

Chinese, Japanese, Korean, and Indian Patent Information in Comparison: Asia's Rising Role in Technology Disclosure Through the Patent System

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Chinese, Japanese, Korean, and Indian Patent Information in Comparison: Asia's Rising Role in Technology Disclosure Through the Patent System

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Patent information as a form of technology disclosure serves an important function in business strategy as well as in industrial policy making. This article thus examines both information disclosure as a fundamental principle of patent law and the role of patent information for technology disclosure.

This paper then proceeds to show the rising importance of Chinese patents as sources of technological information as compared to Japanese, Korean, and Indian patents. With reference to Japan, Korea, and India, this study demonstrates both the substantial increase of Chinese patents in force from the 1980s to 2006 and the increase of Chinese patent grants from the 1990s to 2006. Furthermore, Chinese, Japanese, Korean, and Indian patent grants for every billion U.S. Dollar of the gross domestic product (in current prices of the period measured) are analyzed as is the ratio of patent grants to patent applications in China, Japan, Korea, and India. Based upon this data, this paper argues that China will soon assume a leading role in the provision of technological information through the patent system.

Furthermore, analyses of the availability of and access to patent information in Asia demonstrate that patent information

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is easily accessible, while its relevance is hard to detect. In consequence, it is argued that the increasing relevance of Chinese, Japanese, Korean, and Indian patent information needs to be complemented with the provision of competitive databases that contain value-added patent information allowing for high quality search results.

I. INTRODUCTION

With the awakening of the People's Republic of China (China) to the global economy, the world has witnessed a gradual re-orientation of Chinese intellectual property (IP) policy towards a better protection of national and economic interests for the promotion of domestic innovation and development.¹ This re-orientation together with the rising importance of the Chinese economy in international trade was accompanied by a surge in patent applications and grants in China. As a result of this surge in patent applications and grants, the role and relevance of Chinese patent information as a source of technological information has considerably increased. This article analyzes and discusses the rising role of Chinese patent information with reference to both a larger theoretical context and the availability of Asian patent information in general.

From the very inception of the patent system, information disclosure has constituted a fundamental principle of patent law. Over time, patent information as a form of technology disclosure has assumed an important function in business strategy as well as in industrial policy making. Patent information has in particular gained in importance in the current era of high technologies in which incremental improvements on the basis of prior innovation constitute the lion's share of research and development (R&D) outcomes.² At the same time, the role and relevance of Asia³ in technology disclosure through the patent system has increased due to the emergence of new global players such as China, the Republic of

¹ See Andrea Wechsler, *Intellectual Property Law in the P.R. China: A powerful Economic Tool for Innovation and Development* (on file with author), available at <http://ssrn.com/abstract=1354546> (last visited Mar. 11, 2010).

² See ELAD HARISON, *INTELLECTUAL PROPERTY RIGHTS, INNOVATION AND SOFTWARE TECHNOLOGIES. THE ECONOMICS OF MONOPOLY RIGHTS AND KNOWLEDGE DISCLOSURE* 33 (Edward Elgar Publ'g Ltd. 2008). See generally Suzanne Scotchmer, *Standing on the Shoulder of Giants: Cumulative Research and the Patent Law*, 5 *Journal of Econ. Perspectives* 29-41 (1991).

³ This paper uses the term "Asia" as referring to China, Japan, Korea, and India.

Korea (Korea), and India, thus, warranting a closer look at the rising importance of Asian patent information.

This study first discusses the role of patent information for technology disclosure. Information disclosure is accepted by the study as a fundamental principle of patent law before establishing the patent document as a source of technological information and examining the role and relevance of patent information.

The study then proceeds to show the rising importance of patents in China, Korea, and India while reconfirming the long-established relevance of Japanese patent data as a source of technological information.⁴ While China is gradually assuming a leading role in the provision of technological information through the patent system, Korea was the fourth largest patent office in the world by 2006 with patent filings by residents growing threefold between 1994 and 2004.⁵ Likewise, the number of patent applications and grants from India increased considerably after 2001 as a result of a greater awareness of patents and patent rights.⁶ As a consequence, the most spectacular growth in available patent information has lately occurred in Asian countries. With the rising importance of Asian patent information, the question of availability of and access to patent information has come to the forefront of attention. By referring to trends and issues of patent information in China, Japan, Korea, and India, this study illustrates that patent information has become easily accessible, but its effect on the increasing use of patent information is still hard to detect.

Ultimately, this paper will argue that China will soon enough assume a leading role in the provision of technological information through the patent system. It will also argue that competitive databases containing value-added patent information which allow for high quality search results must be provided to increase the usage of Chinese and Asian patent information.

⁴ See TRILATERAL STATISTICAL REPORT 21 (The Trilateral Cooperation, 2007), available at <http://www.trilateral.net/statistics/tsr/2007.html> (discussing Japan's role in worldwide patenting activity).

⁵ See *WIPO Sees Asian Patent Boom*, MANAGING INTELLECTUAL PROPERTY, Oct. 16 2006, available at <http://www.managingip.com/Article/1257604/WIPO-sees-Asian-patent-boom.html> [hereinafter *Asian Patent Boom*] (last visited Mar. 11, 2010).

⁶ See COMPENDIUM OF PATENT STATISTICS 6 (Organization for Economic Co-operation and Development, 2008).

II. PATENT INFORMATION AND ITS ROLE FOR TECHNOLOGY DISCLOSURE

The term “patent information” denotes the act of disclosing any information contained in patents and about patents or the patent system.⁷ The practice of technology disclosure through patent information is not only a fundamental principle of the patent system as such but serves an important function in business strategy and industrial policy making.

A. Information Disclosure as a Fundamental Principle of Patent Law

The necessity to undermine competition policies through patent protection in order to cure market inabilities serves as one of the earliest and lasting economic explanations for the relevance of patent protection.⁸ At the same time, one of the most important counterbalances for the grant of monopolistic patent rights is the imposition of a duty to disclose the invention.⁹ The law is thus aimed at trading-off incentives and access considerations to allow an optimal level of innovation, economic development, or net social utility.

However, the economic literature is split upon the question of whether or not the disclosure requirement of the patent system encourages inventions. On the one hand, it is argued that society benefits from diffusion due to the reduction of deadweight loss,¹⁰ the improvement prospects for subsequent innovations,¹¹ and the communication of other uses for a specific technology.¹² It is further argued that disclosure improves the efficiency of the patent system by informing potential innovators of possible infringements¹³

⁷ Cf. Curt Edjäll, *The EPO's Patent Information Policy Reviewed*, 29 WORLD PATENT INFORMATION 144, 144-45 (2007) (providing a comparable definition of “patent information”).

⁸ See Richard A. Posner, *Intellectual Property: The Law and Economic Approach*, 19 THE JOURNAL OF ECON. PERSPECTIVES 57 (2005).

⁹ See FRANÇOIS LÉVÊQUE & YANN MÉNIÈRE, *THE ECONOMICS OF PATENTS AND COPYRIGHT* 9-11 (Berkeley Electronic Press 2004), available at <http://www.bepress.com/leveque/> (last visited Mar. 11, 2010).

¹⁰ “Deadweight loss” refers to a reduction in net economic benefits resulting from an inefficient allocation of resources, cf. DAVID BESANKO & RONALD R. BRAEUTIGAM, *MICROECONOMICS – AN INTEGRATED APPROACH*, G-2 (Wiley 2002).

¹¹ See James Bessen & Eric Maskin, *Sequential Innovation, Patents and Imitation* (MIT Working Paper No. 00-01, 2000); Jerry Green & Suzanne Scotchmer, *Novelty and Disclosure in Patent Law*, 21 RAND JOURNAL OF ECONOMICS 131-146 (1990).

¹² See WILLIAM M. LANDES & RICHARD A. POSNER, *THE ECONOMIC STRUCTURE OF INTELLECTUAL PROPERTY LAW* (Harvard University Press 2003).

¹³ See James Bessen, *Patents and the Diffusion of Technical Information*, 86 ECON. LETTERS 121 (2005).

and by costs of production and imitation.¹⁴ On the other hand, it is argued that firms do not place much value on the disclosed information,¹⁵ and, if so, they primarily use the information to monitor competitors or check infringements¹⁶ rather than using it as a source of technological information. Furthermore, James Bessen demonstrates that the diffusion of technical information embodied in inventions is not enhanced by the patent system and may well be delayed.¹⁷ Yet, despite this criticism, the obligation to disclose an invention constitutes a fundamental principle of patent law that is well-established and laid out in international treaties and national laws.

On an international level, the Agreement on Trade-Related Aspects on Intellectual Property Rights (TRIPS Agreement) imposes in Article 29(1) "Conditions on Patent Applicants" a duty to "disclose the invention sufficiently clear and complete for the invention to be carried out by a person skilled in the art."¹⁸ The Patent Cooperation Treaty (PCT) sets out in Article 21 that the "International Bureau shall publish international publications" and that "the international publication of the international application shall be effected promptly after the expiration of 18 months from the priority date of that application."¹⁹

On a national level in Asia, the disclosure of patent information in Japan is set out in Chapter III, "Laying Open of Applications," which provides that "[a]fter one year and six months from the filing date of an application, the Commissioner of a patent shall lay the patent application open for public inspection."²⁰ Korea's disclosure

¹⁴ See Ignatius Horstmann et al., *Patents as Information Transfer Mechanisms: To Patent or (Maybe) Not to Patent*, 93 JOURNAL OF POLITICAL ECON., 837-858 (1985); James J. Anton & Dennis A. Yao, *The Sale of Ideas: Strategic Disclosure, Property Rights, and Contracting*, 69 REVIEW OF ECON. STUDIES 513-531 (2002).

¹⁵ See Stuart Macdonald, *What the Patent System Offers the Small Firm* (summary report for the Economic and Social Research Council 1998); Puay Tang et al., *Patent Protection of Computer Programmes*, (report to the European Commission 2001); Wesley M. Cohen et al., *R&D Spillovers, Patents and the Incentive to Innovate in Japan and the United States*, 31 RESEARCH POLICY 1349-1367 (2002).

¹⁶ See Charles Oppenheim, *How SMEs Use the Patent Literature*, (summary report for the UK Economic and Social Research Council 1998).

¹⁷ See Bessen, *supra* note 11, at 127.

¹⁸ See Agreement on Trade-Related Aspects of Intellectual Property Rights art. 29(1), 15 Apr. 1994, 1869 U.N.T.S. 299, 33 I.L.M. 1197 [hereinafter TRIPS].

¹⁹ See Patent Cooperation Treaty, 19 June 1970, 28 U.S.T. 7645, 1160 U.N.T.S. 231, 9 I.L.M. 978. See also The European Patent Convention art. 93, 5 Oct. 1973, 13 I.L.M. 268 (as amended) (a regional agreement imposing an obligation on the European Patent Office (EPO) to "publish the European patent application as soon as possible" either after 18 months or at the request of the applicant, Convention on the Grant of European Patents) [hereinafter EPC].

²⁰ See Patent Law No. 121, Apr., 13 1959 (Japan), available as amended at http://www.wipo.int/lea/en/text_html.jsp?lang=en&id=2624.

requirement is found in Article 64, “Laying Open of Applications,” of the Korean Patent Act, requiring that “the Commissioner of the Korean Intellectual Property Office shall lay open a patent application in the Patent Gazette more than one year and six months after the date prescribed in any of the following subparagraphs or, upon request of the applicant, within one year and six months of the prescribed date.”²¹ In China, the question of patent information disclosure is laid out in Article 34 of the revised patent law, requiring the State Council’s patent administrative department to “publish [an invention patent application] after the lapse of a full 18 months following the filing date,” though it may also be published earlier at the request of the applicant.²² The importance of patent information is further stressed by Rule 93 of the draft Implementing Regulations, providing that people’s governments above the county level “set up a department for patent administration which is responsible for [. . .] publishing the patent information and disseminating patent knowledge.”²³ Lastly, India’s disclosure requirement is set out in Article 10(4) of the Indian Patent Act,²⁴ which requires a complete specification that enables a person possessing average skill in the art to work the invention without assistance of the patentee.

In summary, all of these international and national regulations accord with the underlying principle of patent disclosure as a fundamental principle of patent law.

²¹ See Patent Act (Consolidation), No. 950, 31 Dec. 1961 (Republic of Korea), *available as amended at* http://www.kipo.ke.wipo.net/clea/en/text_pdf.jsp?lang=EN&id=5028. The publication requirement was substantially reformed in 1996 (effective as of 1 July 1996) introducing three cases of publication: first, upon request from the applicant even before the expiration of one year and six months from the said date, second, after the registration of the patent, and third, one year and six months from the date prescribed under certain conditions. Cf. WIPO Index of Patent Systems, *available at* http://www.wipo.int/ipstats/en/resources/patent_systems.html (last visited Mar. 11, 2010).

²² 中华人民共和国专利法 *Zhōnghuá rénmin gònghéguó zhuānlǐ fǎ* [The Patent Law of the People’s Republic of China], (promulgated by the Standing Comm. of the Nat’l People’s Cong., Mar. 12, 1984), *translated and available as amended in* CHINA LAW AND PRACTICE, Feb. 2009, at 60-74.

²³ See 中华人民共和国专利法实施 *Zhōnghuá rénmin gònghéguó zhuānlǐ fǎ shíshī* [The Implementing Regulations of the Patent Law of the People’s Republic of China], (promulgated by the State Council, June 15, 2001) 1992 SUP. PEOPLE’S CT. GAZ. No. 30 at 1305 (P.R.C.), *translated and available as revised in* 17 CHINA LAW AND PRACTICE, Feb. 2003, at 11 (repealing the Rules for Implementation of the Patent Law of the P.R. China, amended on 12 Dec. 1992, upon approval of the State Council, promulgated on Dec. 1992 by the Patent Office of China).

²⁴ See The Patents Act, No. 39 of 1970 (India), *translated and available as amended at* <http://www.patentoffice.nic.in/ipr/patent/patents.htm>. See also INTELLECTUAL PROPERTY INDIA: DRAFT MANUAL OF PATENT PRACTICE AND PROCEDURE 120-123 (The Patent Office, India 2008), *available at* http://www.patentoffice.nic.in/ipr/patent/DraftPatent_Manual_2008.pdf (analyzing the sufficiency of the disclosure requirement in Indian Patent Law) (last visited Mar. 11, 2010).

B. The Patent Document as a Source of Technological Information

In most countries, the disclosure of inventions is provided in so-called patent documents that contain technological information on inventions that is often unavailable in another document. In some selected countries, the term patent document does not only refer to patent specifications but also to patent applications.²⁵ Both the patent application and the patent specification contain an abstract version of the application's content together with three basic parts of information worded by the applicant: bibliographic data, a detailed description of the invention, and claims. Patent documents can be rather complex, with a single patent held by a shell corporation, for instance, having around nine different claims and 500 drawings.²⁶ In view of the more than two million patent documents published worldwide each year²⁷ and in view of the existence of patent documentation since the end of the 19th century, patent documents can serve as valuable sources of technological information.

