of patent acquisition costs, creating a better environment for invention development.

At the same time, this recommendation offers to patent offices around the world the advantage of reducing wasteful public administration expenses associated with the nine out of ten patents that will never lead to commercial activity. n22 This promotes a smaller and more efficient organization for the patent office. The delayed-examination/rapid- patent system also permits allocation of limited government resources to more productive activity, particularly the enhancement of the information search and retrieval services mentioned.

D. Patents by Reference

Given the first three recommendations, we offer a fourth recommendation that further addresses the two paradoxes in the world's patent system noted previously. We believe that granting patents by reference will greatly encourage inventors in all countries who adopt this recommendation. Indeed, the more countries that adopt this recommendation, the greater the incentive becomes for inventors in the adopting countries. n23

This recommendation reflects elements of the confirmation system of granting patents that has served some countries, such as Argentina, for many years. Granting patents by reference is an evolution from the older confirmation system and is broader because it refers to multiple patent offices in a number of countries, rather than to a single "mother" country. It is made possible by, and takes advantage of, the tools of global information technology, including the Internet.

A patent-by-reference system goes a modest, but important, step beyond the mechanism of the Patent Cooperation Treaty, of which many developing and transition countries are now members. More importantly, it goes only a short step beyond the actual current practices in many developing countries, both large and small.

As noted, many countries, even those as large as Brazil, face considerable difficulty in providing high-quality technical examination for all the patent applications they receive. Routine practice in many countries today involves waiting for patent examination results from the

[*493] world's largest patent offices, which have the means to conduct complete technical examinations. When patents are granted by one of those offices, corresponding local patents are granted without a technical examination. In some countries this is done informally or secretly, while in others the practice is explicit. Ecuador, for example, adopted an explicit system in early 1998.

Therefore, subject to certain conditions, our recommendation is that national patent offices explicitly adopt the practice of granting patents based on reference to corresponding patents granted by any of the world's largest patent offices after thorough technical examinations have been completed there.

In many countries, such a system of reference could be created by unilateral action, requiring no international treaty. In most countries, no changes in current patent law would be necessary. The basic components of a system of reference could be adopted merely by an adjustment in administrative practice. As noted, this practice exists informally in many national patent offices. Thus, making the practice explicit would be a relatively small step to take for many countries, while conferring considerable benefits to both the country's government and its inventors.

In simplest terms, the concept of obtaining a patent by reference is an extension of the Patent Cooperation Treaty system. n24 As with the PCT, a single application serves to initiate the process of obtaining a patent by reference in multiple countries. The difference is that once a patent is granted by one of the patent offices in a major international examining center designated by the PCT, a patent is granted in all countries adopting the patent-by-reference system, without technical examination or further national prosecution. The national patent office would officially recognize the results of technical examinations conducted in those examining centers for both PCT and non-PCT applications.

For national patent administrators, adoption of a system of reference offers the possibility of reducing the size and cost of maintaining an examiner cadre because redundant examinations would be eliminated. There will be little reason to continue performing redundant examinations. n25

Under a system of reference, as under the PCT, each country would still have the final word as to whether a patent should be granted under its laws. Thus, for example, if the patent law of Brazil were to

[*494] exclude widgets, then even though an invention for a new kind of widget might be granted a patent by the European Patent Office, Brazil would still deny the widget a patent in Brazil.

We recognize, of course, that some applications will be filed by national inventors only in their own countries and thus will not be examined by an international examining center. However, as already discussed, it would not be cost effective to maintain a cadre of examiners of sufficient size to cover all fields presented for examination. Moreover, using contract examiners may cast doubt upon the quality of the resulting examinations, hurting precisely the inventors this set of recommendations seeks to help. The most cost-effective alternative may be to have the national patent offices forward these local applications to WIPO in Geneva for examination by one of the PCT examination centers. n26 If necessary, the national patent office might assist with translating the application for its own inventors as a matter of public subsidy.

Adoption of a system of patents by reference would greatly reduce, but perhaps not entirely eliminate, the need for technical examination by national patent offices. This is because of the need to assure that prior art developed in that country, but not yet translated into other languages or not yet available in the international databases, is taken into consideration. Our second recommendation above points to the need to create more comprehensive databases which incorporate technical literature from developing countries. An Iberian-language database of technical and scientific literature, including published patent applications was given as the illustrative example. Once created, these databases can be searched by the PCT-designated examination centers. At the same time, a national patent office or a regional network which functions in, say, the Iberian languages could conduct these searches on behalf of the PCT-designated examination centers.

