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Intellectual property as an economic asset:

key issues in valuation and exploitation

Background and issues

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INTELLECTUAL PROPERTY AS AN ECONOMIC ASSET: KEY ISSUES IN VALUATION AND EXPLOITATION

BACKGROUND AND ISSUES

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INTELLECTUAL PROPERTY AS AN ECONOMIC ASSET: KEY ISSUES IN VALUATION AND EXPLOITATION

BACKGROUND AND ISSUES[1]

Introduction

1. In today's knowledge-based economy, intellectual assets such as intellectual property (IP), human capital and organisational capabilities play a crucial role in business performance and economic growth. An increasing share of the market value of firms appears to derive from their intellectual assets, and firms are managing these assets more actively to identify additional ways of extracting value from them. This is particularly evident in the case of intellectual property, most notably patents. As firms shift to more open models of innovation based on collaboration and external sourcing of knowledge (Chesbrough, 2003), they are exploiting patents not only by incorporating protected inventions into new products, processes and services, but also by licensing them to other firms or public research organisations (PROs). Moreover, they are using patents as bargaining chips in negotiations and as a means of attracting external financing from banks, venture capitalists and other sources.

2. As patents are exploited more strategically and managed as an asset, proper assessment of their value is increasingly necessary by an expanding range of stakeholders. Firm managers value patents when deciding whether or not to file a patent application or renew a patent, when calculating royalties for patent licensing contracts, when estimating the value of a possible merger or acquisition, and when estimating their own corporate value. Lawyers and judges value patents in the course of patent infringement suits; financial institutions need to calculate the value of patents when they are used as collateral for bank loans; and investors and financial analysts value patents to assess the value of firms as a basis for their investment decisions and recommendations. Difficulties or inconsistencies in valuation can impede each of these efforts. While a number of methods have been developed to value patents, their use is neither widespread nor consistent. New methods continue to be developed and improved, but further effort is needed to improve prevailing practice.

3. This paper provides background information on the valuation and exploitation of IP, with a focus on patents, for discussion among the participants of the conference organised by the European Patent Office (EPO), the German Federal Ministry of Economics and Labour (BMWA) and the Organisation for Economic Co-operation and Development (OECD) on "Intellectual Property as an Economic Asset: Key Issues in Valuation and Exploitation" to be held on 30 June and 1 July 2005 in Berlin. It reviews new uses of patents, including as a means of attracting external financing via bank loans, securitisation of patents and patent donation. Then it discusses IP management and exploitation practices across industries. Next, it reviews a number of approaches to patent valuation and available data on patent licensing. To conclude, the paper discusses the initiatives of public institutions and governments to foster and improve the valuation and exploitation of patents.

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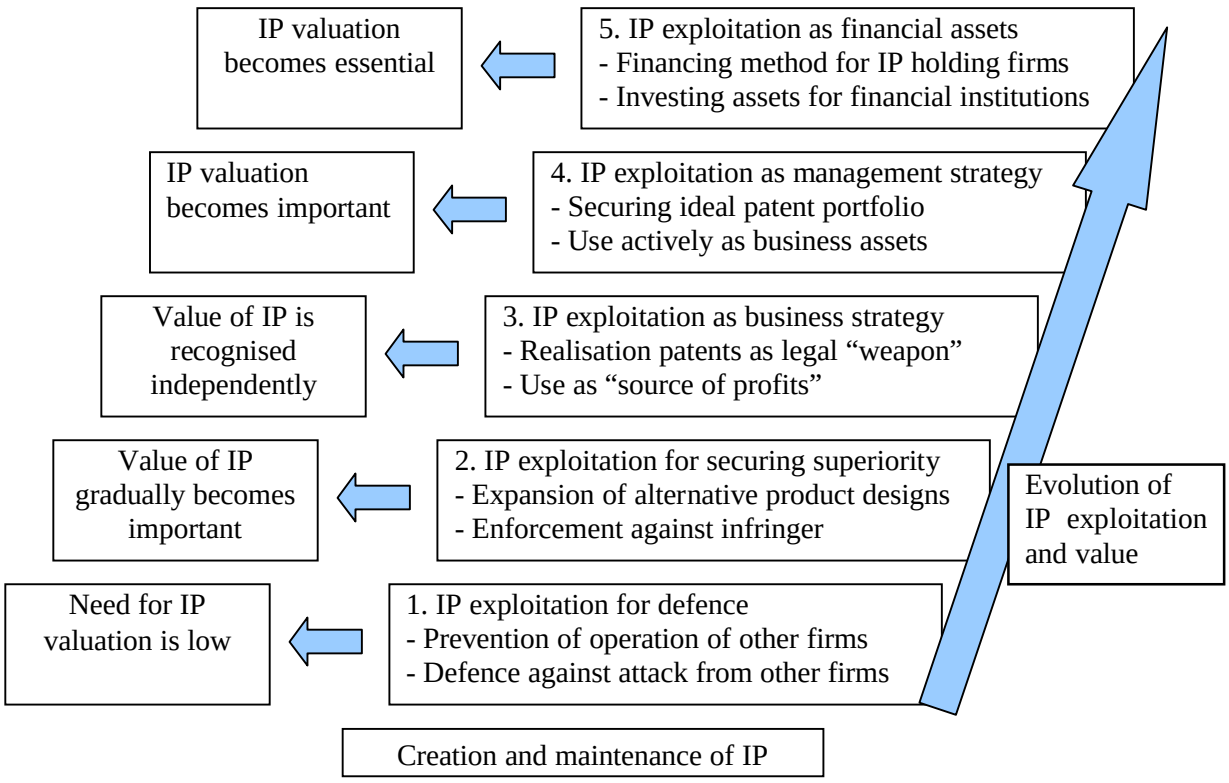
[1] This document was prepared by Shigeki Kamiyama, of the OECD Directorate for Science, Technology and Industry, with valuable contributions from Jerry Sheehan and Catalina Martinez of the OECD, Tilo Bachman and Dominique Guellec of the European Patent Office, and Thomas Multhaup of the BMWA.

New uses of IP and need for valuation [Session 1]

4. The need for improved valuation is closely linked to the expanding uses of IP. Valuation and exploitation evolve hand in hand over time (Figure 1). Firms have long used their IP in a variety of ways to improve their competitive position and generate revenue. A 1994 survey indicated that among various reasons for patenting product innovations, the most frequent among US firms were to prevent copying (98.9% of respondents), prevent other firms from patenting *(i.e.* blocking) (80.3%), and prevent lawsuits (72.3%), followed by use for negotiations (*e.g.* cross licensing) (55.2%), to enhance reputation (38.8%), generate licensing revenue (29.5%) and measure performance (7.8%). Among Japanese respondents to the survey, the results showed the same order, from prevent copying (95.5%) and use for negotiations (85.8%), to generating licensing revenue (66.7%) (Cohen *et al.*, 2002).[2] Recent trends suggest that an increasing share of companies use patents as a leverage point in negotiations and to generate licensing revenues (see discussion of IP management and exploitation below). As IP exploitation is managed in a more strategic and sophisticated manner at the firm level, the need for proper IP valuation increases.

Figure1. An Illustration of the evolution of IP exploitation and demand for valuation



Source: Otsuyama, 2003

[2] A recent German survey found that use for negotiation ranked fourth behind protection, blocking and reputation-building. Use for negotiation was found to be especially important for small companies with fewer than 50 employees (BMBF, 2004).

5. The need for proper valuation of patents is further motivated by their expanding use in applications that extend beyond the firm. The need for monetary valuations of patents becomes particularly relevant when they are used as financing tools by patent holders and as investment assets by financial institutions and venture capitalists (Otsuyama, 2003). Financial analysts and investors increasingly recognise IP as a key element in the value of a firm and as an indicator of its technological capabilities (Box 1). Private investors (such as venture capitalists) and public sector organisations (such as research funding agencies) use various measures of patenting and patent quality, for example, in evaluating investment decisions, just as firms monitor IP-creation as a measure of their own performance. For small and medium-size enterprises (SMEs) that lack internal sources of financing and track records of success needed to attract external financers, patents are increasingly seen as a tool to attract and secure financing. Ownership of a strong IP portfolio can signal to investors that a firm has a technological advantage over its competitors – one that it can protect via patent law. Furthermore, some banks are beginning to accept patents as collateral for bank loans and to develop IP-backed securities that patent holders can use to access financing. Firms are also donating unexploited patents to non-profit organisations in search of tax relief. Each of these types of transaction requires reliable estimates of the financial value that can be derived from patents.