The finely subdivided classification system, especially the International Patent Classification (IPC) system,²⁸ provides for a hierarchical system of language independent symbols for the classification of patents according to the different areas of technology to which they pertain. As a consequence, patent documents allow for access to a technically advanced cluster of information on any given technological field. In particular, the information on the claimed novelty, on the inventiveness by reference to the existing state of the art, and on the possibilities of practical application in industry is unavailable through journals or articles. An analysis of so-called patent indicators of competitors, such as patenting activity, technology share, R&D emphasis, cooperation intensity, share of granted patents, technological scope, international scope, citation frequency, average patent quality, and

²⁵ See Ulf Jansson, Director, Swedish Patent Office, *Patent Documents as a Source of Technological Information*, Lecture Delivered at the World Intellectual Property Organization Roving National Seminar on Industrial Property, WIPO/IP/ET/00/9 3 (2000), available at http://www.wipo.int/edocs/mdocs/sme/en/wipo_ip_et_00/wipo_ip_et_00_9.pdf (last visited Mar. 11, 2010).

²⁶ See Michael Blackman, *Conference Report, EPO Patent Information Conference, Stockholm, Sweden, October 2008*, 31 WORLD PATENT INFORMATION 152 (2009). See also Sadao Nagaoka, *Reform of Patent System in Japan and Challenges*, in 21ST CENTURY INNOVATION SYSTEMS FOR JAPAN AND THE UNITED STATES: LESSONS FROM A DECADE OF CHANGE: REPORT OF A SYMPOSIUM (The National Academies Press 2009) (proving that the average number of claims per application has increased from three in 1990 to around nine in 2009).

²⁷ Jansson, *supra* note 25, at 3 (referring to the total number of patent applications and granted patents).

²⁸ The system was established by the Strasbourg Agreement Concerning the International Patent Classification, Mar. 24, 1971, 1160 U.N.T.S. 483-522.

patent strength, also allows for effective competitor monitoring.²⁹ The rising size of the document archives of patent offices, for instance, from 20 million in the European Patent Office (EPO) document archive in the 1980s to nearly 60 million in 2007,³⁰ further suggests that there exists an impressive body of technological information.

Nevertheless, there are limitations to the usefulness of patent documents as sources of information, not only for legal purposes but also as technical information.³¹ These are caused by the declining patent quality in selected industries,³² the existence of a number of patents with little technological significance, the usage of patent-specific language, the increasing complexity of patent information in a globalized patent world requiring “information scientists” for analysis,³³ and especially the costs and unclear procedures of small and medium enterprises (SMEs).³⁴ These limitations are reinforced by fundamental changes in the patent information environment that were spurred by new technologies and the internet that engenders increasing access of the user community to raw patent office data.³⁵ While the number of commercial players for the provision of value-added patent information went down from forty well-known companies in 1988 to twenty-four in 2007,³⁶ open patent services systems, such as, the free esp@cenet service or EPO’s Open Patent Services (OPS),³⁷ are on the rise. As a result, open patent service

²⁹ See Holger Ernst, *Patent Information for Strategic Technology Management*, 25 WORLD PATENT INFORMATION 233, 235 (2003) (providing a definition of the patent indicators).

³⁰ See Edfjäll, *supra* note 7, at 145.

³¹ It was rightly noted by Daniel Shallow, search examiner at the European Patent Office, that it is in particular the usefulness as a source of legal information that can be compromised by declining patent quality. See also *infra*, note 32.

³² There exist various definitions of patent quality. This paper refers to the allegation that some patent offices tend to issue patents for inventions that are not obvious at first appraisal. The question of a patent quality crisis was raised in a conference organized by the International Intellectual Property Institute: *Uncertainty and Cost – Averting a Global Patent Crisis* in 2006. See International Property Institute, http://www.iipi.org/topics/regional_intellectual_property_integration.asp (last visited Mar. 11, 2010).

³³ See Doreen Alberts, *The Ever-Changing Role of Information Professionals in Pharmaceutical R&D*, 30 WORLD PATENT INFORMATION 233, 235 (2008) (analyzing the changing role of information professionals in the pharmaceutical sector).

³⁴ See ENNO MASUREL, *USE OF PATENT INFORMATION: EMPIRICAL EVIDENCE FROM INNOVATIVE SMES* (Vrije Universiteit Amsterdam 2005).

³⁵ See Christiane Emmerich, *Comparing First Level Patent Data with Value-Added Patent Information: A Case Study in the Pharmaceutical Field*, 31 WORLD PATENT INFORMATION 117-122 (2009) (analyzing the trend in the pharmaceutical sector). See also Wolfgang Pilch & Daniel Shallow, *Patent Information in a Changing World: Perspectives from a Major Patent Office*, 27 WORLD PATENT INFORMATION 287, 291 (2005).

³⁶ See Edfjäll, *supra* note 7, at 145.

³⁷ See Open Patent Services, <http://www.epo.org/patents/patent-information/free/open-patent-services.html> (last visited Mar. 11, 2010).

systems are increasingly pressurized into providing an extended range of search possibilities since the search of first level patent information is not necessarily sufficient to support critical business decisions.³⁸ Furthermore, developing countries lack true patent information professionals to conduct complex patent document searches, a fact that hampers the diffusion of technical information in those countries.³⁹ Despite these limitations, it is well recognized that patent documents serve as valuable sources of technological information.

C. Role and Relevance of Patent Information

In addition to the relevance of patent information as a form of disclosure for technical information, it is important to note that patent information, in its form as a carrier of legal information, also plays an important role in business strategy and industrial policy making.

In essence, patent information is used to formulate intellectual property strategies, design R&D activities, and analyze market and competitors' trends, including industry dynamics using Porter's Five Forces or alternative frameworks of strategic interaction at the firm level.⁴⁰ It is also useful to facilitate licensing and technology transactions, essential for the valuation of patents,⁴¹ and inspire inventors and engineers for further product development.⁴² All of this information is particularly of use to two important recipients: first, senior management, and second, external stakeholders of the firm, such as shareholders and analysts.⁴³ The relevance of patent information is acknowledged through sophisticated patent information management, ranging from documentation to collaborative information commerce.⁴⁴ Such patent information

³⁸ See Emmerich, *supra* note 35, at 121.

³⁹ See World Intellectual Property Organization, WIPO Patent Information Services (WPIS) for Developing Countries, available at <http://www.wipo.int/sme/en/documents/wpis.htm> (last visited Mar. 11, 2010).

⁴⁰ See Dietmar Harhoff, Powerpoint presentation: The Strategic Function of Patent Information, slides 8-9 (presented at the European Patent Office Patent Information Conference 2006), available at <http://www.epo.org/about-us/events/archive/2006/pi-conference-2006/programme.html> (last visited Mar. 11, 2010).

⁴¹ See *id.* at slide 17.

⁴² See REPORT ON THE INTERNATIONAL PATENT SYSTEM 24-25, SCP/12/3 Rev.2 (World Intellectual Property Organization Standing Committee on the Law of Patents, 2009) [hereinafter *International Patent System*]. See also Sungjoo Lee et al., *Using Patent Information for Designing New Product and Technology: Keyword Based Technology Roadmapping*, 38 R&D MANAGEMENT 169-188 (2008) (suggesting a new technology roadmapping (TRM) approach based on the use of patent information).

⁴³ See Ernst, *supra* note 29, at 233-242.

⁴⁴ See Christoph Haxel, *Patent Information at Henkel: From Documentation and Information to Collaborative Information Commerce*, 24 WORLD PATENT INFORMATION 25-30 (2002); Gann Xu,

management allows for the fullest realization of the strategic function of patents.⁴⁵ At the same time, however, it is in particular SMEs that would profit enormously not only from the provision of patent documents per se, but also from user-friendly information services comprising the required technical information.⁴⁶

Industrial policy, by contrast, relies on patent information to monitor national technology performance, to inform national R&D policies, to encourage national technology markets, and to analyze companies' strategic behavior.⁴⁷ The use of patent information is particularly crucial for developing countries to further their economic development, a fact which was taken up in Article 31 of the World Intellectual Property Organization (WIPO) Development Agenda that encourages the facilitation of better access to publicly available patent information.⁴⁸ It is, however, to be noted that the application of patent statistics for the measurement of inventive activity and technological change has its inherent limitations which will further be elaborated below.⁴⁹ Nevertheless, there is a clear consensus that patent statistics are useful in the illumination of the process of innovation and technical change.⁵⁰

In summary, patent information plays an important role both in business strategy and in industrial policy making, though evidence also indicates that patent information is still underused.

III. THE RISING IMPORTANCE OF ASIAN PATENTS AS A SOURCE OF TECHNOLOGICAL INFORMATION

Recent years have witnessed the rising importance of Asian patents as a source of technological information. Through an analysis of patent statistics, the following section will expose the role

Information for Corporate IP Management, 26 WORLD PATENT INFORMATION 149-156 (2004). See also Dietmar Harhoff, *The Battle for Patent Rights*, in ECONOMICS AND MANAGEMENT PERSPECTIVES ON INTELLECTUAL PROPERTY RIGHTS (de Meyer & Van Pottelsberghe, eds., Palgrave 2006).

⁴⁵ See Harhoff, *supra* note 40, at slide 3.

⁴⁶ See U. Schmoch, *Disclosure of Patent Information for Small and Medium-Sized Enterprises*, 12 WORLD PATENT INFORMATION 158-164 (1990) (studying the use of patent information by SMEs).

⁴⁷ Cf., Jansson, *supra* note 25, at 8 (exploring the use of patent information to ascertain general or specific trends in the technological development by the Swedish Patent and Registration Office).

⁴⁸ See World Intellectual Property Organization, The 45 Adopted Recommendations under the WIPO Development Agenda, available at <http://www.wipo.int/ip-development/en/agenda/recommendations.html#c> (last visited Mar. 11, 2010).

⁴⁹ See Sujit Bhattacharya, *Mapping Inventive Activity and Technological Change Through Patent Analysis: A Case Study of India and China*, 61 SCIENTOMETRICS 361, 361-362 (2004).

⁵⁰ See Zvi Griliches, *Patent Statistics as Economic Indicators: A Survey*, XXVIII JOURNAL OF ECONOMIC LITERATURE 1661-1707 (December 1990).

of China, Japan, Korea, and India in international patenting and analyze trends and issues in Asian patent information.

A. The Role of Asian Countries in International Patenting

The following section will, first, elaborate upon the methodology used to analyze trends and issues in Asian patent information. Second, it will introduce Chinese, Japanese, Korean, and Indian patent trends individually before, finally discussing Asian patent information trends more generally.

1. Methodology

This study focuses on the hypothesis that the role and relevance of Asian patent information as a source of technological information has increased over the last couple of years and will continue to do so in the future. This study will corroborate this hypothesis by drawing upon patent statistics and key indicators published by the World Intellectual Property Organization (WIPO), the United Nations (UN), the EPO, and the International Monetary Fund (IMF). More specifically, this study analyzes patents in force and patent grants, since both data correlates most closely with the amount of patent documents available as sources of technological information.

The study examines patents in force in China,⁵¹ Japan, Korea, and India in 1985 and compares it to 2006 data. Both 1985 and 2006 data was retrieved from the United Nations Statistics Division, Key Global Indicators, Patents in Force.⁵² The study further examines Chinese, Japanese, Korean, and Indian patent grants from 1991 to 2006, resorting to data sets published in the WIPO Patent Statistics Database.⁵³ The database reports patent grants by patent offices, broken down by resident and non-resident,⁵⁴ with counts being based on the grant date. “Patent” in the context of patent grants refers to patents only and does not include utility model grants. It should be noted that an interpretation and analysis of patent grant data depends to a large extent on the differences within the patent

⁵¹ Excluding data relating to the Hong Kong Special Administrative Region (Hong Kong SAR) and Macao Special Administrative Region (Macao SAR).

⁵² See UN Data: Patents in Force, available at <http://data.un.org/Search.aspx?q=patents+in+force> (last visited Mar. 11, 2010). See also Brain League IP Services, 2007 Indian Patent Grants, <http://www.brainleague.com/Newsletter/Jan08/thiswayplease.htm> (last visited Mar. 11, 2010) (listing 2007 patent grants in India).

⁵³ See World Intellectual Property Organization: Statistics on Patents, <http://www.wipo.int/ipstats/en/statistics/patents/> [hereinafter WIPO Patent Statistics] (last visited Mar. 11, 2010).

⁵⁴ Resident filing refers to an application filed at an office of or acting on behalf of the state of residence of the first-named applicant. Non-resident filing refers to an application filed at an office of or acting on behalf of a state in which the first-named applicant does not have residence.

system and legal reforms in the respective countries. In the country-sections of this study, relevant law reforms since 1991 will be briefly outlined so as to allow for meaningful interpretations of the data sets.

Data from the United Nations Statistics Division and the WIPO Patent Statistics Database is complemented by data from the WIPO World Patent Report.⁵⁵ The data is further set in relation to every billion U.S. Dollar (USD) of the gross domestic product (GDP) of every individual country. The GDP data is retrieved from the IMF World Economic Outlook Database⁵⁶ and is measured as GDP at current prices, i.e. as GDP at prices of the current reporting period or nominal GDP. The values are based upon GDP in national currency and the exchange rates are either projections provided by country economists or established in the IMF World Economic Outlook assumptions. The patent grants data is also set in relation to patent applications in the individual economies. The source of the patent application data is again the WIPO Patent Statistics Database⁵⁷ with counts being based on the patent filing date.

This study is different from studies measuring scientific, technological, or innovative activities through the patent system which is considered to be a highly contentious undertaking.⁵⁸ Rather it measures the amount of patent documents available by using patents in force and patent grants as an indication for the amount of available patent information. Thus, the limitation of this study lies in the fact that patent grants are considered as proxy for the amount of available patent information. Nevertheless, it is argued that patents in force and patent grants provide for a reliable indication of the amount of available patent documents.

What this study does not do, and cannot do, is provide data on the technical and economic significance of the patent documents concerned. While some patents reflect minor improvements of little economic significance, others prove extremely valuable. Since no procedure has as of yet been developed for the appropriate weighting

⁵⁵ See WORLD PATENT REPORT, A STATISTICAL REVIEW (World Intellectual Property Organization 2008), available at http://www.wipo.int/ipstats/en/statistics/patents/wipo_pub_931.html [hereinafter World Patent Report] (last visited Mar. 11, 2010).

⁵⁶ See International Monetary Fund (IMF): World Economic Outlook Database, available at <http://www.imf.org/external/pubs/ft/weo/2006/02/data/weoselgr.aspx> (last visited Mar. 11, 2010).

⁵⁷ See WIPO Patent Statistics, *supra* note 53.

⁵⁸ See Bhattacharya, *supra* note 49, at 361. See also Griliches, *supra* note 50, at 1666 (criticizing the use of patent statistics to measure inventive activity and technological change); K. Pavitt, *Patent Statistics as Indicators of Innovative Activities: Possibilities and Problems*, 7 SCIENTOMETRICS 77-99 (1985) (discussing the major problems with using patents for economic analysis, such as classification and intrinsic variability).

of patent documents,⁵⁹ this study only provides information on patents in force and patent grants, with all patent grants being put on the same level regardless of their quality. In some selected instances, however, this study will suggest patent quality issues as the explanation for some trends that become visible in this study.

2. Patents in Force and Patent Grants in Asia

The following section will introduce Chinese, Japanese, Korean, and Indian patent trends individually with reference to patents in force and patent grants.

(a) China

The following section will show that China experienced a tremendous increase in the demand for patents over the last ten years. The recent growth in patent information suggests that China will assume a leading role in the provision of technological information through the patent system.