In the meantime, until more comprehensive databases are created, technical examination by national patent offices would be justified in selected fields in which the country has developed a discrete body of scientific and technical knowledge not likely to be included in searches conducted by PCT-designated international examining centers. In Brazil, for example, there would be a temporary need for examiners in specific fields, such as iron ore refining, petroleum recovery, leather working and sugar refining.

In any event, under the system of reference, only a small national patent office staff would be needed to ascertain whether the claims approved by a PCT examination center are patentable under national law.

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1. Three Arguments Against Patents by Reference

Three rationales might be offered to oppose the concept of a system of reference. First, it might be asserted that a developing country must conduct technical examinations of all applications, regardless of examinations conducted elsewhere, in order to learn about the latest developments in all fields of technology. Second, sovereignty principles assert that others (foreigners) should not make decisions affecting the domestic policies of the country. Third, rules in the designated PCT examination center nations may differ from rules in individual countries.

As to the first of these assertions, while there is some truth to it, it can be noted that there are clearly more efficient ways to learn about the latest technical developments in the rest of the world than through the examination of patent applications. Most sophisticated industrialists and university science researchers do not normally resort to the local patent office for this type of information, nor do patent examiners routinely present to the public the incremental knowledge they gain from examining patents. Indeed, they would violate their obligation not to disclose the information contained in applications before they are published. Many seeking the latest scientific information already routinely search the databases available to the public on the Internet and through other electronic means.

If examiner knowledge, as acquired through patent examination, were intended to be a viable source of information for the public at large, then examiners would presumably need to relinquish their employment at the patent office and become lecturers. This is hardly feasible because it would create a constant turn-over of the examiner cadre. Instead, knowledge acquired from patent applications resides in the applications themselves. It is from them, and not the examiners, that the knowledge is obtained. Information is best obtained from patent applications by using the most recent electronic searching techniques discussed above.

The second assertion is that foreigners should not make decisions that have a local effect. This point also has some merit. However, any country is also free to decide that it would be beneficial to rely on certain types of technical decisions made outside the country. Presumably, few would insist that forecasts of local weather which are made by those outside the country should be ignored or considered invalid. In another example, many countries already rely heavily upon foreign government determinations regarding the safety and efficacy of medicines. Many PCT- member countries are willing to have these technical patent decisions made on their behalf by PCT examining centers.

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The third assertion notes that the rules in the countries where the designated PCT examination centers are located may be different from those in the country. While this is true for some provisions in the respective patent laws, it will seldom be true that those rules will produce a different result in the technical examination of applications. Studies of comparative examination results of the American and European patent offices and of the British and European offices found outcomes largely the same. In only a marginal number of cases was it found that examination outcomes were different because of specific differences in the law. n27

2. Details of a Patent-by-Reference System

Under a system of patents by reference, a patent would be granted in one country upon satisfactory presentation of proof to that country's patent office that a corresponding patent had been granted by any one of the major international PCT examination centers. The list of foreign offices could be modified, but such offices would be those capable of performing thorough and competent patent application searches and examinations.

Proof of the foreign patent grant, when presented to the local patent office, would be accompanied by a translation of a summary of the foreign patent of reference, if in a different language. To maintain the patent in force, a translation of the specifications of the foreign patent of reference would be filed with the local patent office within six months of the grant of the local patent.

The local patent, thus granted, would be essentially identical to the foreign patent of reference. Thus, while in force, the local patent would be subject to modification by administrative action of the patent office or by order of a local court, corresponding to any alteration in the foreign patent of reference, resulting from administrative or judicial action, including any amendments or invalidity determinations.

The term of a patent granted in this manner would not be greater than twenty years from the filing date of the foreign patent of reference, or the term granted to local patents. Individuals seeking a local patent based on the grant of a foreign patent would notify the local patent office within one year of the foreign filing of their application by making a declaration of their intent to apply for a local patent by reference. This

[*497] declaration would simply indicate the date of the foreign filing, the office to which the application has been submitted and enough information to subsequently identify the foreign patent of reference when it is eventually granted. These requirements could be established by administrative regulation. A PCT application which designates the country would also serve to satisfy the requirement of notification.