IP as collateral for bank loans

6. Greater attention is being paid to the possible use of IP as collateral for bank loans, although this practice remains limited. The Development Bank of Japan, a government-related financial institution, implemented a loan system in 1995 that allows the use of patents and patent applications, as well as copyrights of computer programs and contents, as collateral. Since then, the Bank has granted more than 250 loans to venture firms, with the Bank assessing the present value of the cash flows to be generated by the IP.[3] Other Japanese financial institutions have been reluctant to adopt such practices, as they consider the cost of IP-collateral valuation high and resulting values of low credibility, signalling the need for improved valuation techniques (JPAA, 2002).

7. The situation in Europe and the United States is similar (EC, 2000; Washington CORE, 2002). A survey of about 50 European commercial banks found none that routinely accepts intangible assets as collateral for loans to new technology-based firms.[4] Commercial banks reported that: *1*) protection of IP is more important as part of the overall assessment of the risk of a loan rather than as collateral itself; *2*) the value of the IP of new technology-based firms is limited; and *3*) they are not confident in the realisation of the value of the firms' IP (EC, 2000).[5,6] However, the Landesbank Rheinland-Pfalz (part of L-Bank Baden-Württemberg) in Germany has used technical documentation of research projects as (additional) collateral for the financing of development projects of mid-size companies. In the last four years about 40 transactions with a volume of EUR 140 million were realised.[7] Furthermore, the Federal Financial Supervisory Authority (BaFin) recently offered banks the possibility of accepting patents as a sole security for bank lending. In order to value patents in a systematic and transparent way, some banks have started to use newly developed methods of valuation. At present there seem to be only few service providers available for valuation.

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3 For further information on this programme (in Japanese), see http://www.dbj.go.jp/japanese/venture/venture_intellectual.html.

4 New technology-based firms are typically defined as firms that are less than 25 years old, independent of larger firms, and established to exploit inventions or innovation, etc. (EC, 2000).

5 Lack of enthusiasm among financing institutions for IP-based funding was also apparent in the EPO public hearings on Basel II and Patents, 4 November 2004.

6 Although banks in the United States take out an "all asset lien" which normally includes IP, they are less concerned with securing the assets of individuals (EC, 2000).

7 The Bank reports high interest for this form of debt financing. See http://www.lrp.de/fs_m52a.html (German). Basic information on the Bank is available in English and Japanese at www.lrp.de.

IP-backed securitisation

8. IP-backed securitisation consists of the transfer of IP by an owner for securitisation and the receipt of capital from investors in the form of lump sum payments. Typically royalty streams from the IP serve as capital for investors. IP-backed securitisation remains a small portion of total asset-backed securitisation in terms of total investment and number of deals completed. Several factors account for its limited use, including piracy risks, concerns over litigation, potential changes in legislation and technological obsolescence. With drug patents, additional concerns relate to possible withdrawals of patented drugs from the market. Given such concerns, IP-backed securitisation may require more substantial due diligence than conventional asset-backed securitisation and consequently may require larger transaction scales to be successfully accomplished (Harris Nesbitt, 2004). Nevertheless, IP-backed securitisation is making some headway in the music industry (based on copyrighted music) and pharmaceuticals. In 1997, musician David Bowie financed USD 55 million by securitisation of future royalty streams resulting from his 25 albums.[8] In 2000, Royalty Pharma arranged the securitisation of the patent for the HIV-drug Zerit, property of Yale University, but the deal defaulted due to low sales.[9] Recognising the risks of securitisation of a single patent, Royalty Pharma subsequently securitised a set of 13 patents to better diversify its holdings and mitigate associated risks (Hillery, 2004).

Patent donations

9. Patent donations are another way that firms obtain financial benefits via improved patent portfolio management. They also demand robust valuation methodologies. The US Internal Revenue Service (IRS) confirmed as long ago as 1958 that patent donors could receive tax benefits for donations to non-profit organisations (Layton and Bloch, 2004). Even in countries where such write-offs are not possible, firms that donate patents can avoid the administrative costs associated with their maintenance and renewal, as well as costs of internal management. Such donations can have other benefits, too, such as enhancing the donors' reputation as an industry leader and good corporate citizen, and establishing valuable relationships with recipients that may lead to future joint ventures. Of course, donations can have larger societal benefits, too, by giving an unexploited technology a chance to be exploited by the recipient (Marcinkowski, 2000).

10. The use of patent donations for tax deductions did not gain considerable attention until the late 1990s. In 1996, Dow Chemical donated patents to Case Western University, and afterward donations to non-profit organisations became more widespread among large firms with significant R&D such as Procter & Gamble, Boeing, Caterpillar and Eastman Chemical (Layton and Bloch, 2004). The benefits of such donations remain unclear. Interviews with more than 80 US firms, universities, IP appraisers and the IRS confirmed only non-quantifiable benefits for donors and recipients of IP, due in part to their reluctance to provide financial information related to donated patents (Layton and Bloch, 2004).[10] Moreover, scepticism has mounted about the seemingly high values assigned to the donated patents, resulting in increased scrutiny of such donations by the IRS (Layton and Bloch, 2004). While firms have always been required to retain independent appraisers to value donations, implementation of new legislative provisions would

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8 In March, 2004, the bond was downgraded from A3 to Baa3 due to the downturn in sales of recorded music. See http://launch.yahoo.com/read/news/12174412.

9 The patent was licensed to Bristol-Myers Squibb; the security was issued for USD 115 million, and Yale received a lump sum of USD 100 million.

10 Securing the financial benefits of patent donations appears to be a more serious issue for non-profit organisations than corporate donors because recipients must pay maintenance fees after receiving donated patents. For example, the University of Virginia received via donation patents valued at more than USD 7 million, but were unable to successfully commercialise them. The University eventually put them in public domain so as to be able to stop paying maintenance fees. See http://www.m-cam.com/downloads/20030108_donation-whitepaper.pdf.

require tax deductions for patent donations to be based on the realised economic benefits derived from the donated patents.[11]

Box 1. Patents and the value of firms

Intellectual assets, including patents, appear to make a significant contribution to the market value of firms. Studies show, for example, that tangible assets accounted for only about 25% of the market value of US firms in 2002, suggesting that intangible assets (of which intellectual property is a part) accounted for the remaining 75% (Kaplan and Norton, 2004). This figure is considerably higher than the 40% of market value that was accounted for by intangibles in 1982. Therefore, it is very important when valuing firms for the purposes of mergers and acquisitions or venture capital investments to consider both tangible and intangible assets, including IP.

The significance of IP and other intangibles can complicate the due diligence process that is conducted as part of investment decisions. A fundamental goal of due diligence is to reveal the problems associated with transactions and secure them. Necessary procedures for addressing IP elements in due diligence vary from deal to deal, but include the tasks listed below (Hildebrand and Klosek, 2004). While they appear fairly basic, effective execution can be difficult and without it unexpected difficulties and costs can arise after a deal is closed.

- Identify and locate all the IP of the target firm including patents, inventions, copyrights and trademarks.
- Ascertain the nature and scope of IP of the target firm, including whether it is owned outright licensed.
- Evaluate the validity of the IP of the target firm in order to confirm that business can continued without problems.
- Evaluate the potential risks of infringement, including infringement of a third party's rights by the target firm and valid claims of infringement against third parties.
- Analyse any grants of IP made by the target firm, including licenses, distribution agreement and resale agreements.

New uses of IP and need for valuation

Suggested issues for discussion:

- *What are the main channels for exploiting patents and how do they affect valuation needs?*
- *How are patents used for securitisation purposes and for accessing financial markets?*
- *How do patents influence the investment criteria of private and public investors (e.g. due diligence, continuous investment tracking)?*

How can SMEs actively use patent protection and licensing as a business strategy? [Session 2A]

11. For SMEs, patents can be a particularly important asset, enabling them to better secure their competitive position and access external financing. Because of their resource constraints, SMEs tend to face different challenges from large firms, related not only to securing patents but also to their valuation and exploitation. Signalling the value of IP to attract financing, for example, is often more important for SMEs than for larger firms because SMEs often have fewer other assets of value. Patent licensing is also important to SMEs as a way of gaining access to the complementary assets needed to scale up the manufacturing and distribution of products or services based on their inventions.