The recent growth in patent information in China went hand in hand with the establishment and reform of the Chinese patent system. The first patent law in modern times in China was enacted in 1984⁶⁰ thereby marking the end of the former Chinese practice of having technologies developed by government laboratories and then transferred to the industrial sector for free.⁶¹ Chinese patent law was subsequently amended, once in 2001 for China's accession to the World Trade Organization (WTO)⁶² and later in 2009 so as to better account for the rising technology capabilities of Chinese companies.⁶³ However, these changes were not primarily responsible for variations in patenting in China. Rather the surge in domestic and international patenting in China in 1992 and 1993 is explained with reference to the booming economy after Deng Xiaoping's Southern China Tour.⁶⁴

While there were only forty-four patents in force in 1985, there were already 182,396 patents in force in China in 2006,

⁵⁹ See Griliches, *supra* note 50, at 1679 (discussing patent rights and values).

⁶⁰ All of the subsequently described changes are laid out in WIPO Index of Patent Systems, *supra* note 21.

⁶¹ See Yifei Sun, *Determinans of Foreign Patents in China*, 25 WORLD PATENT INFORMATION 27-28 (2003).

⁶² See Wechsler, *supra* note 1, at 37.

⁶³ Andrea Wechsler, *Volksrepublik China – Verabschiedung der dritten chinesischen Patentrechtsreform durch den Nationalen Volkskongress*, 3 GEWERBLICHER RECHTSSCHUTZ UND URHEBERRECHT INTERNATIONALER TEIL 275 (2009).

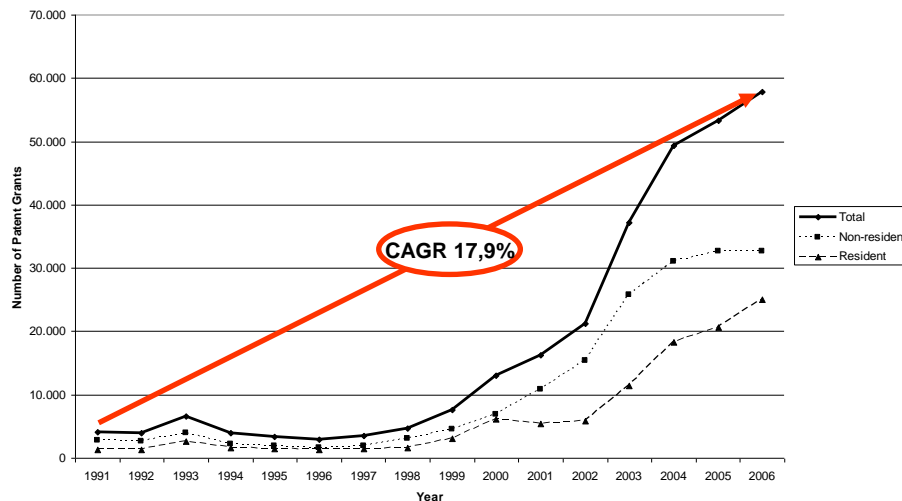
⁶⁴ See Sun, *supra* note 61, at 30.

corresponding to a CAGR of 46%.⁶⁵ The 2006 figure amounts to 15.9% of Japanese patents in force (1,146,871) and 3.0% of worldwide patents in force (about 6.1 million). Thus, China still has a long way to go to reach the same level of patents in force as is present within Japan. However, a look at the number of patent applications by the language of filing is promising: the number of PCT international patent applications in the Chinese language demonstrates that Chinese is the fourth often used language of filing with 5,009 applications in 2007.⁶⁶ Thus, it is to be expected that the number of patents in force in China will considerably increase in the next couple of years, leading to an enormous body of Chinese patent information.

The increasing role and relevance of Chinese patent information also becomes evident when analyzing the number of patent grants in China (Figure 1). While there were only 2,976 patents granted in 1991, there were already 57,786 patents granted in 2006, which corresponds to a growth rate of a CAGR of 17.9%.

⁶⁵ CAGR as the “Compound Annual Growth Rate” denotes the year-over-year growth rate over a specified period of time and is calculated as follow: $CAGR = (\text{ending value} \div \text{starting value})^{1/(\text{number of years})} - 1$.

⁶⁶ See WIPO Patent Statistics, *supra* note 53, at 28.

Figure 1: Number of Patent Grants in China (1991-2006)

The increasing percentage of resident patent grants in China from 32% in 1991 to 43% in 2006 with a CAGR of 1.9% suggests that there is an increasing degree of inventive and innovative activity by Chinese resident companies. At the same time, however, it is to be noted that the large majority of Chinese applications for IP protection still fall within the categories of utility models and industrial designs rather than invention patents. Thus, in 1999 more than 80% of utility models and designs were owned by domestic patentees.⁶⁷ It is also to be noted that invention patents are as of yet primarily awarded to Chinese individuals while foreign patents in China are largely awarded to organizations.⁶⁸ The award of patents to Chinese individuals is explained with reference to the role of university research in China and an increasing intensity of collaboration between university and industry research, which suggests that China has come to understand the relevance of active research participation of universities in R&D processes in science intensive industries.⁶⁹ In summary, the findings, in relation to the increasing ratio of resident patent grants, allow for the prediction that Chinese patent grants will further increase in the future, thereby promoting the role and relevance of Chinese patent information.

This hypothesis is further corroborated by data that allows for conclusions about the relative importance of Chinese patent

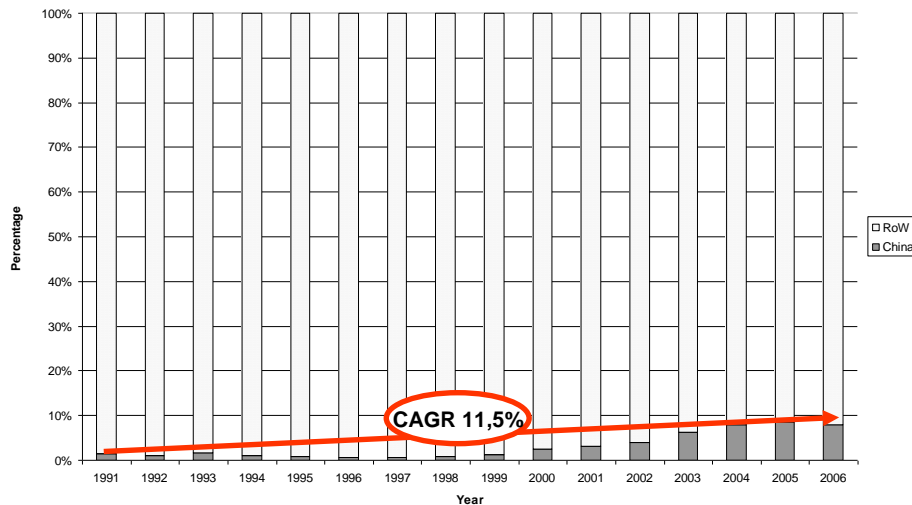
⁶⁷ See Sun, *supra* note 61, at 31.

⁶⁸ See *id.* at 36.

⁶⁹ See Bhattacharya, *supra* note 49, at 37.

information as compared to Asian and worldwide patent information (Figure 2). From 1991 to 2006, the percentage of Chinese patent grants of total Asian patent grants has increased from 8% to 18%. In the same period, the percentage of Chinese patent grants of total worldwide patent grants has increased from 1% to 8%, which corresponds to a CAGR of 11.5%. It follows that the relative importance of Chinese patent information is steadily increasing.

Figure 2: Percentage of Chinese Patent Grants of Total Worldwide Patent Grants (1991-2006)



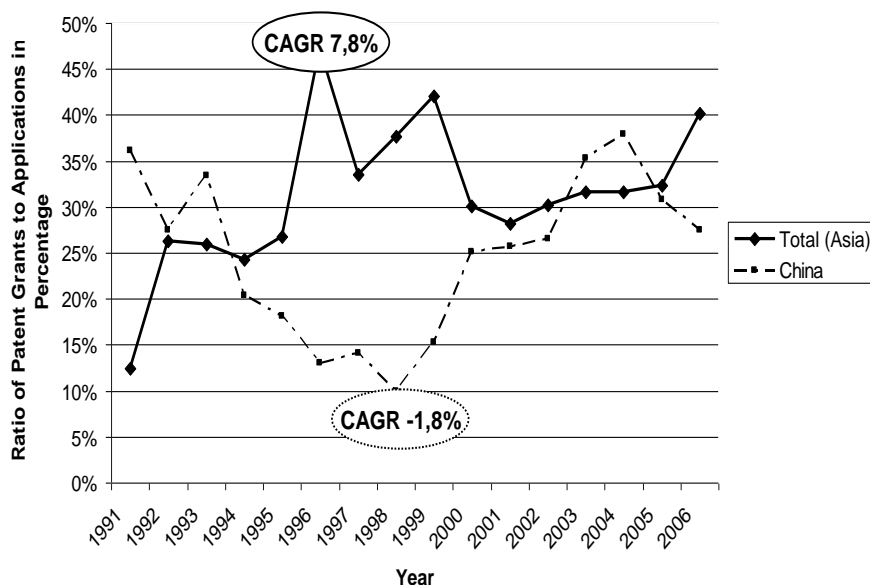
Furthermore, a look at the percentage of Chinese patent grants to patent applications from 1991 to 2006 demonstrates that the percentage of Chinese patent grants measured against patent applications lies mostly below the Asian average and is decreasing over time (Figure 3). This finding stands in stark contrast to findings in relation to the ratio of Korean patent grants to applications. Such a finding allows for the tentative conclusion that the increase of Chinese patent information is not necessarily due to increasing grant rates and, thus, also not necessarily due to a drop in patent quality.

In light of the growth rates described above, it is to be expected that China will eventually become the second most prodigious patent filing authority in the world behind the U.S..⁷⁰ This development is clearly intended by the Chinese government and promoted in the

⁷⁰ See Vin Caraher, *The Evolution of the Patent Information World Over the Next 10 Years: A Thomson Scientific Perspective*, 30 WORLD PATENT INFORMATION 150, 151 (2008).

current 5-year-plan which promotes IP-based industries in order to move China from a manufacturing based economy to an innovation based economy.⁷¹

Figure 3: Ratio of Chinese Patent Grants to Patent Applications in Percent (1991-2006)



(b) Japan

Japanese patents were not only the first of all Asian patents to acquire international significance, but also remained the most important source of Asian patent information ever since, as demonstrated by the following.

An analysis of Japanese patent data requires account to be taken of the most significant changes of Japanese patent law that had an effect on patent statistics relevant for this study.⁷² First, from January 1, 2000 the requirement for the extension of a patent's term was lowered. Second, from July 1, 1995 the term of protection for patents was revised from fifteen years from the publication of the examined application and not exceeding twenty years from the filing date to only twenty years from the filing date. Third, since July 1,

⁷¹ See Chinese Government's Official Web Portal: The Eleventh Five-Year Plan, available at http://www.gov.cn/english/special/115y_index.htm (last visited Mar. 11, 2010).

⁷² All of the subsequently described changes are laid out in WIPO Index of Patent Systems, *supra* note 22.

1995 it is possible to file a patent application in another language other than Japanese. Fourth, on January 1, 1996 an accelerated examination of patent applications was introduced in cases where the applicant submitted a search report issued by a foreign or regional patent office. If successfully requested, accelerated examinations are granted or rejected within thirty-six months of the date on which the request for it was filed.⁷³ Fifth, on January 1, 1996 the pre-grant opposition system was abolished in favor of a post-grant opposition system. As a consequence of all of these changes, Japanese, and thus Asian, patent grants peaked in 1996, as will be shown further below.

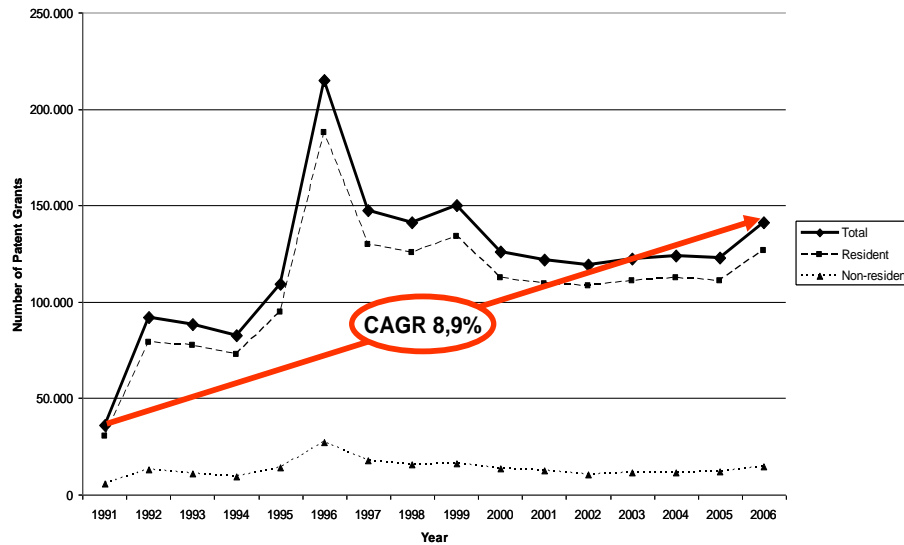
A comparison of patents in force in Japan in 1985 and 2006 demonstrates a sharp increase of patents in force. While there were 501,706 patents in force in 1985, 15.6% of worldwide patents in force, this figure had more than doubled by 2006. In 2006 there were 1,146,871 patents in force in Japan, which amounted to 18.8% of worldwide patents in force. The number of worldwide patents in force was estimated to be around 6.1 million in 2006.⁷⁴ Thus, with 18.8% of all patents in force, the Japanese patent office held the majority of patents in force. This finding suggests that a large body of patent information is now available in Japanese. This suggestion is confirmed by a look at the statistics on the number of PCT international patent applications by the language of filing. Statistics demonstrate that 17.4% of all applications, equivalent to 27,106 applications, were made in Japanese in 2007.⁷⁵

In line with the finding on the rising body of Japanese patents in force, patent statistics confirm an increasing amount of Japanese documents as a result of growing numbers of patent grants. While a total of 36,100 patents were granted in 1991, there were a total of 141,399 patents granted by the Japanese patent office in 2006 (Figure 4). Over time, the compound annual growth rate (CAGR) thus amounted to 8.9%.

⁷³ Cf. Mark S. Cohen, *Japanese Patent Law and the WIPO Patent Law Harmonization Treaty: A Comparative Analysis*, 4 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 847 (1994).

⁷⁴ See WIPO Patent Statistics, *supra* note 53, at 23.