Intervening acts, such as filing other applications, or the publication or exploitation of the invention, would not defeat the grant of the local patent or give rights to any other party in relation to the local application. To comply with the Paris Convention, patents of reference would be available to all inventors, whether local or foreign.

3. Benefits of a Patent-by-Reference System

Both individual inventors and local patent offices would benefit from the adoption of a patent-by-reference system.

For inventors, one application could result in multiple patents, with the first patent being the patent of reference granted by the foreign examination center. The next patent would be granted in the applicant's home country. Patents would also be granted by all other countries employing the system of reference. Ecuador adopted such a system in May 1998. Singapore has adopted a modified version of this concept, and other countries are considering the system.

A patent-by-reference system lowers the inventor's patent acquisition costs considerably, while insuring the high quality of resulting patents. Applications can be filed locally as PCT applications at fairly low initial expense, or can be filed directly in the foreign examination center at a higher cost.

The local patent office would reduce its administrative costs, chiefly through reduction of the total number of examiners it needed to employ. The quality of patents resulting from the system of reference would be high, and state resources previously devoted to redundant patent examination could instead be applied to enhanced information search and retrieval services for the public. Some of the current examiners could be retrained to operate the expanded information retrieval service, while others could administer the reference system.

E. Four Concepts Working Together

Although each of the four recommendations we have presented has individual merit, the four concepts work together to strongly promote inventiveness in developing countries.

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The primary effect of the four recommendations is to shift resources and attention to the early stages of the inventive process.

With earlier access to more comprehensive information, inventors in developing countries have a better opportunity to produce valuable technology, and their patent applications have greater value as instruments for attracting private risk capital.

Thus, the subsequent stage of technical patent examination becomes a finishing touch, not an expensive gamble. We can be less concerned about technical examination. We can grant rapid patents and rely on the large patent offices that have the ability to conduct thorough examinations.

The concepts of patents by reference and the rapid patent with deferred examination may be useful in combination. Both concepts begin with a patent application. This document is, of course, the key to patent administration. The application is prepared by the inventors' lawyers, The patent office is not involved. If the inventor anticipates that his or her market opportunity will be confined to the home country, the rapid- patent system is quite useful. Under this approach, the inventor can control the timing of the patent examination and some of the major patent acquisition costs. If the inventor anticipates that the invention's market opportunities will extend to other countries, the system of reference may provide the best approach.

To further encourage local inventors, it would be entirely appropriate to provide financial assistance for the preparation and filing of patent applications. This can be done in several ways. In some countries, such as Brazil, some law firms reduce or postpone fee payments for clients who have limited means to pay. Additionally, associations of patent attorneys could undertake pro bono assistance programs. Some countries have national, state or local government programs that offer financial assistance. It is important for the local patent bar to upgrade its members' skills in application preparation to ensure competent and quality service to inventors. Services may also include searching digital databases for inventors to assist them in planning and pursuing new research directions. To further assist local inventors, the local patent office could submit applications to WIPO for foreign examination, closely following the procedures of the PCT. n28

Inventors could request a rapid patent with delayed examination, or request a patent by reference. Alternately, inventors could combine both options, seeking a rapid patent and then relying on a patent of reference to satisfy any need for technical examination. An application filed to obtain the rapid patent in the local patent office would also be the

[*499] basis for a PCT application, or for seeking a patent of reference in an international PCT examining center.

V. Implications

In the following sections, we summarize the implications of our four recommendations for four groups of stakeholders: 1) inventors and investors, 2) patent agents, 3) local patent offices and 4) national economies.

A. Inventors and Investors

If a dozen or more countries were to adopt a system of granting patents by reference, then inventors in each adopting country would be powerfully motivated to produce inventions. In such a situation, a patent granted by any one of the major PCT examination centers could result in a patent in each of the countries adopting such a system. Since the resulting patents would be presumed to be of high quality, private investors would be more willing to support development of the underlying inventions. This would provide a potent incentive for innovation in developing countries. Achieving the same degree of protection in countries without a patent-by-reference system would cost an inventor in such a country a substantially greater amount of money. Many other nations will be strongly influenced to adopt a system of reference after a few countries adopt the system.