[11] The American Job Creation Act, passed by in Congress in late 2004, changes the basis of calculating the tax deduction resulting from patent donations. Under the new rule, the initial tax deduction for patent donations is limited to the donor's basis (book value) in the property or the fair market value, whichever is less. The donor also can deduct (under certain conditions) portions of the net income from the exploitation of underlying patents in subsequent years after donation.

12. The commercialisation strategies of start-ups and other SMEs are strongly influenced by IP regimes. The degree of IP protection afforded them can alter decisions whether to commercialise inventions on their own or to do it in partnership with other, usually larger, firms. Start-ups can attempt to integrate downstream manufacturing and distribution facilities in order to maximise the returns from their R&D investments, but the associated costs and risk of failure are high. Alternatively, they may co-operate with established firms to gain access to such complementary assets via technology licensing agreements. For a strategy based on co-operation with established firms to succeed, research indicates that the environment has to be characterised by strong IP protection (Gans and Stern, 2003). In weaker IP protection regimes, start-ups and other SMEs may need to acquire complementary assets directly.

13. Success stories show that pro-active IP strategies can make a difference for SMEs in the marketplace. Successful examples of start-ups whose business models are based on patents can be found in the ICT and biotechnology sectors. Fabless semiconductor firms, for example design custom chips that are produced in separate foundries or are sold to larger semiconductor manufacturers. A number of biotechnology firms successfully focusing on the research that leads to new drug targets or new research tool – inventions that are subsequently licensed to larger pharmaceutical or health sciences companies for commercialisation. The success of both types of firms is highly contingent on their ability to protect their IP through patenting. The patents can not only be licensed to other firms, but can facilitate inflows of venture capital. High-value patents are among most important factors (along with good management) that venture capitalists consider in their investment decisions (Rivette and Kline, 2000; OECD, 2004a).[12] Managers of new technology-based firms report that patents are a crucial factor in their success in raising funds and in competing against larger firms.[13] Research confirms that technology-intensive SMEs and start-ups can improve their negotiating position with larger firms (*e.g.* in cross-licensing arrangements) if they have a strong patent portfolio (Grindley and Teece, 1997).

How can SMEs actively use patent protection and licensing as a business strategy?

Suggested issues for discussion:

- *How important has IP been to the success of individual SMEs?*
- *What can their experiences teach about effective IP management techniques?*
- *How can SMEs access needed expertise for managing their IP?*

IP and technology intermediaries [Session 2B]

14. Technology market intermediaries have existed for a long time, but they have become more numerous and more diverse in recent years as demand for technology transfer and patent valuation have grown. Already in the late 1800s and early 1900s, patent agents and lawyers played an important role in technology markets by matching capital-seeking inventors with investors and by linking sellers of technological inventions with potential buyers who had the means to develop and commercialise them.[14] As innovation processes have become more open and firms have begun to source more of their technology needs from external sources, markets for technology have expanded, and with it the role of intermediaries.

12 See also, "Intellectual Property – The Basis for Venture Capital Investments" at http://www.wipo.int/sme/en/documents/venture_capital_investments.htm.

13 See case studies of WIPO at http://www.wipo.int/sme/en/case_studies/fk_biotec.htm, http://www.wipo.int/sme/en/case_studies/eat_set.htm.

14 Registered agents at the time contributed to the conclusion of effective and speedy patent transactions, as indicated by available information on actual patent transaction records in the United States during those years (Lamoreaux and Sokoloff, 2002).

15. Such intermediaries take several forms, including:

- *Technology licensing organizations (TLOs)* that deal mainly with patents arising from university and other PROs; these institutions have responsibility for identifying potential licensees and negotiating licenses.[15] The number of such organizations has grown as PROs have begun to more actively manage their IP, often with encouragement or support from their governments.

- *Patent transaction intermediation systems*, including various Web-based platforms where patent holders post licensable inventions and technology seeking parties post their needs. In recent years, a number of such Web sites have failed and a series of mergers and acquisitions has consolidated the number of remaining intermediaries.[16]

- *Comprehensive service providers* that assist clients in acquisition, commercialisation and investment in technologies, patent protection and assertion, with the aim to levy royalty income, as well as monitoring patent infringement.[17]

- *Specialists in particular technology fields*, such as biotechnology and ICT, that provide a range of IP services to organisations in their field of expertise.[18]

16. There has also been an increase in what are commonly called *patent trolls*. These organisations tend to acquire unexploited patents cheaply – including those from bankrupt firms – and attempt to raise money from damage awards or licensing fees by suing or threatening other firms with infringement litigation suits. They may be difficult to distinguish from other firms that acquire sets of complementary patents in order to facilitate their exploitation and commercialisation, either by introducing them into products and services themselves or, more frequently, by licensing and selling them to other firms.

17. Following the expansion of technology markets, the role of technology intermediaries seems to be growing in importance and will likely continue to do so. As indicated by two recent surveys, one conducted in Japan (JIII, 2003) and the other in the US and Canada (Razgaitis, 2004), identifying potential licensees seems to be one of the major impediments to successful licensing at present.

IP and technology intermediaries

Suggested issues for discussion:

- *What are the different types of brokers and intermediaries and how do their capabilities differ?*
- *Do firms face obstacles to the commercialisation of their own technologies and to accessing third party technologies?*

15 For more information on PROs patenting and licensing and technology licensing organisations, see (OECD, 2003).

16 See, for example, Yet2.com, http://www.yet2.com/app/about/about/aboutus. In 2002, Scipher plc, a parent of QED Intellectual Property ltd., acquired Yet2.com. QED was acquired by Innovation Development ltd. in 2004. See http://www.qed-p.com/pr/2003_jan_15.htm, http://www.qed-ip.com/pr/2004_May_14.htm.

17 See, for example, BTG, http://www.btgplc.com.

18 See, for example, ThinkFire Services, http://www.thinkfire.com.

IP management and exploitation: practices across industries [Session 3]

18. Across the business sector, intellectual asset management (IAM) is receiving growing attention as firms seek to more effectively exploit their intellectual assets – their patents in particular. The basic concept of IAM is to extract the maximum value from intellectual assets via more comprehensive valuation and management. Either by themselves or with the help of consultants, firms use IAM to evaluate their patent portfolios and identify patents which have not been used for the internal development, but have the potential to be licensed to others without risking their own profitability. They also look for ways to generate cost savings or tax benefits from abandoning or donating to non-profit organisations those patents they do not plan to commercialise themselves. They also defend their patent portfolios more aggressively.

19. Interest in IAM stems from the growing appreciation of the extent to which patents are systematically under-utilised. Available statistics show a surge in the number of patents in force over the world: more than 850 000 patent applications were filed in Europe, Japan and US in 2002, compared to about 600 000 in 1992 (OECD, 2004b). By the end of 2002, there were about 5 million patents in force worldwide (EPO *et al.*, 2004). This growth has not been matched by a commensurate increase in the utilisation of patents, as indicated in several recent surveys:

- A survey by the firm BTG of 150 technology-intensive firms and research universities in the United States, Western Europe and Japan found that 24% had more than 100 unutilised patents, 12% had more than 1 000 unutilised patents and only 15% reported had no unutilised patents (Arora *et al.*, 2001). Approximately 30% of Japanese firms reported having more than 2 000 unused patents (Arora *et al.*, 2001).

- A survey of EPO patent applicants (about 700 total responses) showed that the average share of licensed patents in a respondent's patent portfolio in 2003 was 8% among Japanese firms, 11% among European firms and 15% among US firms (Roland Berger, 2005).

- A large scale, comprehensive survey conducted by the Japan Patent Office (JPO) (with about 6 700 total responses) found that only 30% of Japanese patents were being exploited internally, less than 10% were being licensed out to other parties, and more than 60% of Japanese patents were not being used at all (JPO, 2004).[19]

20. There may be many legitimate reasons for patent holders not to exploit their patented inventions. Changes in business policies or product market conditions may affect the ability of a firm to introduce related products or services, and the advent of new technologies can make existing inventions obsolete. Alternatively, the decision not to exploit an invention may reflect sound business judgement, balancing the costs of filing, maintaining and protecting patents against the projected benefits of exploitation.