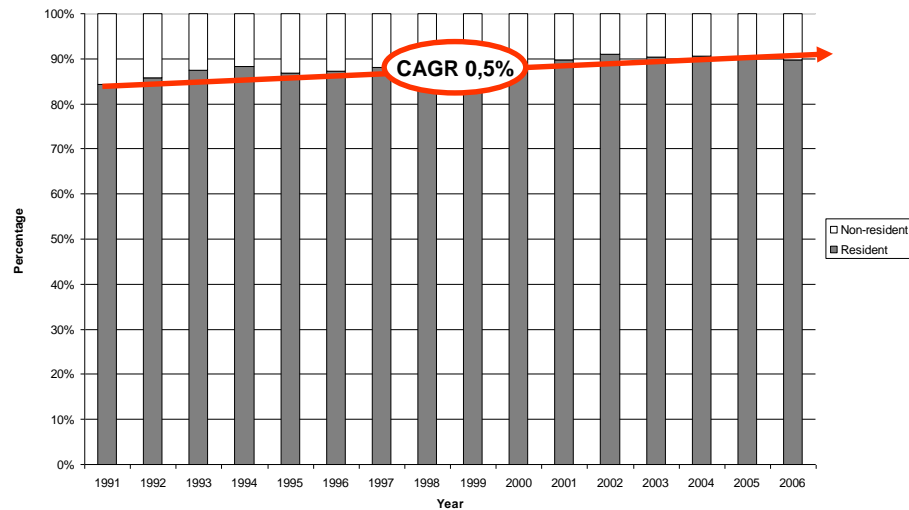
⁷⁵ See *id.* at 28.

Figure 4: Number of Patent Grants in Japan from 1991 to 2006

A look at the percentage of resident patent grants versus non-resident patents grants over time shows a consistently high percentage of resident patent grants in Japan – between 84% and 90% from 1991 to 2006 (Figure 5). This finding was explained by K. Pavitt who suggested that the greater number of Japanese patents awarded to Japanese residents, than of U.S. patent to U.S. residents, was due to the relatively low cost of Japanese patenting rather than to any extraordinarily high Japanese inventive and innovative activity.⁷⁶ In light of this finding, a substantial decrease of patent grants in Japan after 2006 was not to be expected unless Japanese patent fee structures changed considerably.

⁷⁶ See Pavitt, *supra* note 58, at 81 (discussing domestic patent activity and foreign patenting).

Figure 5: Percentage of Resident and Non-Resident Patent Grants in Japan from 1991 to 2006



A look at the demand between the so-called trilateral blocs⁷⁷ further demonstrates the relevance of Japan for the international IP market; European Patent Convention (EPC) applicants filed more in Japan than Japanese applicants did in the EPC countries.⁷⁸ The high demand for Japanese patents supports the hypothesis that Japan was one of the first Asian countries that assumed an important role in international patenting. This hypothesis is further corroborated by reference to the percentage of Japanese patent grants of total worldwide patent grants. The percentage of Japanese patent grants has increased from 12% in 1991 to 19% in 2006, which corresponds to a solid 2.9%. It is only in relation to the number of patents granted by Korea, China, and India that a decrease of the role and relevance of Japanese patents becomes visible. From 1991 to 2006 the percentage of Japanese patent grants of total Asian patent grants has substantially decreased from 72% to 43%, which is mainly due to the rise of Korean and Chinese patent grants. In summary, however, Japanese patent information still remains the most important source of Asian patent information.

⁷⁷ The term “trilateral blocs” includes the U.S., European Patent Organization member states, and Japan.

⁷⁸ See Trilateral Statistical Report, *supra* note 4, at table 3.5.

(c) Korea

Comparable to Japan, the Republic of Korea has experienced an enormous growth in patent grants and, thus, patent information in recent years, which is reflected in the rise of the Korean patent office to the fourth largest patent office in the world.⁷⁹

When analyzing the rising role of Korea in international patenting, the following changes in Korean patent law need to be kept in mind. First, the term of protection for patents was extended from fifteen years to twenty years on July 1, 1996.⁸⁰ Second, the disclosure requirement was refined on July 1, 2006 to require information related to the application to be published or open for public access eighteen months from the date of filing or from the priority date and when the patent is granted.⁸¹ Third, from July 1, 2001 it is possible to initiate an opposition between the date of the grant and the date of the publication of the grant.⁸² The analysis of Korean patent grants will show that the first and second change of Korean patent law resulted in a significant increase of patent filings and eventually patent grants from 1997 to 2000. However, it further needs to be taken into account that in 1998 the country suffered a severe financial crisis and IMF bailout, which is also clearly reflected in the number of patent grants.⁸³

A look at patents in force in Korea in 1985 and 2006 demonstrates a substantial increase in the role and relevance of operative Korean patents in a worldwide comparison. In 1985 the number of operative patents in Korea amounted to 12,936, or 0.4% of the total worldwide 3,220,982 patents in force.⁸⁴ By 2006, the number of patents in operation in Korea had increased to a total of 465,988, which shows a CAGR of 17.7%. Thus, with 465,988 patents in force, Korea held 7.6% of worldwide operating patents in 2006.

An analysis of the number of patent grants in Korea demonstrates that the number of patent grants has increased with a CAGR of 17.8% from 8,691 in 1985 to 120,790 in 2006 (Figure 6). At the same time, the percentage of resident patent grants in Korea had increased from 29% in 1991 to 74% in 2006 (Figure 7). Reference to the development of Asian and worldwide patent grants

⁷⁹ See *Asian Patent Boom*, *supra* note 5.

⁸⁰ See WIPO Index of Patent Systems, *supra* note 21.

⁸¹ See *id.*

⁸² See *id.*

⁸³ See Sungchang Jung & Keun-Yong Imm, *The Patent Activities of Korea and Taiwan: A Comparative Case Study of Patent Statistics*, 24 WORLD PATENT INFORMATION 303-311 (2002).

⁸⁴ This number indicates the total number of patents in force in 64 countries that reported their statistics to the United Nations. Cf. UN Data: Patents in Force, *supra* note 52.

corroborates the finding that the role and relevance of Korean patent information has disproportionately increased. The percentage of Korean patent grants of total Asian patent grants has increased from 17% in 1991 to 37% in 2006, while the percentage of Korean patent grants of total worldwide patent grants has increased from 3% to 17%.

Figure 6: Number of Patent Grants in Korea from 1991 to 2006

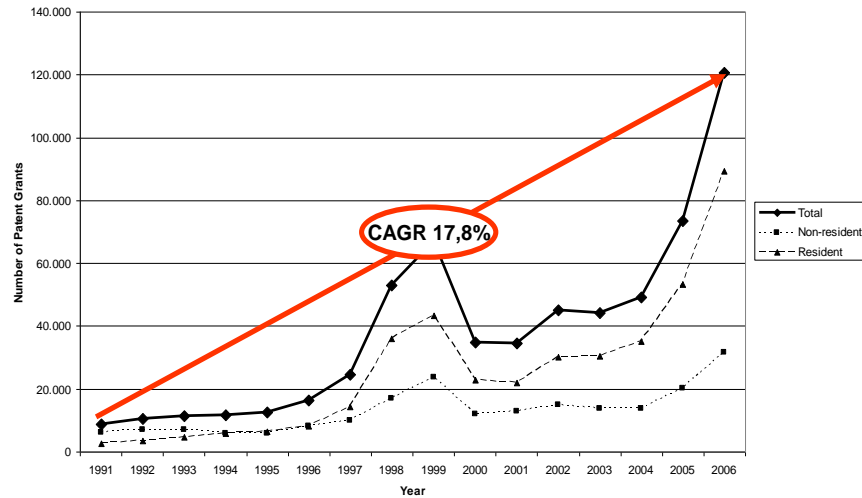
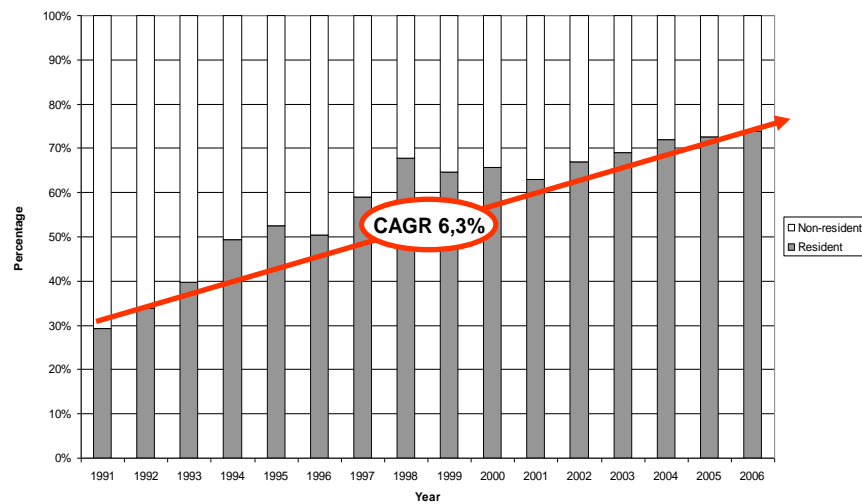


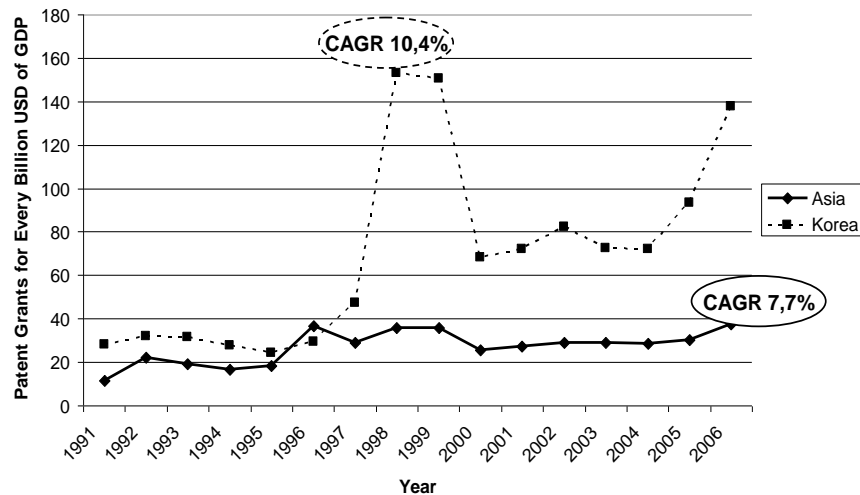
Figure 7: Percentage of Resident and Non-Resident Patent Grants in Korea from 1991 to 2006



The enormous increase in Korean patent information probes the question as to the quality of the available patent information. Although no definite answer can be provided to this question, the following data is supposed to set the rise of Korean patent information in context.

First, a comparison of Korean patent grants for every billion USD of GDP at current prices demonstrates that the grant of patents in Korea is well above the Asian average (Figure 8). From 1991 to 2006 Korea has almost consistently granted more patents for every billion USD of GDP than the Asian average. In 2006 Korea granted 137.7 patents for every billion USD of GDP while it was only twenty-nine patents for every billion USD of GDP in Asia in general. A comparison of growth rates, 10.4% in Korea and 7.7% in Asia, corroborates the finding that there is a disproportionate increase of patent grants in Korea as measured against the country's GDP as the key indicator.

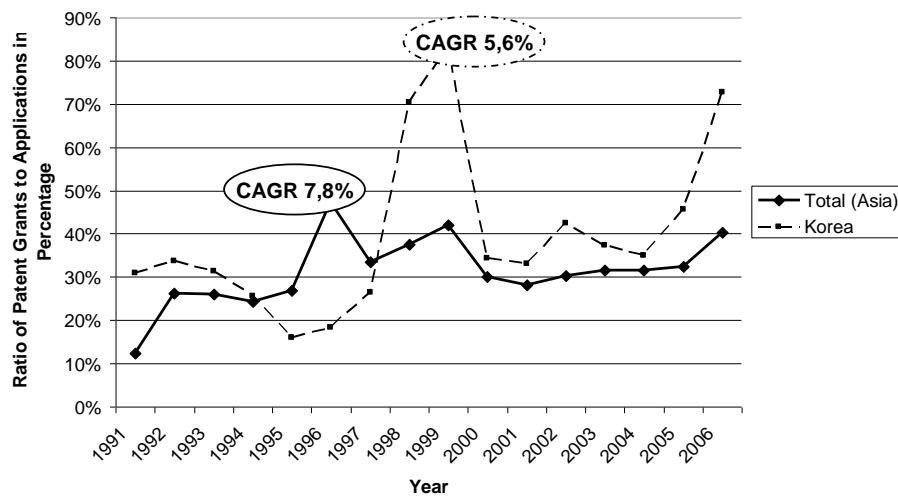
Figure 8: Korean Patent Grants for Every Billion USD of GDP (Current Prices) (1996-2006)



Second, a look at the percentage of Korean patent grants to patent applications from 1991 to 2006 demonstrates that Korea has started with a 30% grant rate in 1991, which has increased to more than 70% in 2006 (Figure 9). This percentage lies well above the Asian grant rate which has only risen from 12% in 1991 to 40% in 2006. It was suggested that the rise of patent grant rates in Korea resulted from

the improvement of patent management.⁸⁵ It was further demonstrated that the dynamic domestic patent activities of Korea have not led to a high rate of U.S. patent applications in Korea, and as a result of which it followed that the quality of domestic patent applications in Korea was relatively low.⁸⁶ However, despite these indications, it is yet to be proven that the extraordinary Korean grant rate is not related to a drop in patent quality.

Figure 9: Ratio of Korean Patent Grants to Applications in Percent (1991-2006)



In summary, recent years have witnessed the development of Korean patent information to the second most important source of technological information in Asia when measured in terms of patent grants.

(d) India

India is often regarded as similar to China in terms of technological and economic development and, thus, lends itself to interesting comparisons.⁸⁷ The following section will analyze the current role and relevance of Indian patent information through patents in force and, in particular, the grant of patents.

The development of Indian patent information hinges upon the larger developments of Indian patent law which is currently in the

⁸⁵ See Jung & Imm, *supra* note 83, at 309.

⁸⁶ See *id.* at 310.

⁸⁷ See Bhattacharya, *supra* note 49, at 361-381.

midst of transformation from patent reforms that were undertaken to conform with the stipulations of the TRIPS Agreement⁸⁸ to a patent policy that accounts for the emerging domestic constituency aiming at raising the patent activity of domestic actors.⁸⁹ The current patent law reform resulted from several policy changes. First, in 1999 the Patent Amendments Act introduced a mail box system for the patenting of product patents in agro-chemical and pharmaceutical fields and established exclusive marketing rights for these products.⁹⁰ Second, in 1998 India acceded to the Paris Convention⁹¹ and the Patent Cooperation Treaty.⁹² Third, the Second Patent Amendments Act was passed in 2002 and intended to fulfill some more of the conditions laid out in the TRIPS Agreement,⁹³ such as raising the term of patent protection to twenty years and compulsory licensing provisions.⁹⁴ Fourth, further amendments to the Indian Patent Act were affected in 2005 and 2006, and introduced full product patent protection in all fields as well as pre-grant representation (opposition) in addition to the existing post-grant mechanisms.⁹⁵ These changes in the Indian patent law itself were complemented by a number of policy statements and efforts, such as the Science and Technology Policy Statement of 2001, the modernization of the Indian patent offices, and WIPO IP trainings which aimed at an increase of domestic patent activities.⁹⁶

As a result of these law reform efforts and changes, patent activities in India rose.⁹⁷ The number of patents in force in India amounted to 17,066 as of 31 March 2007, out of which 3,473 patents stood in the name of Indians. This compares with 6.1 million patents in force across the world and, thus, only constitutes 0.3% of worldwide patents in force. Together with the 1985 figures, when

⁸⁸ See TRIPS, *supra* note 18.

⁸⁹ See Anitha Ramanna, *Policy Implications of India's Patent Reforms: Patent Applications in the Post-1995 Era*, 37 ECONOMIC AND POLITICAL WEEKLY, 2065, 2066 (2002).