Coupled with the rapid-patent concept, the patent-by-reference system allows inventors to obtain immediate patent protection and delay the technical examination, thus postponing some patent acquisition costs. Inventors could then obtain high-quality patents in multiple countries by reference. When local inventors can obtain multiple, high-quality patents for the cost of one patent application, investors will take notice and inventors will be encouraged to innovate.

Patent acquisition costs cannot be avoided, but they can be reduced, and more importantly, delayed. For inventors in developing countries, a system of reference only partially reduces legal expenses at the front end of the patent acquisition process, since under any system, the first step toward obtaining patent protection involves filing an application. However, under the two concepts proposed here, only one application is needed at the front end of the process. The single application produces a greater and swifter benefit, while deferring further patent acquisition costs. This attracts risk capital and permits allocation of scarce resources to the technical development of inventions.

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In sum, high-quality patent protection, obtained at a modest cost, will further encourage inventors.

B. Patent Attorneys

At first glance, many patent attorneys in developing countries may fear that their legal practices will be diminished by adoption of the rapid-patent and patent- by-reference concepts.

What roles do private attorneys play under these concepts?

Today, a significant portion of their patent law practice consists of submitting applications to local patent offices. These applications correspond to applications previously prepared and filed in other countries. The core of this local prosecution activity involves overseeing translation of a foreign application into the local language. Then the attorney follows the application through various processing stages at the patent office until the patent is finally granted, an endeavor that may take many years. This is a lucrative legal business, if not particularly challenging.

It may be noted that many sophisticated companies and inventors in developing countries routinely seek patents abroad before seeking them locally. Two factors may account for this practice. First, patent offices in many developing countries are notorious for poor service, in terms of both lengthy processing delays and illogical decisions. Second, many inventors look to foreign markets more than to their local market for eventual commercial success.

Two other activities conducted by local patent attorneys under the present system consist of: 1) writing new applications for local inventors and 2) defending patent rights through enforcement actions and litigation. For most law firms and practice groups, these activities currently constitute a minor element of their practice.

We predict that under the concepts presented here, law practice for local patent attorneys will change, but not diminish. In fact, business may increase. The earlier availability of more comprehensive information via the latest search and retrieval techniques will permit local attorneys to prepare patent applications of better quality. A greater volume of high-quality patents granted as the result of the new concepts will produce more legal work, particularly because of increased enforcement activity, including litigation. There will also be more legal work generated by technology licensing, joint venture agreements and expanded investment activity.

For the many, highly competent patent agents, our recommendations will probably produce more patent application preparation work.

[*501] Applications will be prepared both for the local patent office in order to obtain the rapid patent, and for the PCT examining centers abroad. Often the same application will serve both purposes. We predict that there will be an increased volume of applications presented by foreign inventors seeking the rapid patent. As an offset to the increased volume, there will be less application prosecution work under the rapid-patent system. Note that the initial applications must be thorough and of high quality, since they cannot be adjusted later during prosecution. This will tend to upgrade professional capability within developing countries, again supporting the concept of effective access to comprehensive technical databases.

It is an open question whether there would be a reduction in the number of local applications submitted that correspond to foreign-filed applications. In our judgement, the number would increase because foreign inventors obtaining a rapid patent would not need to prosecute the application before the local patent office. They would look to the system of reference examination phase to perfect the rapid patent granted locally.

There is already a clear trend for foreign inventors to approach developing countries indirectly through PCT applications rather than directly, a trend likely to accelerate. Essentially, the indirect approach postpones presentation of an application translation to the local patent office.

It would be informative to prepare a detailed analysis of the fees that local attorneys would charge under the two proposed concepts and compare the result with current fee schedules. We submit that the difference between proposed and current total costs would not be great. The main difference would be that some of the most significant legal fees would be postponed under the proposed system, but this is already happening under PCT procedures.

In summary, patent practice would change as the result of our four recommendations. There would be less work in preparing translations of foreign-origin applications, but more work in preparing original applications and in defending patent rights through enforcement and litigation. The overall outcome appears promising and rewarding.