21. The benefits of such an approach can be significant. By adopting IAM processes in its business model, Dow Chemical, for example, increased its IP licensing revenue from USD 25 million to USD 125 million per year and saved USD 50 million in intellectual property costs.[20] Additional gains may also be possible as the results above were achieved by exploiting 55% of the firms patents (as of 2002): 21% in practice, 9% used defensively, and 25% licensed (Hillery, 2004). As a result, many large technology-based firms have created independent units to extract value from patents through licensing and other means,

[19] The JPO implemented an annual survey on IP-related activity in 2002. Respondents were asked about *1)* their use of the IPR; *2)* the status of their exploitation IPRs; *3)* the licensing revenue balance resulting from IPR; *4)* operations implemented at IP divisions; and *5)* IPR infringement suits.

[20] See http://www.ipambestpractices.com/Info/GordonP%20bio.pdf.

and many small and medium enterprises (SMEs) have found that outward-licensing is an effective means for them to economic returns from their R&D without having to develop all the complementary assets needed for large scale production and distribution.

Patent licensing

22. Patent licensing is an important element of IAM within firms. Various types of licensing are practices (see Box 2), but all involve an agreement by the owner of a patent (licensor) to allow another party (licensee) to make, sell and use of the patented invention on an exclusive or non-exclusive basis, without transferring ownership of the patent. Usually, a licensor receives financial rewards in exchange, such as in the form of royalty payments. Therefore, licensing is one suitable mechanism to make good matches between licensors who wants to leverage their technological assets and licensees who want to complement their technological capabilities, although the advantages and disadvantages can vary from one case to another (Table 1).

Table 1. Some advantages and disadvantages of patent licensing

	Inward licensing	
Advantages	•	License payments tend to be less costly than in-house R&D
	•	Payment can be used to control risks by designing the payment scheme prudently
	•	Shortens the time required for R&D and bringing new products into markets
	•	Lower risks when an invention has been already commercialised
Disadvantages	•	Often with some restrictions in licensing agreements and may raise antitrust concerns
	Outward licensing	
Advantages	•	High profitability, although revenue streams are uncertain
	•	Allowing multiple licensees at the same time
	•	Low risks compare to Foreign Direct Investment (FDI) that sometimes applicable laws, living habit, economic climate, political situation differ from licenser's own
	•	Possibility of paper license, when a licensee does not need technical advice nor know-how, only a paper work (drafting contract) is needed
	•	Especially for SMEs, making profits with lower risk by not to have downstream production facilities
Disadvantages	•	Potentially making rivals in downstream markets who could erode the profit
	•	Usually total profit is smaller than successful internal development
	•	Returns largely depend on the capabilities of licensees to develop technology and marketing

23. A number of high-technology firms have been able to generate considerable revenues from outward licensing of technology. IBM Corp., which started to more actively managing its IPR in the late 1990s and averaged more than 3 000 US patent grants a year between 2000 and 2004, received more than USD 1 billion in annual revenues from licensing royalties and sales of IPR, about half of which came from licensing (IBM, 2002:2003:2004).[21] Other technology-intensive firms such as DuPont, Merck and Amgen also report significant amounts from commercialisation of patents, and significant growth in such revenues (Table 2). Texas Instruments reported USD 391 million in licensing revenue in 1992 and was thought to have earned around USD 800 million a year by the end of the decade (Rivette and Kline, 2000). Microsoft Corp. changed its IP management approach to reduce its reliance on copyrights and secrecy in favour of greater reliance on patents, due to the emergence of Internet and the resulting need for greater openness

[21] IBM has received more US patents than any other private sector organisation for past 12 years. See http://www.uspto.gov/web/offices/com/speeches/05-03.htm. Reported licensing and sale revenues from IP were USD 1.4 billion in 2000, USD 1.2 billion in 2001, USD 0.86 billion in 2002, USD 0.9 billion in 2003 and USD 0.86 billion in 2004

and transparency in software. Its new intellectual property policy, announced in 2004, is more open to outward licensing of its inventions, which should offset somewhat the costs of inward-licensing, which stand at around USD 1 billion.[22]

Table 2. Reported licensing revenues

Millions of USD

	1999	2000	2001	% of earnings
DuPont (chemicals)	289	349	380	10-15
Merck (pharmaceuticals)	134	153	126	1.5
Amgen (biotechnology)		181	253	11-15
IBM (computing)		528	465	

Source: Gu and Lev (2004); Corporate reports

24. Japanese and European firms also license extensively, especially in the ICT sector. Among Japanese firms, Hitachi was one of the top licensors, and is reported to have earned licensing revenues of JPY 43 billion in FY 2002. However, Hitachi changed its licensing policy in 2003 from one of openness to third party licenses to a more closed approach that aims to protect its competitive advantage (Takahashi, 2005). In recent years, Sony Corp. and Canon Inc. earned roughly JPY 29 billion and JPY 20 billion, respectively, each year from their patent licensing activities (Baba, 2003). NEC already earns more than JPY 10 billion annually from patent licensing (Baba, 2003); to increase its licensing activity, it launched in 2003 a searchable database listing patents that are available for licensing to third parties.[23] Among European firms, Thomson successfully increased its licensing revenue from EUR 278 million in 1999 to 462 million in 2003, which accounts for 5.5% of 2003 total net sales. Thomson has approximately 40 900 patents and pending applications and 750 licensing agreements relating to a diversified mix of video products and services. Thomson's top ten licensees account for approximately 72% of its total licensing revenues (Thomson, 2004).

25. Further development of patent licensing markets will require additional attention to issues of valuation. A 2003 survey by the JIII investigated the issues of patent licensing and assignment perceived by firms in Japan. Difficulty determining patent validity ranked the highest (67.3%). Many of the remaining issues, such as shortages of information about possible licensee (28.1%) and lack of qualified technology licensing personnel (18%), can be ameliorated by employing various types of intermediaries (including Web-based transaction systems); however, difficulties related to patent valuation will continue to arise. Another licensing survey targeted IP owners of members of the Licensing Executives Society International from the United States and Canada[24] also suggests the importance of value of IP for licensing deals: the inability to reach mutually acceptable financial terms was the most frequently reported reason for not concluding successful agreements (26% of respondents for out-license, and 32% for in-license), although non-financial terms ranked a close second (23% for out-license and 17% for in-license) (Razgaitis, 2004). Therefore, establishment of reliable and well accepted patent valuation methods is a priority issue for facilitating licensing markets.

22 Summary of remarks by David Kaefer, Director of Business Development, Microsoft Corporation at the OECD Forum on Business Performance and Intellectual Assets, 6 October 2004. See http://www.oecd.org/dataoecd/51/13/33848750.pdf.

23 For further details see http://www.ipr-nec.com/en/.

24 Information on Licensing Executives Society International (LESI) is available at http://www.lesi.org/.

Box 2. Types of licensing agreements

Unilateral licensing is the most basic type of licensing agreement, consisting of an agreement by a patent holder to allow a licensee to practice an invention, subject to certain restrictions (*e.g.* geographic region, product market) and in return for some form of compensation, typically an up-front payment and a stream of royalties based on revenues from use of the invention.

Cross-licensing agreements involve an exchange between two or more patent portfolios and are typically used to allow the mutual use of patents by multiple patent holders in order to secure freedom of operation (avoid running the risk of entering into patent infringement litigation with other firms operating in similar product markets) and access complementary technologies. As the number of patents required to manufacture products becomes larger, firms tend to engage in cross licensing agreements involving all current and future patents within a particular field-of-use without making specific reference to individual patents to reduce transaction costs. Although a primary purpose of cross licensing is to secure freedom of operation, establishing a balancing royalty payment scheme from the owner of the weaker patent portfolio to that of the stronger portfolio may be important as a source of revenues and requires valuing the patents involved in the deal, which might substantially increase transaction costs (Grindley and Teece, 1997).

Patent pools typically consist of the collection of patents required to offer a product or service. One of the advantages of patent pools from the licensee's perspective is that it becomes a one-stop-shop for the set of pooled patents, which can help reduce costs associated with royalties and negotiation. A number of patent pools associated with technological standards are found in the ICT sector, which requires numerous numbers of essential patents. To maximise the benefits of a patent pool, it is important to collect as many required patents as possible while keeping total royalty payments commercially reasonable.[25,26] The design of the incentive scheme for encouraging patent holders to join a patent pool is important, especially as regards those patent holders who might wish to remain outside the pool and to demand high royalties for their related patents. Kato (2003) considers two possible approaches to this problem. The differentiated royalty approach allows different royalties to apply to different patents, based on their value.[27] The antitrust law approach apples when a royalty demanded by an outsider is extraordinarily high compared to those demanded for patents within the pool. This can indicate an abuse of patent rights and lead to antitrust suits. The threat of an antitrust suit and related transaction costs may lead the outsider to lower its royalties and join the patent pool.