⁹⁰ See Ramanna, *supra* note 89, at 2067.

⁹¹ The Paris Convention for the Protection of Industrial Property, Mar. 20, 1883, 21 U.S.T. 1583, 828 U.N.T.S. 305 (as amended).

⁹² See Patent Cooperation Treaty, *supra* note 19.

⁹³ See TRIPS, *supra* note 18.

⁹⁴ See Ramanna, *supra* note 89, at 2068.

⁹⁵ See Manpreet Kaur, *TRIPS & The Indian Patent Regime* at 7, SOCIAL SCIENCE RESEARCH NETWORK, (2008), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1305585 (last visited Mar. 11, 2010).

⁹⁶ See Ramanna, *supra* note 89, at 2069.

⁹⁷ Indian patent activity is further expected to rise with the pending legislation in India, similar to the Bayh-Dole legislation: The Protection and Utilisation of Public Funded Intellectual Property Bill, Bill No. LXVI of 2008 (India), available at http://www.prsindia.org/uploads/media/1229425658/1229425658_The_Protection_and_Utilisation_of_Public_Funded_Intellectual_Property_Bill_2008.pdf (last visited Mar. 11, 2010).

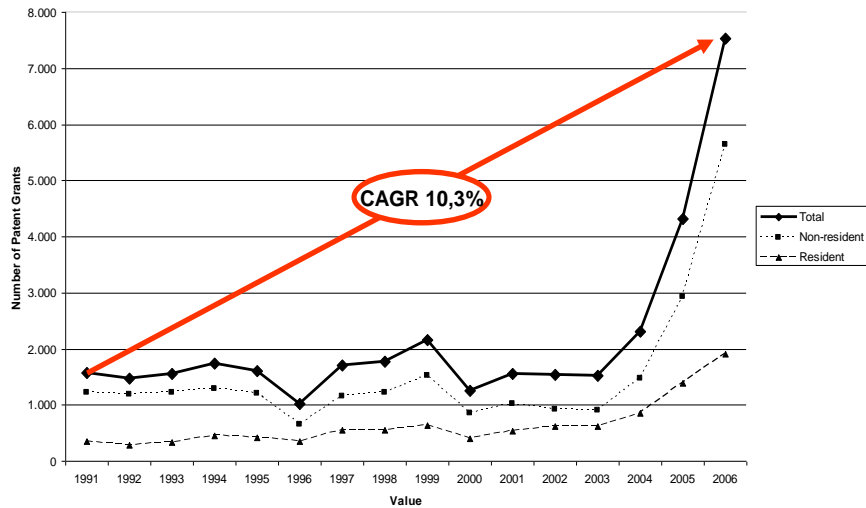
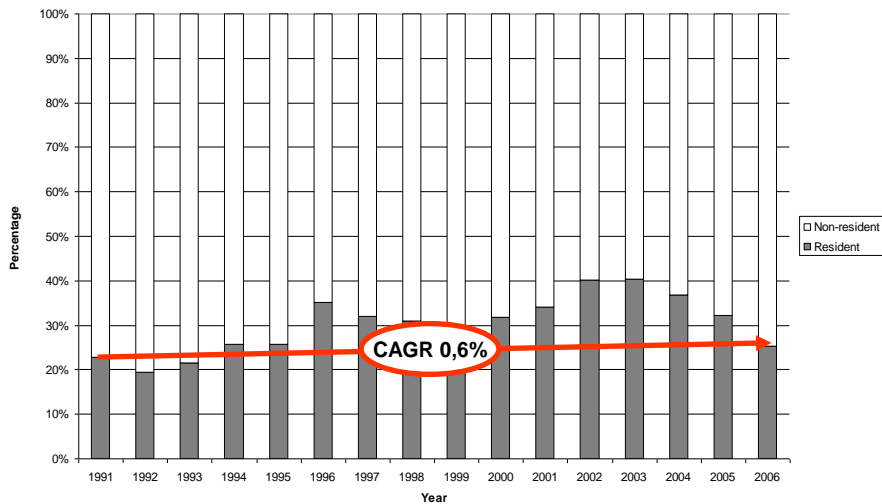
India had 7,702 or 0.2% of worldwide patents in force, the 2007 figures suggest that the body of Indian patent information has not reached international significance in recent years. The growth rate of the number of filings, however, suggests that India is starting to be well on its way to international significance. For 2005, for instance, the Indian patent office reported 24,505 filings – a number greater than the number of patents in force in India.

However, the development of the role and relevance of Indian patent information should further be judged by reference to Indian patent grants (Figure 10). According to WIPO statistics the total number of patent grants in India has risen from 1,572 in 1991 to 7,539 in 2006. This increase corresponds to a CAGR of 10.3%. It is noticeable that the post-1995 period patent grants reflect the interest of firms in filing product patents in India in fields that were not patentable in India's Patent Act of 1970.

While resident patent grants increased from 358 in 1991 to 1,907 in 2006, non-resident patent grants increased from 1,214 in 1991 to 5,632 in 2006 (Figure 11). The percentage of resident patent grants, thus, increased from 22.77% of total patent grants in India in 1991 to 25.30% in 2006 with a peak in 2002 and 2003 where resident patent grants constituted 40% of total patent grants. This data has been interpreted to demonstrate the capacity of domestic actors to make the transition towards the new patent regime.⁹⁸ Nevertheless, the disparity between domestic firms within the overall rise in patent activity should not be overlooked. Research has shown that the rise in domestic patent applications in India is mainly due to a few firms rather than an overall rise in domestic patent activity.⁹⁹

⁹⁸ See Ramanna, *supra* note 89, at 2069.

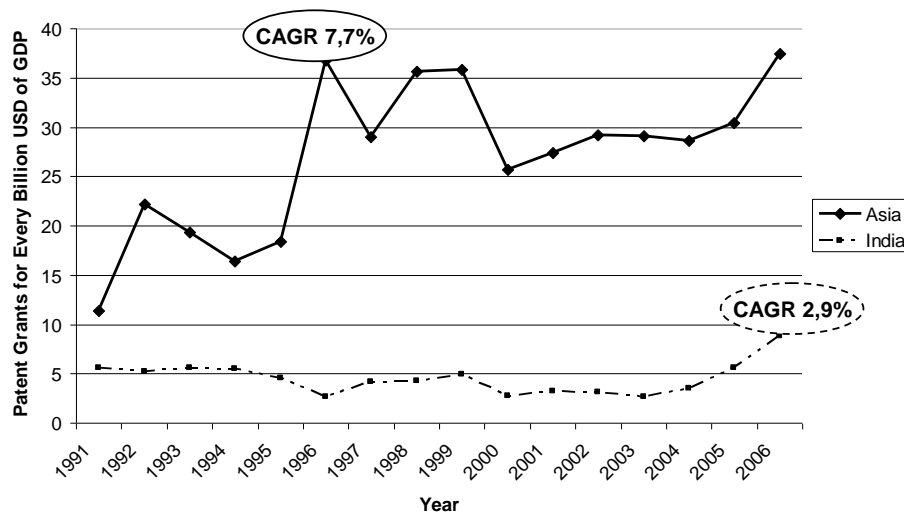
⁹⁹ See *id.* at 2071.

Figure 10: Number of Patent Grants in India (1991-2006)**Figure 11: Percentage of Resident and Non-Resident Patent Grants in India (1991-2006)**

Despite the noticeable increase of Indian patent grants, however, India is still a long way from providing a significant share of Asian or worldwide patent information. The percentage of Indian patent grants of total Asian patent grants has remained stable at around 2% to 3% from 1991 to 2006. At the same time, the percentage of Indian patent grants of total worldwide patent grants has increased from 0.53% to 1.04% but is still rather insignificant.

Likewise, a comparison of Indian patent grants for every billion USD of GDP at current prices demonstrates that India lies well below the Asian average both in the ratio itself and the growth rate (Figure 12). While there were on average 11.35 patent grants for every billion USD of GDP in Asia in 1991 there were only 5.59 in India. Comparably, there were only 8.82 patent grants for every billion USD of GDP in India in 2006 while the Asian average had risen to almost 37.43.

Figure 12: Indian Patent Grants for Every Billion USD of GDP (Current Prices) (1991-2006)



In summary, India demonstrates significant increase in patenting activity since the 1990s when India had first started to proactively promote domestic and foreign patent activity. However, as of yet, these policy efforts have not translated into making India a country that is one of the major providers for patent information in the world. Yet, while Indian patent information is as of yet the least relevant Asian patent information, it should be noted that the global reach of Indian patents, as determined by patent families, is more intense than that of China.¹⁰⁰ This demonstrates not only a greater desire of Indian companies to make their presence felt in the world, but also constitutes an indication as to the quality and usefulness of Indian patent information.

¹⁰⁰ See Sujit Bhattacharya & Pradosh Nath, *Using Patent Statistics as a Measure of "Technological Assertiveness": A China-India Comparison*, 83 CURRENT SCIENCE 23, 27 (2002).

3. Asian Patent Information in Perspective

The above analysis of patents in force and patent grants in individual Asian countries will now be used for a comparative analysis of Asian patent information so as to set the growth of Chinese patent information into perspective. A look at the combined role and relevance of Chinese, Japanese, Korean, and Indian patent information will corroborate the hypothesis that Asia, and in particular China, plays a rising role in technology disclosure through the patent system.

In 2006, the total number of patents in force across the world was estimated to be around 6.1 million.¹⁰¹ Though the largest number of patents in force were in the U.S., 1.8 million in 2006, it was Japanese residents that owned the majority of patents in force.¹⁰² Out of the 6.1 million worldwide patents in force, 1.1 million or 15.9% were reported to be in Japan,¹⁰³ and 182,396 or 3.0% of worldwide patents were reported to be in force in China.¹⁰⁴ Korea reported 465,988 patents in force in 2006, while the number of patents in force in India amounted to 17,066 as of 31 March 2007, out of which 3,473 patents stood in the name of Indians.¹⁰⁵ In total, the 1,812,321 Asian patents in force constituted 29.7% of worldwide patents in force in 2006. This figure compares to 522,388 Asian patents in force in 1985 which constituted a mere 16.2% of worldwide patents in force in 1985. In conclusion, this increase corresponds to a CAGR of 2.8% with an increasing share of Korean and Chinese patents (see Figure 13).

¹⁰¹ See World Patent Report, *supra* note 55, at 23.

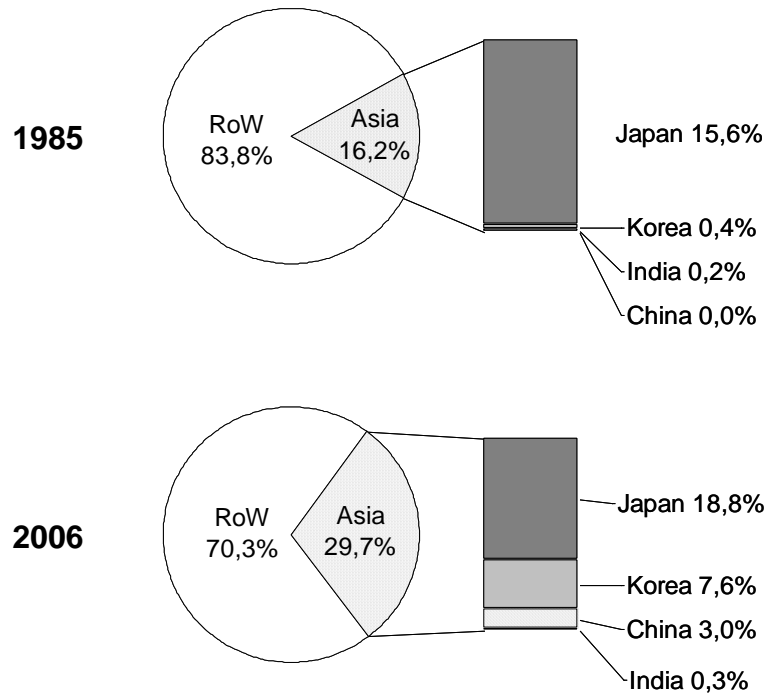
¹⁰² See *id.* at 8.

¹⁰³ *Id.* at 63.

¹⁰⁴ *Id.* at 63.

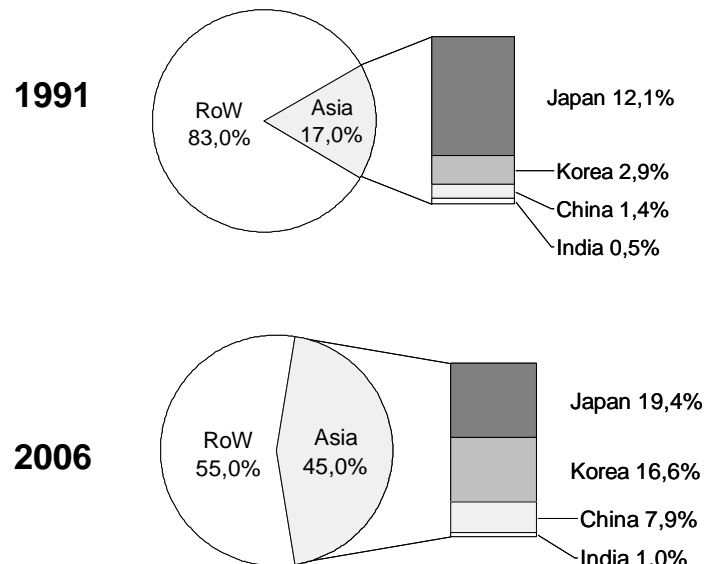
¹⁰⁵ See Brain League IP Services: Indian Patent Grants in the Year 2007, available at <http://www.brainleague.com/Newsletter/Jan08/thiswayplease.htm> (last visited Mar. 11, 2010).

Figure 13: Percentage of Patents in Force in Japan, Korea, China, and India in 1985 and 2006 of the Total of Worldwide Patent Grants



In addition to the percentage of Asian patents in force, the rising number of Asian patent grants from 50,485 in 1991 to 327,514 in 2006, CAGR 12.3%, of total world-wide patent grants reflects the rising body of technological information in Asia (Figure 14). Most striking is the rising importance of Chinese and Korean patent information as opposed to Japanese patent information since 1991 and the astounding figure of 45% which marks the relative importance of Asian patent information as compared to the rest of the world.

Figure 14: Comparison of Percentage of Asian Patent Grants of Total Worldwide Patent Grants 1991 and 2006



A comparative analysis of the total number of patent grants from 1991 to 2005 leads to the finding that the increase of Asian patent information is to a large extent owed to the growth in patent grants in China and Korea. China's patent grants (CAGR 17.9%) and Korea's patent grants (CAGR 17.8%) have grown well above the Asian average (CAGR 12.4%), while Japan's growth rate (CAGR 8.9%) and India's growth rate (CAGR 10.3%) are below the Asian average (Figure 15).

At the same time, it is to be noted that the increasing role of Asian patents goes hand in hand with a general demand for patents world-wide in recent years.¹⁰⁶ While there was a demand of 1,595,950 (PCT demand: 503,055) patents worldwide in 1991, a demand of 2,774,582 (PCT demand: 1,807,216) was already reported in 1995 with first filings of 685,354.¹⁰⁷ By 2006 the number of first filings worldwide had increased to 1,493,404.¹⁰⁸ Nevertheless, Figure 16 demonstrates that from 1991 to 2006 it was Asian patent grants that were responsible for the worldwide increase in patent

¹⁰⁶ Demand for patents as measured by the number of patent applications amassed through three types of patent application procedures: national procedure, regional procedure, and international procedure through the Patent Cooperation Treaty.