C. Local Patent Offices

After adopting the concepts we have suggested, a local patent office would be able to reduce its administrative burden. Technical examination of patents would be significantly limited and eventually eliminated. The resources previously devoted to examination would be

[*502] redirected to creating a world-class information search and retrieval service. Some countries, Peru among them, are already moving in this direction.

The budgetary implications of the two concepts deserve careful consideration, but revenue from maintenance fees collected during patent terms is likely to increase, because once more high-quality patents are granted, more private risk capital will support these inventions. The patent office could then look to increased maintenance-fee revenues to offset the reduction and postponement of front- end patent acquisition fees.

D. National Economies

Any resource-scarce country would be wise to structure its patent examination operations to maximize benefits from the administrative work done by other countries which perform thorough searches and examinations. To do otherwise would unnecessarily increase the public costs of patent administration and inventors' patent acquisition costs, at the expense of a corresponding substantial loss of public benefits.

Freeing resources would permit creation of a first-class information search and retrieval service, serving inventors, investors, university research scientists, business planners, private research programs, students and others.

As noted, inventors are anxious to commercialize their raw inventions, but often lack the resources to do so at that early point in time. Nonetheless, lawyers must inform inventors that considerable resources must be devoted to acquiring patent rights, perhaps in more than one country. Frequently, it is impossible for an inventor to sustain both expenses simultaneously.

Therefore, patent acquisition costs should be postponed for as long as possible, preferably until successful commercialization can be foreseen. At that time, funds to pay the patent acquisition costs will be more readily available.

Thus, two main objectives should be to reduce and delay patent acquisition costs for inventors, and to provide them with a high-quality examination to ensure a high- quality patent. Both efforts will enhance the ability of inventors to commercially exploit their inventions and to attract private risk capital to finance development and commercialization.

Economic literature teaches us that the injection of new technology into any economy bolsters national economic and technical growth. The introduction of new technology creates new industries,

[*503] expands employment, enhances tax revenue and has other positive effects as well.

VI. Closing Reflections

Only a very few countries are able to provide the considerable public resources needed to maintain a modern patent office with full capability for thorough technical examination in all fields of invention.

The United States, for example, spends over \$ 300 million each year for its patent office, and the costs in Europe are similar. It makes sense, therefore, particularly for developing countries, to take advantage of foreign public expenditure while retaining control of local final outcomes.

Obviously, many more concepts and issues in relation to these recommendations deserve careful consideration. This paper is intended as an early step in the enactment of reforms that advance patent systems in developing countries.

More precisely, this article presents suggestions that can help developing countries create modern, twenty-first century patent administrations, as models for many countries seeking to enhance their growth and sustain their development.

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Appendix I: The Patent Cooperation Treaty

Under the Patent Cooperation Treaty, n29 which now has over ninety member countries and is administered by the World Intellectual Property Organization, inventors of member states may file a single patent application which has effect in all member states designated by the applicant. An international search is then performed by one of the international searching authorities designated by the PCT, currently the European Patent Office and the national patent offices of Australia, Austria, China, Japan, the Russian Federation, Spain, n30 Sweden and the United States. The search report is sent to the applicant and, if the application is not withdrawn, it is published by WIPO and communicated to each designated patent office. The applicant then has twenty months from the priority date to commence prosecution of the application in each designated patent office. This period can be extended another ten months if the applicant requests an international preliminary examination - a request that is made in nearly all cases. Preliminary examinations are performed by one of the internationally designated examination centers.

The PCT benefits member countries by eliminating the need to conduct local searches and examinations. It even eliminates the need to examine application formalities, since this is done by the designated PCT examining center.

For inventor/applicants, the PCT provides the advantage of a twelve- to eighteen-month postponement of a significant portion of the high costs of obtaining a patent. This cost includes not only official filing fees, but also most translation and attorneys' fees. Deferment of costs permits inventors to direct scarce resources to developing their raw inventions for market introduction during the critical early months after the invention is made.

Under the terms of the Patent Cooperation Treaty, member countries need not accept the examination results produced by the PCT examining centers as binding on the national patent office. Thus, each member nation may elect to conduct its own technical examination of applications, notwithstanding examination by a PCT examining center. At the same time, the treaty does not prohibit member countries from accepting PCT examination results as the basis for granting patents without local technical examination.