Licensing practices across industries

26. As the dynamics of innovation and the role of patenting in the innovation process vary across industries, patent licensing practices may also differ from one to another. Anand and Khanna (2000) attempt to identify differences across industries with respect to patent licensing based on information from the SDC strategic alliances database. They examine licensing contracts involving US participants between 1990 and 1993. Main findings of their study include the following:

- *Licensing is concentrated in selected industries.* About 80% of licensing deals occur in three industries, 46% in chemical industry including drugs, 22% in electronic and electrical equipment industry including semiconductors and 12% in industrial machinery and equipment industry including computers.
- *Prior relationship is important to engage in licensing contracts*. About 30% of licensing deals are singed between parties having prior relationship. This tendency is more observed in computer and electronics firms than chemicals.

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25 Although standard-setting bodies typically require participants to license under Reasonable And Non Non-Discriminatory (RAND) conditions, a definition of RAND has not been developed. Furthermore, even if each individual royalty is reasonable, a cumulative royalty may not be reasonable (Lerner *et al*., 2003).

26 The 3G Patent Platform has introduced the systems of Maximum Cumulative Royalty (MCR) and Standard Royalty Rate (SRR) to its royalty structure. Under this structure, SRR is applied for the royalty of each license. If the cumulative SRR royalty exceeds the MCM, the SRR is adjusted to keep the cumulative royalty beneath the MCM ceiling.

27 Of course, this approach entails another challenge for valuation of patents.

- *Exclusivity and restriction clauses are more common in chemical firms.* More than half of the deals in chemical involve some exclusivity clauses, which are less common in computers (18%) and electronics (16%). Restrictions such as field of use, geographic domain and contract length are more common in chemicals (40%) than computers and electronics (30%).
- *Cross licensing is frequently used in electronics.* Cross licensing is more common in electronics (20%) than other industries (10%). This arrangement is more observed for transfers of technology not yet developed than ex-post transfers.[28]

27. Another study, also based on information from the SDC database on strategic alliances but using more recent data (1985-2002) finds similar results and identified several factors that affect positively the likelihood of firms to engage in licensing agreements (Vonortas and Kim, 2004). Companies will tend to engage in licensing agreements: the closer their technological profiles; the closer their market profiles; the more familiar they are with each other through prior agreements; the higher their prior independent experience with licensing; and the stronger the intellectual property protection in the primary line of business of the licensor. All these factors affect licensing transaction costs and indicate that reducing transaction cost may be more important when licensing occurs across sectors, whereas strategic and competition-related factors may be more important when licensing occurs between firms pertaining to the same industry.

28. Firms in complex industries, such as ICT and biotechnology are increasingly faced with the need to access areas densely populated by patents, which may sometimes even overlap and are referred as patent thickets (Shapiro, 2001). In such situation, patent holders may perceive that infringing other patents is unavoidable, even unintentionally. Practical solutions to obtain room for manoeuvre in environments where patent thickets abound include the use of cross licensing agreements and patent pools (Shapiro, 2001).

Information and communications technologies

29. Patent congestion is increasingly becoming an issue of concern in ICT industries. More than 90 000 patents generally related to microprocessors are held by more than 10 000 parties (FTC, 2003). The propensity to patent in the US semiconductor industry doubled between 1982 and 1992, going from about 0.3 to 0.6 patents per million dollars of R&D spending, compared to an average increase from 0.2 to 0.3 patents per million dollars of R&D in manufacturing.[29] Hall and Ziedonis (2001) attribute this high propensity to patent to a series of pro-patent changes during those years, such as the establishment in 1982 of the US Court of Appeals for the Federal Circuit (which hears IPR-related cases), Polaroid's successful patent infringement suit against Kodak and the successfully assertion of patent in courts by firms such as Texas Instruments. This situation led large semiconductor firms to enter into patent portfolio races to reduce the hold-up problem posed by other patent holders and use them as bargaining chips to obtain favourable terms in negotiations with other patent holders. On the other hand, new entrants (in particular, design firms without manufacturing facilities) since 1982 patented more aggressively than pre-1982 entrants to attract venture capital funds and secure proprietary rights in niche product markets.

30. Patent pools have been one approach used to address the problem of patent congestion and the need for firms to acquire rights to multiple inventions in order to produce a new product, process or service. An illustrative example of a patent pool in the ICT industry is the MPEG-2 patent pool which collects patents covering MPEG-2 standard. The pool successfully cleared antitrust concern with a de facto approval from regulatory authorities by including only essential, complementary patents – not substitute

[28] This trend is also observed in Japan. Indeed, the ratio of cross license to out-license is about 90 % in electronics industry, while the ratio accounts for less than 20 % in chemical industry (JPO, 2004).

[29] Patent intensity declined in the pharmaceutical industry between 1982 and 1992, from about 0.2 to 0.1 patents per million dollars of R&D.

patents – which is one of the major determinants of an approval for patent pools. However, at the process of its formation, there were disagreements regarding the licensing rate. Some patent holders sought to profit from MPEG-2 by selling products based on the standard rather than from licensing their patents, and hence sought low royalty rates. Others sought greater licensing revenues and hence a higher royalty rate. Still other firms that thought they held critical patents attempted not to join the pool so they could charge a separate, higher royalty rate (Lerner *et al.*, 2003). In the end, a lower rate was adopted, even if not all firms joined the patent pool. MPEG-2 was widely licensed and is recognised as one of the most established and successful patent pools.

Biotechnology

31. Licensing patterns in biotechnology have been influenced by changing industrial dynamics of the industry. While large pharmaceutical firms maintain in-house research facilities, they are becoming more reliant on externally sourced compounds to widen their product lines, and hence are licensing more technology from outside firms, especially from biotechnology firms. About 30% of large pharmaceutical firms' revenues came from in-licensed drugs in 2001 (Kalamas *et al.*, 2002), and competition for in-licensing drugs has becomes fiercer in recent years due to the limited number of available compounds, endowing licensors with stronger bargaining power (Rogers, 1999). Deals for late-stage drugs are on the rise, both to reduce risks for drug development and to make immediate revenue streams (Picone, 2002; Rogers, 1999), even though late-stage drugs are 10 times more expensive than early-stage drugs and about one-third of all licensing deals occur at an early stage (Kalamas *et al.*, 2002). Whereas large pharmaceutical firms paid about USD 24 million in pre-commercial payments in 1990, they paid an average of USD 76 million in 2000 to smaller biotech firms for late-stage compounds (Picone, 2002). Nevertheless, established pharmaceutical firms are not as active in outward-licensing. Between 1995 and 1998, only about 50 outward licensing deals were signed by the top ten drug firms in the US, versus more than 200 inward licenses (Rogers, 1999).[30]

32. Some concerns have been voiced that as the number of patented research tools needed for drug developments increases, R&D could be impeded because of the difficulty in assembling the necessary patents and formidable costs that might involve.[31] Patent pools have been suggested as a possible solution to this problem (USPTO, 2000; JPO, 2002).[32] A recent study based on interviews with personnel in biotechnology and pharmaceutical firms and universities in the United States, however, showed little evidence to date of R&D projects being terminated due to difficulties in getting licenses from multiple IP owners. The first reason advanced by the authors was that the number of required patents for each R&D project is not necessarily as large as anticipated. Second, even though licensing fees for research tools have become more expensive, these patented technologies are more productive than alternative approaches and thought to be worth the higher price. Some firms have been willing to offer discounts to university and government researchers (Walsh *et al.*, 2003). Nevertheless, further monitoring should be done in the future, as the challenges might increase if the area becomes more densely patented (OECD, 2002).

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30 Possible explanations for the reluctance of top pharmaceutical firms' to engage in outward licensing is the desire to guard their intellectual property, fear that small firms (licensees) may not be successful in further development and successful marketing of end-products, and the low priority for out-licensing assigned by their managements (Rogers, 1999).

31 This situation is commonly referred to as "the tragedy of the anti-commons,", which is the antithesis of "the tragedy of the commons", which arises when people tend to overuse resources when resources are owned in common. On the contrary, the tragedy of the anti-commons occurs when resources are privatised by multiple owners, and people tend to under-use resources due to difficulties of negotiations of permission to use resources with owners. See Heller and Eisenberg (1998).