¹⁰⁷ See Trilateral Statistical Report, *supra* note 4, at graph 3.1.

¹⁰⁸ See *id.* at figure 3.1.

grants. The CAGR of 5.8% of worldwide patent grants compares with a CAGR of 12.4% for Asian patent grants and a CAGR of only 3.0% for the Rest of the World (RoW). Thus, a substantial contribution to the worldwide growth rate is due to the growth of patent grants in Asia. Out of the Asian contributions, China has demonstrated the most impressive growth in patent grants from 4,122 in 1991 to 53,305 in 2005, which is equivalent to a CAGR of 18.6%.

Figure 15: Total Number of Patent Grants in Asia (1991-2005)

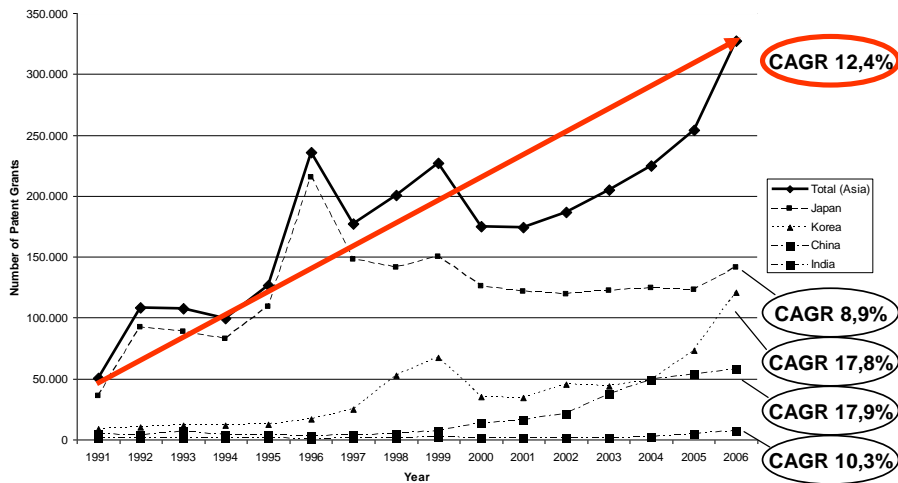
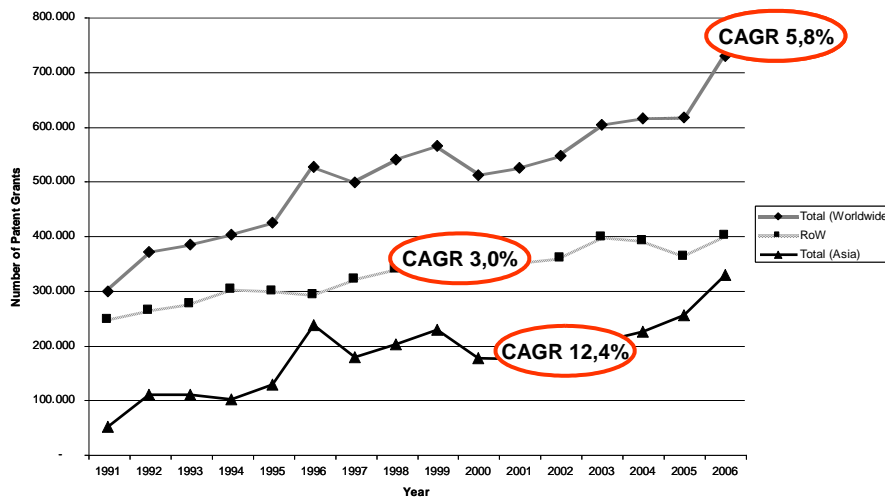


Figure 16: Asian Patent Grants and the Worldwide Increase of Patent Grants (1991-2006)



The above analysis does not take into account the quality of the patent grants and, thus, the usefulness of the additional patent information that an increase in patent grants represents. Rather, the analysis equates an increase of patent grants with an increase of patent documents and, thus, patent information. However, some indications on the quality of patents may be drawn from an analysis of patent grants for every billion USD of GDP and the ratio of patent grants to patent applications.

A comparison of patent grants for every billion USD of GDP at current prices from 1991 to 2006 demonstrates a rather high rate of patent grants in Korea as compared to Japan, China, and India. While Korea has 138 patent grants for every billion USD of GDP, the Asian average only amounts to thirty-seven patent grants for every billion USD of GDP in 2006.¹⁰⁹ It should be noted that WIPO had argued that while the number of patent applications filed across the world has increased at a steady pace, the rate of increase was less than the rate of increase observed for other economic indicators such as GDP or trade.¹¹⁰ However, the analysis of patent grants for every billion USD of GDP (current prices) from 1991 to 2006 suggests that patent grants for every billion USD of GDP are increasing at a steady pace throughout Asia, and in particular in Korea.

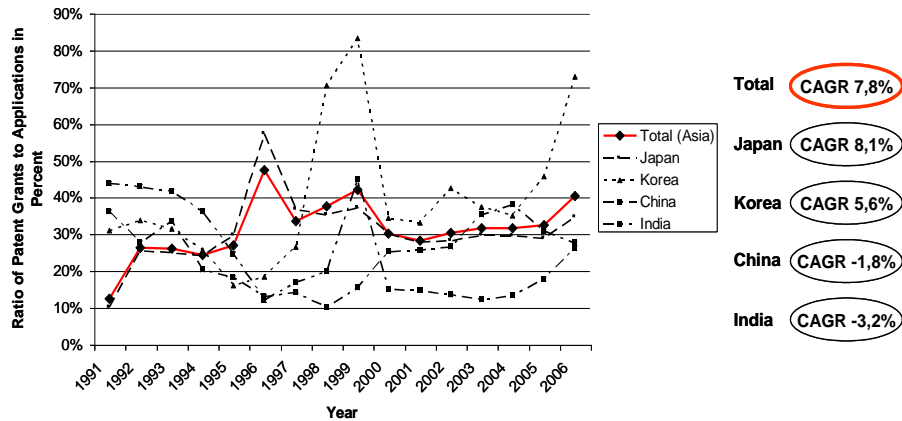
An analysis of the ratio of patent grants to patent applications demonstrates that it is again Korea that ranges considerably above the Asian average (Figure 17). While the average Asian patent grant rate to applications has increased from 12% in 1991 to 40% in 2006, Korea's patent grant rate increased from 31% in 1991 to 73% in 2006. Thus, Korea grants almost double the amount of patents for the same amount of applications in Asia, while the grant rate of Japan has only slightly increased and the Chinese and Indian grant rates have even decreased from 1991 to 2006.

In summary, the above analyses have shown that Asia plays a rising role in technology disclosure through the patent system with the role of Korea, however, being questionable in terms of quality when judged according to its patent grants for every billion USD of GDP and the disproportionate ratio of patent grants to patent applications from 1991 to 2006.

¹⁰⁹ See IMF, *supra* note 56.

¹¹⁰ See World Patent Report, *supra* note 55, at 7.

Figure 17: Ratio of Patent Grants to Patent Applications in Percent (1991-2006)



B. Trends and Issues of Asian Patent Information

The above analyses have shown the rising importance of Asian patent information in general and Chinese patent information in particular. The following section will discuss trends and issues of Asian patent information in order to allow for an assessment of the availability, accessibility, readability, and quality of Chinese patent information.¹¹¹ It will close with recommendations for improved availability, access, and quality of Chinese and Asian patent information.

1. Availability, Accessibility, and Quality of Asian Patent Information

In view of the rising importance of Asian patent information, the question arises to what extent the increasing body of Chinese, Japanese, Korean, and Indian patent information is easily accessible for searchers without Asian language skills so as to allow for a detection of its relevance and, thus, for the intended diffusion of information for the furtherance of innovation. The following section will provide an overview of trends and issues of the availability, accessibility, readability, and quality of Asian patent

¹¹¹ A clear line should be drawn between the legal clarity of a patent system, and the quality of information provided by the patent, the latter of which is the primary focus of this paper. For patent searchers, the quality of a patent system is largely measured in terms of the ease of retrieving and understanding all the patents relevant to a particular search.

information with specific emphasis on its online availability for Western searchers.¹¹²

(a) *China*

In China, there are a number of sources and resources on patenting activities.¹¹³ Foremost among the national resources is the database of the Chinese patent office (State Intellectual Property Office, SIPO) with its “Advanced Search” function.¹¹⁴ SIPO publishes a range of data that stretches from the publication number, the publication date, the application number, the application date, the title, the abstract, the claim, the description, the notice of grant, the citations, to the expiry of patents.¹¹⁵ The information is available for free with coverage from 1985 both in Chinese and in English.¹¹⁶ Until 2007, English data, however, has not entailed details on the description of the patent, but only English language abstracts from 1985 for patents and utility models. Furthermore, while Chinese data is updated on a weekly basis, English data has a time delay of approximately 6 months.¹¹⁷ The backbone of Chinese patent information provision is the China Patent Information Center (CPIC).¹¹⁸ Initially, CPIC was founded in 1983 to prepare and develop SIPO’s automation work. Since then, CPIC has become

¹¹² See Stephen Adams, *Survey of Patent Documentation from the Pacific Rim Countries*, 17 WORLD PATENT INFORMATION 48-61 (1995) (surveying then-applicable patent documentation in a number of Pacific Rim countries).

¹¹³ This paper focuses primarily on internet-based resources, though it should be noted that there are also print resources available, for example, the Invention Patent Gazette (发明专利公报, *fāmíng zhuānlǐ gōngbào*), the Utility Model Gazette (实用新型专利公报, *shíyòng xīnxíng zhuānlǐ gōngbào*), and the Design Gazette (外观设计专利公报, *wài guān shèjì zhuānlǐ gōngbào*). Moreover, there are CD/DVD of CPAS products containing the full texts of documents available only in Chinese, and CNPAT with information in English, such as titles and abstracts for invention patents, and bibliographic information for utility models, plus the corresponding Chinese full text. Additional useful CD-Rom or DVD databases include the Chinese Patent Application Search Database, Granted Invention Patent Search Database, Chinese Patent Legal Status Search Database, Chinese Invention Patent Full-Text Applications, Granted Chinese Invention Patents Full-Text, Chinese Utility Model Full-Text Applications, Chinese Design Patents Full-Drawing Applications, Chinese Invention Patent Gazette, Chinese Utility Model Gazette, Chinese Design Patent Gazette, Chinese Lapsed Patent Database, and Chinese Patent Classification Database. See State Intellectual Property Office of the PRC: Price List of Cd-rom/DVD, available at http://www.sipo.gov.cn/sipo_English/service/200904/t20090408_449660.html (last visited Mar. 11, 2010).

¹¹⁴ Cf. State Intellectual Property Office of the P.R.C., http://www.sipo.gov.cn/sipo_English (last visited Mar. 11, 2010).

¹¹⁵ SIPO also publishes the main IPC, the applicant/proprietor, the inventor, the representative, the agency, the address, the priority, the country/province code, and the category classification.

¹¹⁶ Cf. Experimental Platform of Patent Information Services, available at <http://pub.cnipr.com/pubpisfts/index.do> (last visited Mar. 11, 2010).

¹¹⁷ See Irene Scheller, Presentation at the European Patent Information Conference 2007: The Special Challenge of East Asian Legal Status (Oct. 17, 2007).

¹¹⁸ See China Patent Information Center, <http://www.cnpat.com.cn/> (last visited Mar. 11, 2010).

responsible for the operational maintenance of the internal information system, the development and updating of the application system, and other data processes.

In addition to the official SIPO patent information retrieval services and the services provided by CPIC, there are currently three other English search interfaces available. First, the China Intellectual Property Net (CNIPR) is maintained by the Intellectual Property Publishing House and provides low-cost professional patent information services with Chinese to English and English to Chinese human-aided machine translation – the so-called “C-Pat Search”.¹¹⁹ Second, there exists the SIPO “Experimental Platform for Patent Information Services” (EPPIS), which serves as a test bed for new services with test data from 1985 to 2006.¹²⁰ Third, there is the China Patent Database (CNPAT) of the China Patent Information Center (CPIC), a unit of SIPO, which provides both services in Chinese and English.¹²¹ One of the most recent developments in China is the furthering of the availability of patent searches through Internet search engines. Thus, on January 1, 2008 Baidu.com started its cooperation with CPIC to supply professional and authoritative patent searching services for netizens.¹²²

A comparison of the services provided by SIPO, CNPAT, and CNIPR demonstrates that they are comparable in their content, in their time delay, and in their updating procedures, although CNIPR also provides information on design patents which SIPO and CNPAT do not. In terms of functionalities CNPAT and CNIPR, as opposed to SIPO, allow for document downloads and provide information on legal status. In addition, CNIPR allows for full text searches which CNPAT and SIPO do not.¹²³ All of the databases, however, provide machine translation services.¹²⁴

In terms of international resources, Chinese patent information can also be retrieved from INPADOC.¹²⁵ It is expected that by week twenty-five of 2009, all of the back-files will have been

¹¹⁹ See China Intellectual Property Net, <http://english.cnipr.com/newenpat/index.htm> (last visited Mar. 11, 2010).

¹²⁰ Cf. *id.* at <http://www.pub.cnipr.com> (last visited Mar. 11, 2010).

¹²¹ See China Patent Research Database, <http://search.cnpat.com.cn/Search/CN/> (Chinese), <http://search.cnpat.com.cn/Search/EN/index.jsp?clearstate=clear> (English) (last visited Mar. 11, 2010).

¹²² See *Baidu Expands Patent Internet Searches in China*, CHINATECHNEWS, Dec. 24, 2007, available at <http://www.chinatechnews.com/2007/12/24/6228-baidu-expands-patent-internet-searches-in-china/> (last visited Mar. 11, 2010).

¹²³ Cf. Heike Göbel, *Maschinenübersetzung von Patentvolltexten aus Ostasien, Japan, China, Korea, STN-Erfahrungsaustausch Patente* (Sept. 30, 2009), available at <http://www.uni-jena.de/unijenamedia/Downloads/faculties/chgeo/Dekanat/IVS/maschinenubersetzung.pdf> (last visited Mar. 11, 2010).

¹²⁴ See below for more details on the status of machine translation in China.

¹²⁵ Cf. European Patent Office: Raw Data Resources, available at <http://www.epo.org/patents/patent-information/raw-data.html> (last visited Mar. 11, 2010).

uploaded and will constitute a comprehensive collection of over 6.7 million records, covering all Chinese legal status events for patent and utility model applications in China dating back to October 1985.¹²⁶ It is, however, to be noted that there are a number of problems with the so-published patent data, especially in relation to English language data: the poor quality of the data, the shortage of effective search tools, the lack of machine translation, and the use of differing terminology are all problematic.¹²⁷

First, up to mid-2008 only bibliographic data of invention patents and utility models, abstracts of invention patents, and legal status of invention patents, utility models, and design patents were in English. At the same time, applicants and inventors were often mistranslated; titles and abstracts were often missing or of poor quality.¹²⁸ Due to the poor quality of English data, reliable patent searches were a difficult undertaking for non-Chinese speakers. Therefore, it was suggested to encourage high-quality and value-added abstracts and patent information that allow for complete and high-profile searches.¹²⁹

Second, even though the Chinese patent office has made great strides towards the provision of effective search tools, it has been argued that there still exists of shortage of such technology.¹³⁰ The creation and improvement of online searchable patent databases containing English abstracts or bibliographic resources of Chinese patents has further exposed the need for machine translation services so as to allow access to the full text of the published Chinese patents.¹³¹

This need for machine translation has recently been addressed. Though in 2007 it was still argued that Chinese-English machine translations were at least three to five years away,¹³² just a year later

¹²⁶ See European Patent Office: Chinese Legal Status Data in the EPO INPADOC Database (update), Newsflash 11a/2009, <http://www.epo.org/patents/updates/2009/20090512.html> (last visited Mar. 11, 2010).