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Appendix II: A Case Example

The following partially fictionalized case illustrates the main problem addressed in this article.

In the late 1980s, Prof. Dr. Vanderlei S. Bagnato obtained his doctorate in physics from the Massachusetts Institute of Technology ("MIT"). He returned to Sao Carlos in Brazil to continue research in his chosen field, fiber optics. In 1993, he received a grant from a government agency, and together with his students, advanced his fiber optics work. In late 1996, the team published a report of their findings in a well-regarded journal, but never considered whether any inventions had been made, and no technology was developed for commercialization.

In 1997, while attending a conference in London, Dr. Bagnato learned that a team in Italy had done work closely resembling the work done at Sao Carlos. The Italian team claimed two inventions, filed patent applications in Europe and the United States in early 1996, and signed a licensing agreement to commercialize their inventions. Dr. Bagnato realized he could have been first to file for patents on similar inventions.

In 1998, Dr. Bagnato developed several options for further research and contemplated a proposal to seek another government grant. He was uncertain, however, as to whether any of his research proposals would break new ground, or simply repeat work already done by others. By now, Dr. Bagnato was aware of the possibility of making inventions, and their economic importance for Brazilian industry. Through his contacts at MIT and from the London conference, he had some, although limited, knowledge about research being conducted by others.

Friends at MIT encouraged him to search several databases available through the Internet, but some were too expensive to be accessible to a professor with a modest income. Moreover, these databases only permitted keyword searches, which often produced hundreds of references that needed to be downloaded and read individually.

In this situation, Dr. Bagnato's best opportunity to find the information he needs is to access newer technology that employs linguistic algorithms to electronically search databases containing both patent applications and technical literature. Unfortunately, he has only limited means to access this technology.

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Appendix III: Recommendations

A. Early Knowledge Access

Recommended: That developing countries take steps to provide inventors and patent lawyers, at the early stages of research planning and patent application writing, with effective access to the broadest collections of worldwide technical literature and patent applications.

B. Linguistic Databases

Recommended: Creation of databases that will systematically gather and incorporate patent applications and technical literature produced in regions and linguistic areas not yet represented in the international databases commonly used by the PCT-designated search and examination centers.

C. Rapid Patents/Delayed Examination

Recommended: That national patent offices be authorized to grant patents immediately after an examination of the formalities of the patent application, without requiring a prior technical examination. Technical examination can be performed later, at a time selected by the patent holder.

D. Patents by Reference

Recommended: That subject to certain conditions, national patent offices explicitly adopt the practice of granting patents based on reference to corresponding patents granted by any of the major search and examination centers, such as the European Patent Office, after a thorough technical examination has been completed there.

n1 A table of recommendations appears as Appendix III.

n2 Peter D. Blumberg, Comment, From "Publish or Perish" to "Profit or Perish": Revenues from University Technology Transfer and the 501(c)(3) Tax Exemption, *145 U. Pa. L. Rev.* 89, 97 (1996) ("An oft-quoted rule of thumb suggests that of ten laboratory inventions, only one will receive a patent; only one in ten patents will be licensed by a

company, and only one in ten licenses results in more than \$ 25,000 per year in income.").

n3 TRIPs is the common name for the Agreement on Trade-Related Aspects of Intellectual Property Rights, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C, Results of the Uruguay Round vol. 31, 33 *I.L.M. 1125 (1994)*, reprinted in *Selected Statutes and International Agreements on Unfair Competition, Trademark, Copyright, and Patent* 493 (Paul Goldstein et. al. eds., 1999).

n4 For example, Article 4C.-(1) of the Paris Convention for the Protection of Industrial Property, Mar. 20, 1883, as last revised July 14, 1967, 21 *U.S.T. 1583, 1587* (French text), 1632 (English text), establishes a one-year period within which applications for patents must be filed in countries beyond the country of first application. What consequences would flow from an extension of that treaty period? Could an added extension be granted on payment of a fee?

n5 In Brazil, for example, a new law which modified Brazil's patent system took effect in May 1997. Among its improvements, the new law permits the national institute for industrial property to grant patents in five fields of technology previously excluded from patent protection. Because of this and other factors, there has been a pronounced increase in the number of patent applications. Within the next few years, the TRIPs Agreement will contribute to this increase in other countries.