32 Pooling patents related to DNA chips has been suggested in Japan (JPO, 2002). The United States Patent and Trademark Office (USPTO) published a white paper in 2000 discussing the benefits of pooling biotechnology patents (USPTO, 2000).

IP management and exploitation: practices across industries

Suggested issues for discussion:

- *How different are licensing practices in the biotech/pharmaceutical, IT and automobile industries?*
- *What do they have in common?*
- *How does licensing contribute to value creation within firms?*
- *What are the most serious challenges to be overcome by firms in licensing markets?*

Methods for patent valuation [Session 5A]

33. Despite its importance, systematic IP valuation does not appear to be pervasive in OECD countries, judging from the available evidence. A recent survey of European firms reveals that only 12% of respondents had employed a third party to conduct a patent valuation, despite the view that third parties may be in a better position to conduct a more authoritative, objective assessment that draws upon a broader set of experiences (DLA, 2004). Interestingly, the survey found the highest likelihood of valuation in Italy and Spain (46% of responding firms) followed by the BeNeLux countries (42%), United Kingdom (40%), Scandinavia (36%), Germany (32%) and France (32%). In Japan, about 50% of the entities holding patents were found to evaluate their patent portfolio (JIII, 2003).

34. Several factors preclude more widespread valuation. First, when firms employ patents as a defensive tool, they have limited incentive to conduct a patent valuation, and they tend not to recognise patents as a financial asset in this situation. Second, there is a fundamental question whether or not patents can be valued in a reliable way using existing tools. Furthermore, their value may be highly context dependent, varying according to different expectations about markets for products or services that make us of the patented invention and on the complementary assets that a firm has in place to successfully implement and commercialise the invention (these complementary assets may include other patents). The 2003 JIII survey revealed the relative importance of various difficulties firms face in valuing patents. The valuation of present and future marketability of the products which employ the subject patented technology was seen as the most difficult issue (reported by 71% of respondents) followed by valuation of the contribution of the patented invention to products (67%) and choice of the best method for conducting the valuation (42%). Respondents also suggested that the data limitations impede valuation. Data are needed on markets size, projected sales and profits for some valuation approaches (JIII, 2003).

35. So, how do firms conduct a patent valuation? Which methods are employed in different situations, and is it possible to identify a best-practice, general-purpose tool for valuation? A number of different approaches have been proposed by experts to value patents and several have been put into practice. Each approach has strengths and weaknesses, and it is very important to choose the most appropriate method available for each specific case. Methods used for business purposes can be generally divided into two groups. One group covers qualitative valuation methods for rating and scoring patents based on factors such as the strength and breadth of patent rights and their legal certainty. The other group covers quantitative valuation methods attempting to calculate the monetary value of the patents, including the cost approach, market approach and income approach (Smith and Parr, 2000), each of which is also used to value fixed assets and assets relevant to M&A and specific projects. An emerging quantitative approach uses option pricing theory to value patents.

Qualitative patent valuation methods

36. Qualitative valuation methods have been often used for the purpose of internal patent management, due to its relative simplicity compared to quantitative valuation methods. In addition, some service providers offer valuation services, and some national patent offices, such as the Japan Patent Office (JPO) and the Danish Patent and Trademark Office (DKPTO) propose qualitative valuation models within their countries. Some examples of qualitative valuation methods developed in the private sector include the valuation tool called 'PRISM' developed by QED Intellectual Property. This tool classifies patents into four basic management models, namely *1)* monopoly (patents for internal exploitation with high value), *2)* defensive (internal exploitation, low value), *3)* license (external exploitation, high value) and *4)* joint venture (external exploitation, low value). Classification is determined by a multiple choice questionnaire inquiring about patent coverage, defensibility, profitability, revenue growth, patent attributes, industry adoption, competitive position and company capability for person inside firms (IPA, 2004). Another example is the valuation tool developed by Nihon IR based on the valuation method built by the JPO that is described in more detail later in this report (JIII, 2003).

Quantitative patent valuation methods

37. The *cost approach* to valuing patents is based on the cost of obtaining a patented invention by either internal development or external acquisition. This approach relies on calculations of the reproduction and the replacement cost of the patented invention: *1)* the cost of the reproduction is the cost of construct the exact replica of the patented invention subject to valuation; and *2)* the cost of replacement is the cost to obtain an invention with the equivalent utility to the patented invention subject to valuation. A patented invention with equivalent utility would be an invention that performs the same functions but may accomplish the required tasks in a different way (Smith and Parr, 2000). Despite its large potential for application in other settings, the cost approach is not widely used in the context of patent valuation because it does not reflect the future economic value of the valued patents. This approach may nevertheless be helpful in accounting systems, which are based on historical costs and dictated by taxation methods (Pitkethly, 2002) or a as a supplement to the income approach set out below (WIPO, 2003).

38. The *market approach* uses comparable patent transactions in the market as a basis to obtain the value of the patent subject to valuation. However, the lack of a sufficient number of exchanges and the lack of transparency about their characteristics makes this approach less reliable and useful than others. The market approach faces other difficult challenges such as the need to make adjustments for comparability when the difference between the subject patent and the comparable patent is not negligible (Smith and Parr, 2000). To date, some proprietary services have been collecting transaction information such as royalty rates and constructing their own databases to provide comparable transaction information, but they are still limited. In the future, when the market for patents becomes more active and transaction information becomes more publicly available this approach has the potential to be used widely. For examples, if firms increase their voluntary disclosures or if regulation changes to foster disclosure of patent transactions.

39. The *income approach* attempts to calculate the present value of the projected future income flow arising from the subject patent during its economic life. The discounted cash flow method allows an estimated future income flow to be converted to a present value by discounting the estimated future income flow with a certain rate, referred as a discount rate. One of the most difficult challenges in this approach is how to set a discount rate. Factors affecting the discount rate include inflation, liquidity, real interest and risk premium (added up to a real interest for risk free investment when the future prospect is not clear) (Smith and Parr, 2000). It is also important to take into account that when the direct income stream from the subject patent is not available, it is required to isolate its value from the aggregated income stream of the projects (Otsuyama, 2003).

40. The utility of these approaches and the frequency of their use vary according to the purpose of the evaluation. According to one estimate, the cost approach is the most suitable approach for the valuation for the financial accounting and corporate tax purposes, the income approach is for the valuation for the inheritance tax purpose and for collaterals which focus on future revenue generated by the underling IP, the market approach is for the valuation of an internal management purpose which often needs monetary value of IP for a resource allocation and a performance evaluation (Table 3).

Table 3. Application of three main quantitative patent valuation approaches to different purposes

	Cost approach	Income approach	Market approach
M&A	-	++	++
Financial accounting	+++	-	-
Taxation			
Corporate tax	+++	-	-
Inheritance tax	-	+++	*
Sale price	++	++	*
License	+	+	+
Collateral	-	+++	*
Infringement litigation	-	++	+
Internal management	-	++	+++

Note: "+++" : Theoretically or by rules is applicable and used widely.
"++" : Used widely.
"+" : Used to some extent.
"-" : Not used.
"*" : Theoretically or by rules is applicable, but rarely used due to difficult applicability.
Source: Watanabe, 2002.

41. As noted above, the options approach is an alternative quantitative patent valuation method which is increasingly gaining acceptance. The option pricing theory was originally developed for pricing financial options, which are defined as "a right but not an obligation, at or before some specified time, to purchase or sell an underlying asset whose price is subject to some form of random variation" (Pitkethly, 2002). The application of the concept of options is not limited today only to financial assets, as it also applies to non financial assets, known as real options. One limitation of existing valuation methods is their difficulty in dealing with managerial flexibility, a problem that can be overcome by this approach. The real option method is able to take into account the flexibility of patent management, which can in turn be considered as a series of options. Real option models include the binomial model and the Black-Scholes option pricing model (Pitkethly, 2002). Some firms provide patent valuation services that employ the Black-Scholes equation to value patents.

Econometric approaches to patent valuation

42. Several attempts have been made to use econometric methods to measure the economic value of patents. They use a variety of econometric approaches based on citation data, renewal data and patent holder's estimations of value and typically aim to measure patent value in order to identify implications for public policy or enhance understanding of innovation process rather than improve patent management and exploitation at the firm level.