¹²⁷ See Huabing Liu, *China Patent Information for Western Users*, Patent Information Conference 2008, Slide 7 (2008), available at [http://documents.epo.org/projects/babylon/eponet.nsf/0/39419962615F1F44C12573670042D360/\\$File/Huabing_Liu_en.pdf](http://documents.epo.org/projects/babylon/eponet.nsf/0/39419962615F1F44C12573670042D360/$File/Huabing_Liu_en.pdf) (last visited Mar. 11, 2010).

¹²⁸ See Huabing Liu, Powerpoint presentation at the Patent Information Conference 2008: China Patent Information for Western Users, slide 7 (Oct. 17, 2007), available at <http://www.epo.org/about-us/events/archive/2007/pi-conference-2007/Programme.html> (last visited Mar. 11, 2010).

¹²⁹ See Heather B. Harvey, Patent Information Conference Workshop B: Chinese Patent Information: What Do Searchers Need? (Oct. 29, 2008), presentation available at <http://www.epo.org/about-us/events/archive/2008/pi-conference2008/workshops.html> (Mar. 11, 2010).

¹³⁰ See Liu, *supra* note 128, at slide 11.

¹³¹ See Dan Wang, *Chinese to English Automatic Patent Machine Translation at SIPO*, 31 WORLD PATENT INFORMATION 137, 138 (2009).

¹³² See, e.g., Patent Information Conference Workshop F: Chinese translations – A Co-operation Project for the Patent Community, (Oct. 16, 2007).

a test phase of a Chinese-English machine translation service was launched.¹³³ For the first time in Chinese patent history, the Chinese Patent Machine Translation (CPMT) of CPIC offers a fully automatic machine translation service for patent documents from China through the Internet. From 2001 onwards, CPIC had invested considerable efforts towards automating the translation of patent documents.¹³⁴ The new automatic patent machine translation is based on a hybrid-strategy that integrates the use of bilingual dictionaries which are post-edited by humans, the use of pattern knowledge of patent chunks and treatment modules embedded in the rule-based frameworks, and the reuse of previous resources accumulated through human translations of the patent documents.¹³⁵ Thus, the automatic patent machine translation at SIPO tailors the general machine translation engines to the patent domain and integrates its services with the previously available English search tools.¹³⁶ In essence, a query can now be inserted in English that refers to the previous-stored English abstracts or bibliographic data. The full texts of retrieved patents are then translated into English online at the users' request with an average response time of less than 1.5 seconds per page.¹³⁷ Despite these advances, it should be noted that the quality of the current Chinese to English patent machine translation is a critical topic, mainly because of the fundamental structural differences of Chinese and English. This problem is addressed through a semantic approach that enhances the rule-based approach with Hierarchical Network of Concepts (HNC), a theory in the field of natural language processing.¹³⁸ This approach attains an average correctness of 85% for technical terms and a translation speed of no less than eight thousand Chinese characters per minute. It follows that CPMT is well on its way in providing a low-cost screening tool that gives users an idea of what is being disclosed in a particular patent and helps them to decide which parts, if any, need to be translated by human translators.¹³⁹

Fourth, one of the major issues with Chinese patent information is the lack of standard basic terminology which impacts upon the process, exchange, and utilization of IPR documentary information.

¹³³ See Chinese Machine Translation Services, <http://www.cnpat.com.cn/430homepage/mt.html> (English) (last visited Mar. 11, 2010).

¹³⁴ See Wang, *supra* note 131, at 137.

¹³⁵ *Id.* at 138.

¹³⁶ *Id.*

¹³⁷ *Id.*

¹³⁸ See *id.* (explaining that sentences are classified into fifty-seven categories, increasing the likelihood that the machine translation system will correctly translate different sentence structures and meanings of words).

¹³⁹ *Id.*

First, there is a difference in the use of terms in China as opposed to Taiwan.¹⁴⁰ Second, many of the terms used in Chinese patents are not found in ordinary Chinese. Third, one of the problems with the Chinese language is its morphology, such as the lack of spaces between Chinese words.¹⁴¹ Responding to these challenges, on June 1, 2008 two voluntary national standards “Intellectual Property Documentation and Information – Essential Vocabulary” and “Intellectual Property Documentation and Information – Classification and Codes” formulated by SIPO were put into practice.¹⁴² In view of the ever-increasing complexity of patents, however, these efforts can only be the first step towards unambiguous patent vocabulary.

In summary, recent steps regarding the retrieval of patent information by SIPO have greatly improved the accessibility, readability, and comprehensiveness of Chinese patent information, especially for non-Chinese speakers even though quality issues still remain. These improvements are of particular importance not only to account for the growing importance of Chinese patent information, but also in light of the fact that a WIPO analysis showed that patent information is underused in developing countries such as China.¹⁴³

(b) Japan

There is a variety of sources and resources on patenting activities worldwide and in Japan. The provision of these sources and resources is well in line with Japan’s 2005 IP strategy which stresses the role of the digital availability of Japanese patent information.¹⁴⁴

In terms of national resources, the Japanese National Center for Industrial Property Information and Training (INPIT) publishes the notice of grant, the citations, the payment of annual fees, the expiry, the term extension, and the online file inspection in its Industrial Property Digital Library (IPDL).¹⁴⁵ Its information is available for free and covers patent data from 1990 onwards. Japanese data is updated in the register on a regular basis with a time delay of about

¹⁴⁰ See CONFERENCE REPORT, INFORMATION RETRIEVAL FACILITY SYMPOSIUM (IRFS), VIENNA, AUSTRIA, NOVEMBER 2008, (David Newton, ed., Elsevier, 2008), available at <http://www.sciencedirect.com> (search “Information Retrieval Facility Symposium” under “All fields” and “David Newton” under “Author”) (last visited Mar. 11, 2010).

¹⁴¹ See *id.*

¹⁴² See Zheng Ying, *News from PR China, Two IPR National Standards Carried out Since Jun 1st, 2008*, 30 WORLD PATENT INFORMATION 352, 352 (2008).

¹⁴³ See World Patent Report, *supra* note 55, at 29.

¹⁴⁴ See Hisamitsu Arai, *Japan’s Intellectual Property Strategy*, 28 WORLD PATENT INFORMATION 323, 324 (2006).

¹⁴⁵ Cf. Industrial Property Digital Library, <http://www.ipdl.inpit.go.jp/homepg.ipdl> (last visited Mar. 11, 2010).

six to twelve weeks.¹⁴⁶ The backbone of IPDL is the so-called Japan Patent Information Organization (Japio)¹⁴⁷ that since 1985 is devoted to the provision of high-quality IP information through the integration of retrieval technology, translation capability, and system integration competences. Japio is both responsible for translation activities for JPO and for system development and operation for IPDL.¹⁴⁸

As opposed to the availability of Japanese patent data, it has long been a problem to obtain English language Japanese patent information. Thus, IPDL launched its Patent Abstracts of Japan services (PAJ) which offers English abstracts data of approximately 400,000 patents per year.¹⁴⁹ However, it is well recognized that PAJ data is ridden by a time lag of about three months, limited search terms, legal status data,¹⁵⁰ and the provision of only one representative drawing.¹⁵¹ Thus, IPDL decided to provide a newly designed search system that provides some extra information to the PAJ data.

In 2008 JP-NET was launched, a database that contains both English abstract PAJ data and machine-translated English abstracts data for the latest three months where no PAJ data is yet available.¹⁵² This includes bibliographic and English abstracts, the entire amount of drawings, the full legal status data, and citation data that date back to 1989. The database offers simple search functions as well as advanced search functions while providing an index tool that greatly facilitates searches. The time lag of the JP-NET database is at most one week of the publication date at any time.¹⁵³ It is well recognized that JP-NET now provides a powerful search tool for unexamined patents since 1989, but it is also understood that the

¹⁴⁶ See Irene Scheller, Presentation at the European Patent Information Conference 2007: The Special Challenge of East Asian Legal Status (Oct. 17, 2007).

¹⁴⁷ The Japan Patent Information Organization originally emerged from a merger of JAPATIC and a service division of the Japan Institute of Invention and Innovation (JII). See Japan Patent Information Organization, <http://www.japio.or.jp/english/index.html> (last visited Mar. 11, 2010).

¹⁴⁸ See Akira Kobayashi, *Machine-translation and Japio's Role in Disseminating Japanese Information*, Far East Meets West, Vienna 2004, available at http://www.epo.org/about-us/events/archive/2004/emw2004_de.html (last visited Mar. 11, 2010).

¹⁴⁹ Cf. Industrial Property Digital Library, *supra* note 145, <http://www19.ipdl.inpit.go.jp/PA1/cgi-bin/PA1INIT?1244898316468> (last visited Mar. 11, 2010).

¹⁵⁰ Legal status data gives information on the legal status of a patent application or an existing patent, such as trial or appeal status, examination, registration, requests, refusals, license agreement, assignment, waiving of patent protection, expiration of the protection period, etc.

¹⁵¹ See Shigeaki Oda, *JP-NETe – A[n] English-language search tool for Japanese unexamined patents*, 31 World Patent Information 131 (2009).

¹⁵² See *id.* at 131.

¹⁵³ Cf. Japan Patent Data Service Co., <http://www.jpds.co.jp/english/jpnete.html> (last visited Mar. 11, 2010).

ongoing improvements of the system are necessary to further facilitate searches of Japanese patent information.

In addition to the above-mentioned databases, there are also a number of commercial databases in Japan that offer detailed and value-added legal status information, for instance, PATOLIS,¹⁵⁴ JPDS, and NRI Cyber Patent.

Having been launched in 1978, PATOLIS constituted the first online search system for Japanese patent information, and is now one of the world's largest online databases for patent information with more than ninety million documents of patent data.¹⁵⁵ PATOLIS-e contains the bibliographic patent data of all document kinds from 1955 onwards, machine-translated patent abstracts from 1971 onwards and PAJ patent abstracts from 1976 onwards. Full texts with machine translation for unexamined patent publications are available from 1993 onwards.¹⁵⁶ It has further extensive coverage of utility models, trademarks, and designs. While PATOLIS charges search, display, and command fees, comparable JPO-IPDL services are free of charge. However, compared to JPO-IPDL services, PATOLIS offers a variety of value-added features such as the validation of patent families and is largely regarded to be the quickest and cheapest way to obtain the latest legal status information on Japanese patents.¹⁵⁷

In terms of international agencies, most notable is the International Patent Documentation Center (INPADOC),¹⁵⁸ an international patent collection with emphasis on patent families¹⁵⁹ and the legal status of patent applications. It was founded in 1972 by WIPO and the Austrian government before being integrated into the European Patent Office in 1990.¹⁶⁰ However, one of the issues with adding Japanese legal status to INPADOC is grounded in the complexity of Japanese legal status data which has more than four hundred different legal status codes.¹⁶¹

¹⁵⁴ Cf. Patolis, <http://www.patolis.co.jp/en/index.html> (last visited Mar. 11, 2010).

¹⁵⁵ See Kobayashi, *supra* note 148.

¹⁵⁶ See Sei Murabe, *From Full-text to Legal Status and Beyond: Exploit Japanese IP Information using PATOLIS-e*, Far East Meets West in Vienna 2004.

¹⁵⁷ See European Patent Office: Search Services, <http://www.epo.org/patents/patent-information/east-asian/search.html> (last visited Mar. 11, 2010) (providing information on search services).

¹⁵⁸ Cf. European Patent Office: Raw Data Resources, *supra* note 125.

¹⁵⁹ "Patent families" are patents for the same invention granted in a number of countries.

¹⁶⁰ See Pavitt, *supra* note 58, at 79.

¹⁶¹ See STATUS REPORT ON ACTIONS RESULTING FROM THE EPO PATENT INFORMATION CONFERENCE 2007 IN RIGA, LATVIA (European Patent Office, 2008), available at <http://www.epo.org/about-us/events/archive/2008/pi-conference2008.html> [hereinafter EPO Latvia Conference Status Report] (last visited Mar. 11, 2010).

Despite enormous advancements in recent years, there still exist a number of issues with English language patent data, which is primarily rooted in the complexity and characteristics of the Japanese language. Like with Chinese, one of the problems in the Japanese language is the lack of spaces between Japanese words.¹⁶² Furthermore, the subject is often neglected in Japanese sentences. In addition, long sentences, long technical compound words, newly created words, and drafting mistakes cause difficulties for machine translation.¹⁶³ Lastly, the non-recognition of the context and the neglect of quotations can produce faulty translations. It is suggested that these shortcomings of machine translation would best be addressed by drafting checks, syntax analyses, and patent word dictionaries.¹⁶⁴

In summary, however, Japanese patent information is readily accessible, though substantial improvements are still necessary in the quality of the machine-translation data. It is only with improved machine-translation that the relevance of Japanese patent information will be fully detectable.

(c) *Korea*

In Korea, patent information is provided by the Korean Intellectual Property Office (KIPO)¹⁶⁵ with computer-based information processing being provided since 1981.¹⁶⁶ More specifically, KIPO provides the Korean Intellectual Property Rights Information Service (KIPRIS).¹⁶⁷ The backbone of KIPRIS, as the provider of Korean patent information on behalf of KIPO, is the Korean Institute of Patent Information (KIPI)¹⁶⁸ that constitutes an affiliated public institute of KIPO with the mission of creating and diffusing Korean patent information. In addition to the provision of KIPRIS, KIPI also provides commercial, and thus secondary, patent information services, such as its patent analysis services through Forecast by Reliable Experts (FORX)¹⁶⁹ and Korea-Patent Evaluation & Grading Services (K-PEG).

¹⁶² See Newton, *supra* note 140.

¹⁶³ See Kobayashi, *supra* note 148, at slides 11-12.

¹⁶⁴ See *id.* at slide 15.

¹⁶⁵ See Korean Intellectual Property Office, <http://www.kipo.go.kr> (last visited Mar. 11, 2010).

¹⁶⁶ See Yang Sup Chung, *Computerization of Industrial Property Administration in Korea*, 14 WORLD PATENT INFORMATION 79-87 (1991).

¹⁶⁷ See Korean Intellectual Property Rights Information Service, <http://eng.kipris.or.kr/> (last visited Mar. 11, 2010).

¹⁶⁸ See Korean Institute of Patent Information, <http://eng.kipi.or.kr/main/main.jsp> (last visited Mar. 11, 2010).

¹⁶⁹ See Forecast by Reliable Experts, <http://eng.forx.org/> (last visited Mar. 11, 2010) (providing competitor analysis, patent trend analysis, and patent landscape analysis).