n6 See Robert M. Sherwood, *The TRIPs Agreement: Implications for Developing Countries*, 37 *IDEA* 491, 528 (1997).

n7 *Id.*

n8 The United States Patent Office classification system now uses more than 700 classes.

n9 See Sherwood, *supra* note 6, at 491.

n10 WIPO officials report that, as a global average, about ninety percent of all Patent Cooperation Treaty applications reach the examination stage, and virtually all of these applications request preliminary examination. This implies a ten percent reduction in the applications which ultimately need to be processed at the national level. Individual country experience may differ.

n11 The Patent Cooperation Treaty, WIPO Publication No. 274(E), 28 *U.S.T. 7647*, initially signed on June 19, 1970, amended on September 28, 1979, and modified on February 3, 1984, is reprinted in Colin Jones, *Patent Cooperation Treaty Handbook* App. I (1998).

n12 The case of Brazil is instructive. Although there is some confusion regarding the correct figures, it appears from internal patent office data that in addition to 5,488 applications for patents of invention received directly in 1995, 2,860 more came as a result of PCT designations. This number increased by about thirty percent to 3,756 PCT designations in 1996. Growth is likely to continue. Of the non-PCT applications received, a large percentage were submitted by non-residents. Presumably many of those applications will have also been examined by other patent offices, including those designated as PCT examination centers. This indicates that a large proportion of

applications will have been searched and will have received a preliminary examination at one of the designated PCT international examining offices. Thus, technical examination by Brazil's patent office could be considered redundant for these applications, at least as far as the scope of the PCT-designated examination centers' search capability is concerned. Searching beyond that capability is discussed below.

n13 We do not discuss the older microfilm technology of the 1970s and 1980s, a technology that is still in use today in some countries.

n14 Manning & Napier, of Rochester, New York, is a leader in this field. There are others. This technology has been derived from intelligence gathering techniques developed by the United States government.

n15 There are numerous other concepts which could serve these same objectives. However, they would involve international treaty modifications, new treaties, or extensive new legislation.

n16 See Appendix II for an illustration of the problem.

n17 Peru's INDECOPI has set an example by providing a high-quality search service designed for the broader public. INDECOPI stands for Instituto Nacional de Defense de la Competencia y de la Proteccion de la Propiedad Intelectual [National Institute for the Defense of Competition and Protection of Intellectual Property].

n18 MERCOSUL is a common market formed by Argentina, Brazil, Paraguay and Uruguay.

n19 As of late 1998, these tools have not been adapted to search materials in the Iberian languages, although an advanced prototype is under development for Spanish. Information supplied by David L. Snyder of Manning & Napier, Rochester, NY.

n20 See Sherwood, *supra* note 6, at 533 for a discussion of fee postponement.

n21 This suggestion parallels recent developments in Europe regarding utility models. See The Green Paper, July 19, 1995. Those developments indicate that the dual imperatives of reducing costs and adjusting patent acquisition times are sprouting in the industrialized countries as well as in developing countries.

n22 This recommendation would probably require legislative adjustments. In Brazil, for example, the concept of a rapid patent/delayed examination would require amending Law 9279/96 of May 14, 1996. These changes might be viewed as nominal or technical in nature.

n23 See Sherwood, *supra* note 6, at 531 for another discussion of the patent-by-reference system.

n24 See Appendix I for a description of how the PCT functions.

n25 There have, of course, been cases in which the international centers have missed prior art. The number of such cases is not known. Statistics are not readily available, but the number is probably small. If overlooked prior art is found at any time, the patent can, of course, be challenged in any country during the life of the patent there.

n26 This practice is utilized by other countries, Peru among them.

n27 See, e.g., EPO-USPTO Examiner Exchange Program Final Report, 72 J. Pat. Trademark Off. Soc'y 5, 29 (1990); EPO/USPTO Examiner Exchange Program Final Round, 72 J. Pat. Trademark Off. Soc'y 621 (1990); Derek Haselden, Report on Search Comparison: UK, Europe and USA, J. Chartered Inst. Pat. Agents 250-61 (1996).

n28 The inventor would, of course, be free to file the application without this assistance.

n29 28 *U.S.T.* 7647.

n30 The Spanish patent office is designated for searching only and not for examination.