- *Citation data.* Citation-based analysis aims to measure the value of a patent by the number of times it is cited by other patents (backward citations). Such information can then be used to measure effects on firm performance or value. Hall *et al.* (2000) employed citation-weighted US patent stocks to build an indicator of patent quality and showed that highly cited patents are highly valued by markets. Firms with very highly cited patents (more than 20 citations per patent)

showed a 50% increase in value relative to firms with the same level of R&D and patent stocks, but with the median citation intensity.[33] Ramb and Reitzig (2004) used EPO patent stocks of German firms and found that patent stocks both weighted and unweighted by backward citations similarly correlate with the residual value of German manufacturing firms. This result suggests there is little value added from weighting with backward citations, which is inconsistent with earlier studies.

- *Renewal data.* An alternative approach estimates patent value via renewal data. This approach relies on the fact that patent systems typically require substantial increases in renewal fees over time, and assumes that patent holders renew patents only when they are economically valuable. An advantage of this approach, compared to those using stock market valuations as a proxy of patent value, is that it reflects the actions and valuations of the patent holders themselves, who may be better able to estimate the economic value of the patent. The disadvantages include the fact that it is useful only for valuing patents retrospectively and usually in aggregation (Pitkethly, 2002). Schankerman and Pakes (1986) attempted to estimate the distribution of the private value of patents using patent renewal data of United Kingdom, France and Germany. They found that the distributions of the value of the patents are sharply skewed for all three countries studied and that most patents have little economic value. Schankerman (1998) extended the study to four technology areas, pharmaceutical, chemical, mechanical, and electronics sector using French patent renewal data. The similar skewed value distribution was observed across the industries that the top 1% of patents was found to account for about 12% and 14% of the total value of patents in pharmaceuticals and chemicals, respectively, and 21% and 24% for mechanical and electronics patents. Mean values of the patents were found to vary across the industries, with patents in electronics being the most valuable, followed by those in mechanicals, chemicals and pharmaceuticals, in this order.

43. Patent value can also be estimated by patent holders, using more *subjective approaches*. Harhoff *et al.* (2003) reports results of a survey which asked German patent holders the minimum price for which they would have sold their patents. Because the sale of a patent can sacrifice a firm's profits or impose additional cost of inventing around the patented invention, the estimated values obtained by the survey are considerably higher than the values estimated using the renewal data approach. Again, the distribution of the patent value is skewed, with most patents showing low monetary value and a small number of high-value patents accounting for most of the total value. Beyond the distribution of patent value, the survey found correlations between patent value and various other patent indicators, such as the number of forward and backward citations, the size of family of related patents to cover the invention and the outcomes of opposition cases.[34]

Methods for patent valuation

Suggested issues for discussion:

- *What approaches are businesses taking to value patents, and which are the most effective in different contexts?*
- *What techniques are being developed by academic researchers and how applicable are they to real-world business situations?*
- *What are the most effective patent valuation methods offered by consultancies and other service providers?*
- *How can the valuation approaches of different stakeholders inform each other and lead to improved valuation techniques?*

[33] A citation analysis for a particular patent may be useful for finding possible licensees and monitoring patent infringement since a party who cites the patent builds their inventions on it and is probably operating in same field.

[34] Similarly, Harhoff *et al.* (1999) found a significant correlation between patent value and citations. Scheffer *et al.* (2005) also uses statistical methods for patent valuation.

Macroeconomic evaluations of licensing markets in Europe, Japan and the United States [Session 5B]

44. Little is known about the size and evolution of licensing markets at the national or regional level, because of a lack of statistics. As most patent licensing is based on private contracts that are subject to confidentiality agreements, comprehensive time-series data on patent licensing are not available.[35] Accounting rules do not require firms to disclose patent licensing revenues as a separate item in corporate reports (Box 3), and although most OECD countries have regulatory requirements for reporting licensing contracts, these are mostly related to cross-border transactions and data is available only at an aggregate level. Therefore, disclosure of patent licensing activity depends largely on firm policy. Even though disclosure of information of licensing revenues has been shown to have a positive effects on investors (Gu and Lev, 2004), most firms elect not to make public such information.[36] As a result, available data on patent licensing is limited, scattered, and lacking in uniformity.

45. The limited information that does exist suggests that markets for technology are large and growing. With regard to the size of the worldwide market for technology licensing, a conservative estimate indicates that it averaged more than USD 36 billion between 1990 to 1997 —considerably higher than the estimated average of USD 5.6 billion in the 1980s (Arora *et al.*, 2001). In the United States, it has been estimated that patent licensing revenues rose from USD 15 billion in 1990 to more than USD 100 billion in 1998, and experts estimated that revenue could top half-trillion dollars annually by the middle of next decade (Rivette and Kline, 2000). In a recent OECD survey of businesses found that approximately 60% of responding firms had seen an increase in both inward and outward patent licensing over the previous decade, and around 70% of respondents expected the importance of inward and outward patent licensing to grow in the next five years (Sheehan *et al.*, 2004).

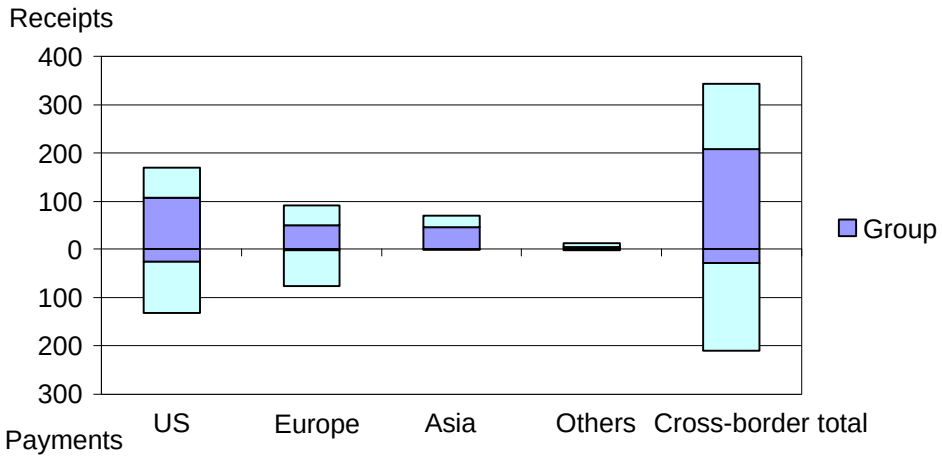
46. International licensing is also large and appears to be increasing. In Japan, patent licensing revenue from foreign parties totalled JPY 340 billion in fiscal year 2002, and Japanese firms spent approximately JPY 210 billion on foreign licenses, yielding a surplus of JPY 130 billion (Figure 2). If business transactions within affiliated firms (groups) are excluded, however, total revenue and expenditure become about JPY 140 billion and JPY 180 billion respectively, resulting in a deficit (JPO, 2004). OECD data on receipts from international licensing and transfers of patents show steep increases in France and Germany (Figure 3). In France, receipts increased by more than a factor of six between 1990 and 2003 from EUR 330 million to EUR 2.4 billion (not taking into account inflation), while in Germany they doubled from EUR 1.3 billion to EUR 2.7 billion. Receipts remained relatively flat in Italy at roughly EUR 200 million to EUR 300 million per year, in contrast.

[35] Some patent-related laws stipulate registration of licenses; however, most licensing contracts are not registered.

[36] Based on their survey, Gu and Lev (2004) estimate roughly half of the firms conducting patent licensing do not disclose their royalty income.

Figure 2. International balance of payments for patent licenses in Japan, total and within group, FY2002

Billions of Yen

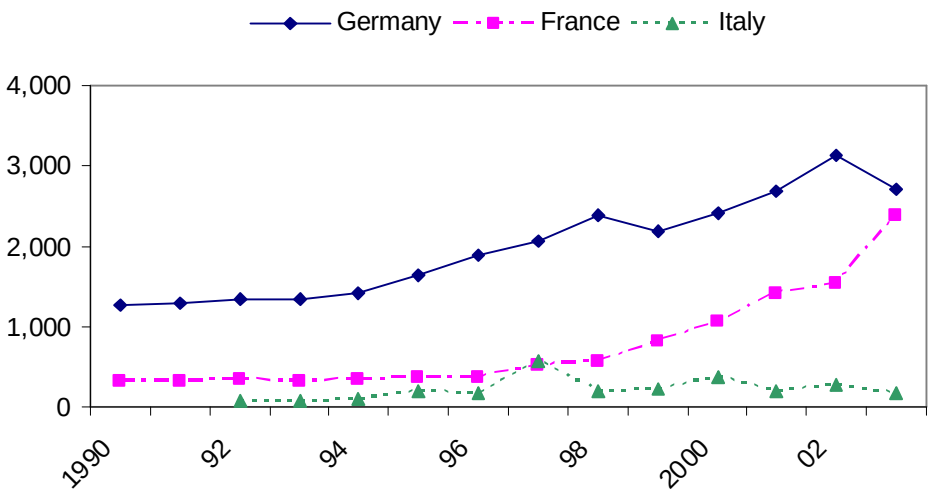


Note: Data are estimated based on responses from a sample of firms.