As the main provider of Korean patent information, KIPRIS offers two separate search interfaces: KPA and K2E-PAT. The KPA search system is free of charge and has both its interface and its contents in English so that it is possible to use English search terms. The data coverage of KPA, however, is limited to legal status information in English and Korean patents that were published as English abstracts from 1979 for examined patent applications and from 2000 for unexamined patent publications.¹⁷⁰ As with the Korean language database, English data is updated in the register on a daily basis.

K2E-PAT, by contrast, offers machine-translated full texts of Korean patents and utility models. Launched in 2007, the service not only allows for English keyword searching but also offers a "Pattern-Based Machine Translation approach"¹⁷¹ that combines various translation patterns and relies on a translation memory for the acceleration of the translation process.¹⁷² Due to regular updates, the underlying Korean to English machine translation dictionary increased to more than 3 million words and sentences by 2009.¹⁷³ The coverage of the K2E-PAT service reaches back to 1979.

In addition to these interfaces, KIPRIS offers the English-language bibliographic patent database, Korean Patent Abstracts (KOREAPAT), which covers Korean examined patents from 1979 to 2001 and Korean unexamined patents from 2000 to the present.¹⁷⁴ It contains data relating to the inventor and assignee, publication information, the IPC codes, an image of a representative drawing, and the title and abstract in English.

In terms of international resources, Korean patent information can also be retrieved from INPADOC¹⁷⁵ which offers a collection of bibliographic data and legal status data regarding Korean patents.

In general, access to Korean patent information, and especially the K2E-PAT services, is regarded as readable, understandable, and good. Nevertheless, KIPI is consistently working on the improvement of its services, such as an upgrade of translation dictionaries. This is particularly necessary since Korean language-

¹⁷⁰ See Korea Intellectual Property Rights Information Service, http://eng.kipris.or.kr/eng/search_guide/howto_search.jsp#answer4 (last visited Mar. 11, 2010); Scheller, *supra* note 147. See also Newton, *supra* note 140.

¹⁷¹ See YooChan Choi, *Korean to English Patent Automatic Translation (K2E-PAT) and Cross Lingual Retrieval on KIPRIS*, 31 WORLD PATENT INFORMATION 135, 135 (2008).

¹⁷² See EPO Latvia Conference Status Report, *supra* note 161.

¹⁷³ See Choi, *supra* note 171, at 135.

¹⁷⁴ Cf. STN DATABASE SUMMARY SHEET (Korean Institute of Patent Information, 2008), available at <http://www.cas.org/ASSETS/7ADADCC088714377883DE10194B2D37F/koreapat.pdf> (last visited Mar. 11, 2010).

¹⁷⁵ Cf. European Patent Office: Raw Data Resources, *supra* note 125.

specific issues, such as the flexibility of spaces between Korean words, require constant improvement efforts.¹⁷⁶ However, access to Korean patent information is generally regarded to be comparably satisfactory.

(d) India

In India, there are a number of sources and resources on patenting activities under the responsibility of the Controller General of Patents, Designs and Trademarks (CGPDTM) and ultimately the Indian patent office, Intellectual Property India (IPO).¹⁷⁷ Most notable in the area of patent information is the Patent Information System (PIS), which was established in Nagpur in 1980. The objective of PIS is the provision of technological information contained in patents or patent related literature through publication services, search services, and patent copy supply services.¹⁷⁸

PIS offers various patent documentation on payment of appropriate charges, i.e. the full text of patent documentation since 1912 on paper, and from 1963 onwards, the notifications issued by the patent office regarding Indian patents on paper. The patent search services offered by PIS range from advanced searches, including: bibliographic searches, English equivalent patent searches, and equivalent patent family searches, to more basic assisted searches. Moreover, the Department of Science and Technology, under the Technology Information and Forecasting Council (TIFAC), has published a CD containing the titles of filed and granted patents in India.¹⁷⁹ However, there is still limited access to electronic databases of Indian patents.

Now, the CGPDTM offers three gateways for public searches. Of note, the 18 Months Publication Search¹⁸⁰ and the Controller's Decision Search¹⁸¹ are not sufficient to trace earlier patent specifications that might be important for the establishment of

¹⁷⁶ See Newton, *supra* note 140.

¹⁷⁷ Cf. Government of India, Controller General of Patents Designs Trademarks, <http://www.patentoffice.nic.in/> (last visited Mar. 11, 2010).

¹⁷⁸ Cf. Government of India, Controller General of Patents, Designs, and Trademarks, *supra* note 175, at <http://www.patentoffice.nic.in/ipr/pis/pis.htm> (last visited Mar. 11, 2010).

¹⁷⁹ See Prabuddha Ganguli, *Patents and Patent Information in 1979 and 2004: A Perspective from India*, 26 WORLD PATENT INFORMATION 61, 62 (2004).

¹⁸⁰ Cf. Office of Controller General of Patents, Designs and Trademarks, Indian Patent Information Retrieval System, [https://www.ipindiaonline.gov.in/patentpublishedSearch/\(S\(1k5mvl555114lumf0r2ygk45\)\)/patentwebSearch.aspx](https://www.ipindiaonline.gov.in/patentpublishedSearch/(S(1k5mvl555114lumf0r2ygk45))/patentwebSearch.aspx) (last visited Mar. 11, 2010).

¹⁸¹ Cf. *id.* at <https://www.ipindiaonline.gov.in/patentdecisionsearch/patentsearch.aspx> (last visited Mar. 11, 2010).

novelty or for tracing the technological development of a subject.¹⁸² The Public Search for Patents¹⁸³ allows for the public search of granted patents from No. 1 to No. 169,500 and new records. However, the data is still under the process of verification and testing so that these electronic records are not yet reliable or valid for any legal purposes but solely meant for reference purposes. Therefore, currently there is no official reliable electronic database of patents published by the Patent Office. In light of the still unsatisfactory provision of electronic databases on Indian patent information, it is worth noting that Indian patent information can also be retrieved from INPADOC¹⁸⁴ which contains a collection of bibliographic data and legal status data of Indian patents.

However, efforts to create a Traditional Knowledge Digital Library (TKDL)¹⁸⁵ on traditional medicinal plants and systems in India linked to the IPC system through a Traditional Knowledge Resource Classification System (TKRC) are under way.¹⁸⁶ On February 2, 2009 the Indian government granted access to TKDL which now contains more than thirty million pages of information on Indian traditional knowledge in English, French, German, Japanese, and Spanish that had previously only been available in Hindi, Sanskrit, Arabic, Persian, and Urdu.¹⁸⁷ Thus, TKDL does not constitute a patent information service as such, but allows for comparisons of patent applications with existing traditional knowledge in order to prevent misappropriation of traditional knowledge at international patent offices.

Unlike in Japan, Korea, or China, issues with Indian patent information are not as centered around language problems. The only area in which language might constitute an issue is in the area of non-patent traditional knowledge literature that might originally have been recorded in Sanskrit, Urdu, Tamil or other languages.¹⁸⁸ This issue has, however, extensively been addressed by TKDL. Rather than language, difficulties with Indian patent information

¹⁸² See S. Amba, *Documentary Sources of Information on Indian Patents*, 23 WORLD PATENT INFORMATION 25, 25 (2001).

¹⁸³ Cf. Controller General of Patents, Designs and Trademarks (India), Public Search for Patents, <http://www.ipindia.nic.in/patsea.htm> (last visited Mar. 11, 2010).

¹⁸⁴ Cf. European Patent Office: Raw Data Resources, *supra* note 126.

¹⁸⁵ Cf. Traditional Knowledge Digital Library, <http://www.tkdlib.in/tkdlib/langdefault/common/home.asp?GL=Eng> (last visited Mar. 11, 2010).

¹⁸⁶ See Ganguli, *supra* note 179, at 62.

¹⁸⁷ See India's Traditional Knowledge Digital Library, a Powerful Tool for Patent Examiners, EUROPEAN PATENT OFFICE, <http://www.epo.org/topics/issues/traditional.html> (last visited Mar. 11, 2010).

¹⁸⁸ This problem is addressed by the "Traditional Knowledge Digital Library," see *supra* note 185.

involve gaining access to full documents in electronic form, completeness of data, and availability of efficient search tools.¹⁸⁹

In summary, India is on the verge of setting up an advanced patents information system. Compared to Japan, Korea, and China however, it is the shortage of effective online search tools which renders the retrieval of Indian patent information rather difficult. It follows that with the increasing relevance of Indian patent information, India is well advised to substantially improve upon its patent information services.

2. Recommendations

Summarizing the above analyses of the availability, accessibility, readability, and quality of Asian patent information, this study demonstrates that English-language Japanese patent information is readily accessible, although the quality of the machine-translation data still needs substantial improvements. English-language Korean patent information, by contrast, is generally regarded to be comparably satisfactory. The analysis of English-language Chinese patent information shows a greatly improved accessibility, readability, and comprehensiveness of the data, though it is still far from satisfactory. The core issue in relation to Japanese, Korean, and Chinese patent information continues to be the accuracy of translations of Asian languages into English. By contrast, the core issue in the retrieval of Indian patent information is still the shortage of effective online search tools. Thus, even though the above analyses demonstrate ongoing improvements in the availability and accessibility of Asian patent information, it is suggested that there are still five areas of focus for further improvements.

First, the improvement of the comprehensiveness of the data. In terms of the comprehensiveness of data, it is argued that more data regarding the legal status of patents for Japan, Korea, and China is needed, namely easily retrievable data on the entry or non-entry into the national phase of PCT documents.¹⁹⁰

Second, the improvement of data quality.¹⁹¹ It is argued that machine translation is better than nothing, but it is not yet optimal, as even abstracts are often only of poor quality.¹⁹² In light of this criticism a hybrid approach seems useful, i.e. combining systematic automatic translation with manual translation of documents

¹⁸⁹ See EPO Latvia Conference Status Report, *supra* note 161.

¹⁹⁰ See *id.*

¹⁹¹ See Blackman, *supra* note 26, at 152.

¹⁹² See Alyson Birch, Patent Information Conference Workshop E, Patent Information from Japan, China, Korea and Southeast Asia (Nov. 8, 2005).

considered relevant on the basis of the information contained in images and automatic translations.¹⁹³ In terms of quality, it is also criticized that there is no indication when a search is complete and whether the retrieved information is correct.¹⁹⁴

Third, unification of document numbers and classifications used for different countries and in different databases.¹⁹⁵ Due to the variety of document numbers and classifications used in Asia, and in particular Japan, a unification of the systems is urgently recommended in order to allow for a better use of classifications as a search tool and for higher search precision.¹⁹⁶

Fourth, the improvement of user interfaces of Asian databases.¹⁹⁷ The existing variety of Asian patent information websites and databases is addressed by international researchers stressing their interest in having one access point for Asian patent information. This also includes access to legal status information.¹⁹⁸ This request is especially relevant in light of the sixty billion EUR that are wasted in the European Union each year on duplicated research.¹⁹⁹ This demonstrates the need for one access point with detailed information on patent information and its dissemination in Asia.

Fifth, the provision of value-added patent information. Even when issues of comprehensiveness, quality, classification, and access are solved, the relevance of patent information is often hard to detect. Part of the problem is due to issues with the retrieval of non-text information, such as images, tables, pictures, and flow charts.²⁰⁰ Part of the problem is also a result of the comprehensive view of patenting strategies adopted by applicants, whom have increasingly come to focus on overall patent portfolios, requiring patent landscaping, patent mapping, and other ways of visualizing data.²⁰¹ This requires rich and detailed information as well as scientifically validated content with high predictive power in order to accomplish stronger integration of patent information into business frameworks and their early integration into standard strategies.²⁰² Improved patent information databases can, for instance, focus on the exposition of technological profile of Asian patents and their technical fields so as to allow conclusions in terms of the positioning

¹⁹³ See EPO Latvia Conference Status Report, *supra* note 162.

¹⁹⁴ See Birch, *supra* note 192.

¹⁹⁵ *Id.*

¹⁹⁶ See Emmerich, *supra* note 35, at 121.

¹⁹⁷ See Birch, *supra* note 192.

¹⁹⁸ See *id.*

¹⁹⁹ See Newton, *supra* note 140.

²⁰⁰ See *id.*

²⁰¹ See Harhoff, *supra* note 40, at slide 22.

²⁰² See *id.* at slide 23.

of the countries in the emerging knowledge economy as opposed to more traditional industry sectors.²⁰³ In any case, there is a strong need for the provision of value-added patent information based on the actual requirement of particular end users.

Therefore, it is argued that the increasing relevance of Asian patent information needs to be complemented with improvements of data comprehensiveness, of data quality, of document numbers and classifications, and of user interfaces of Asian databases. In particular it needs to be complemented with the provision of competitive databases, including advanced and improved machine translations that contain value-added patent information to provide high quality search results.

IV. CONCLUSION

This paper demonstrates that patent information as a form of technology disclosure serves an important function in business strategy as well as in industrial policy making. It further shows the rising importance of Asian patents as a source of technological information by reference to patent grants in China, Japan, Korea, and India. Japanese patents are not only the first of all Asian patents to acquire international significance, but continue to remain the most important source of Asian patent information. Korean patents have experienced an enormous growth in sheer numbers, reflecting the rising importance of Korean patent information in recent years. Surprisingly, with only 0.3% of worldwide patents in force, India is yet to assume a leading role in the provision of patent information in Asia. However, it should be noted that this paper left open the question of patenting activities of Chinese, Japanese, Korean, and Indian companies in the U.S. and Europe and other important markets. Such analysis might constitute yet another indicator of the prowess of Asian companies in developing new products and, thus, further corroborate the hypothesis that Asian patent information is on the rise.²⁰⁴

China specifically has experienced a tremendous increase in the demand for patents over the last ten years, indicating that the country will soon assume a leading role in the provision of technological information through the patent system. With Chinese already the

²⁰³ Cf. Pavitt, *supra* note 58, at 88.

²⁰⁴ See Michael O'Keefe, *Cross comparison of US, EU, JP and Korean companies patenting activity in Japan and in the People's Republic of China*, 27 WORLD PATENT INFORMATION 125, 125 (2005) (providing an analogous argument).

fourth often used language of filing, it is expected that China will become the second most prodigious patent filing authority in the world behind the U.S. A comparison with Japanese, Korean, and Indian patent information data shows that the increase of Asian patent information is to a large extent a result of the growth in patent grants in China, which is equivalent to a CAGR of 18.6% from 1991 to 2005. On the other hand, an analysis of the ratio of patent grants to patent applications demonstrates that the Chinese grant rate has slightly decreased from 1991 to 2006 thereby suggesting that the increase in patent information is not due to a lax patent grant policy in SIPO.

One of the major concerns, however, is still the question of accessibility, readability, comprehensiveness, and quality of Chinese patent information. It is therefore suggested that major improvements of the provision of Chinese patent information should be pursued to make China one of the leading providers of technological information through the patent system. China should also aim to provide adequately accessible and readable patent information in order to preserve the important principle of the patent system: that the price for patent protection is disclosure. After all, technology disclosure through the patent system can be a crucial element to support China's transition to an innovation nation.

In conclusion, this paper demonstrates ongoing improvements in the availability and accessibility of Asian patent information but suggests there are still five areas of focus for further improvements. As long as patent information is not adequately accessible and readable, inventions not only run the risk of being economically irrelevant but the whole rationale of patent disclosure is severely undermined.

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