Source: JPO, 2004.

Figure 3. Receipts from international patent licenses and sales in Europe

Millions of Euros



Source: OECD Technology Balance of Payments database.

Box 3. Reporting of intangible assets

In the United States, the private-sector Financial Accounting Standards Board (FASB) has agreed that "*financial reporting should provide information that is useful to present and potential investors and creditors and other users in making rational investment, credit, and similar decisions*".[37] Current accounting standards in most countries do not fully capture intangible assets including patents, however. In order to be reported as an asset in financial statements, an item is required to meet several criteria according to FASB rules. First, it must meet the definition of an asset and offer "*probable future economic benefits obtained or controlled by a particular entity as a result of past transaction or events*".[38] In addition, it must satisfy three criteria namely measurability, relevance and reliability.[39] In other words, an item lacking reasonably reliable measurement can not be recorded as an asset in a financial statement which leaves out most of intangible assets.

Recent developments may encourage greater reporting of intangible assets. In 2001, FASB released SFAS No.141,"Business Combinations" which requires that all business combinations be accounted for by the purchase method, recording a business combination based on values exchanged, instead of by the pooling method. This change makes it possible to provide better information about the total purchase price paid to acquire another entity. It is also required that intangible assets be reported separately from goodwill, if the assets arise from contractual or other legal rights or if they are separable from an acquired entity.[40] Patents, licenses and royalty agreements are listed as such intangible assets.[41] In addition, the US Sarbanes-Oxley Act of 2002, which aims to improve the accuracy and reliability of corporate disclosures, also affects reporting practices for intangible assets, through requirements to indicate important IP assets, risk factors related to IP and any material IP litigation, etc.[42]

Macroeconomic evaluations of the market for licenses in Europe, Japan and the United States

Suggested issues for discussion:

- *What do recent studies indicate about the size of patent licensing markets in different geographic regions and their relative rates of growth?*
- *How does the size and sophistication of licensing markets differ across industries and technology fields?*
- *How many agreements involve cross-licensing? Are there important differences across countries or regions?*
- *Do other sources of licensing information exist that can be used for economic analysis?*

37 FASB(1978), Paragraph 34, SFAC No.1, Objectives of Financial Reporting by Business Enterprises.

38 FASB(1985), Paragraph 25, SFAC No.6, Elements of Financial Statements.

39 FASB (1984), SFAC No.5, Recognition and Measurements in Financial Statements of Business Enterprises.

40 FASB launched project on Disclosures of Intangible Assets in 2002 aiming to establish standards for improving disclosure of information about internally developed intangible assets. The project was removed from its research agenda in January 2004.

41 Examples of intangible assets recognised apart from goodwill include *1)* trademarks, tradenames (marketing-related intangible assets); *2)* customer lists (customer-related intangible assets); *3)* plays, operas, ballets (artistic-related intangible assets); *4)* licensing, royalty, standstill agreements (contract-based intangible assets); and *5)* patented technology (technology-based intangible assets). See FASB(2001), Appendix A, SFAS No.141, Business Combinations.

42 Sarbanes-Oxley Act of 2002, Public Law No: 107-204(2002). Additional information on its provisions is available at http://westorg.org/nl/featured_articles/IP_011304.html

Encouraging valuation and exploitation: the role and experience of public institutions [Session 4]

47. Although the primary mission of patent offices has traditionally been to examine and process patent applications, some patent offices have taken initiatives to encourage the exploitation and valuation of patents, within the capacity of their mandates. A first step has been to develop new mechanisms for licensing. The patent offices of Germany, France and the United Kingdom, for example, have introduced a system of *licenses-of-right* to promote the exploitation of patents. Licenses-of-right offer patent holders a discount on renewal fees (of around 40% to 50%) in exchange for their agreement to offer non-exclusive licenses to any party that requests one.[43] A number of firms have taken advantage of licenses-of-right, with large electronics firms appear to be the most numerous users of this system. Further evaluation of this mechanism is needed to better understand its impact on licensing behaviour and the types of patents that are introduced into the system.

48. Another approach has been to develop analytical tools to assist firms in valuating and exploiting their patents. In 2000, the JPO issued "Patent Evaluation Indexes for Technology Transfer," an initial evaluation tool for measuring the potential for technology transfer of patents from a large patent portfolio (JPO, 2000). The model provides an evaluation of three specific aspects of IP (rights, transferability and business potential), as well as a comprehensive evaluation that weights these factors according to the purpose of the evaluation. An assessment of the tool indicated that while all three specific aspects are related to actual licensing behaviour, only the business potential evaluation is statistically significant (JIII, 2004).[44] In 2000, the Danish Patent and Trademark Office (DKPTO) released a report "Management and Evaluation of Patents and Trademarks" that includes two evaluation models for patents and trademarks, similar to that promulgated by the JPO (Ernst & Young and Ementor Management Consulting, 2000). In 2001, the DKPTO released a basic model of an IP management software tool named IPscore® that aids in the evaluation and strategic management of patents and development projects. The software provides a qualitative assessment of a patented technology by evaluating five categories (legal status, technology, market conditions, finance and strategy). It also enables the calculation of quantitative financial forecasts of the value of a patented technology based on information regarding development costs, development time, market conditions and product conditions (Nielsen, 2004).[45]

49. Patent offices have also provided information and related services to encourage licensing. Since 2001, Japan's National Centre for Industrial Property Information and Training (NCIPI), an independent administrative institution, has been in charge of a licensing promotion programme. The program includes dispatch of patent licensing advisors, creation of the patent licensing database and training programs for intermediaries.[46] Its economic impact has been has been estimated at about JPY 160 billion between 1997 and 2004; the programme is attributed with creating more than 5 000 technology transfer contracts and more than 1 000 new jobs.[47] In the United Kingdom, the UK Patent Office (UKPO) has facilitated the work of the Lambert Working Group on IP, which was established to produce model agreements for industry-university research collaboration that touch upon ownership and exploitation of IP and provide supporting materials to help understanding how to use the model agreements.[48]

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43 For more information about the system in the UK, see http://www.patent.gov.uk/patent/indetail/lofright.htm. The German Patent and Trade Mark Office provides a searchable database of licenses of right within the patent register at https://dpinfo.dpma.de.

44 In the assessment, a set of licensable patents was extracted from the patent licensing database maintained by the NCIPI, and the owners were asked whether the patents had been licensed out to other parties. The database is available online at http://www.ryutu.ncipi.go.jp/db/index.html (Japanese) or http://www.ryutu.ncipi.go.jp/en/db/index.html (English).

45 Further information is available online at http://www.dkpto.dk/int/patents/ipscore.htm.

46 For details of initiatives, see http://www.ncipi.go.jp/english/index.html.

47 See http://www.ryutu.ncipi.go.jp/about/seika_i.html (Japanese).

48 For further information, see http://www.innovation.gov.uk/lambertagreements/index.asp?lvl1=1&lvl2=0&lvl3=0&lvl4=0.

50. At the international level, initiatives of the Small and Medium-Sized Enterprises (SMEs) Division of the World Intellectual Property Organisation (WIPO) include organising seminars and workshops across the globe and providing Web-based information (articles, case studies, etc.) for IP licensing, valuation and financing. A training manual, "Exchanging Value – Negotiating Technology Licensing Agreements," which aims to provide practical issues in the process of negotiating technology licensing agreements, was released in cooperation with the International Trade Centre (ITC) in 2005.[49] The OECD has also undertaken to develop the guidelines for licensing genetic inventions which to provide principles and information on best practices for the licensing of genetic inventions.[50]

Encouraging valuation and exploitation: the experience and role of public institutions

Suggested issues for discussion:

- *What concrete steps have been taken by patent offices around the world to encourage valuation and exploitation?*
- *How effective have such actions been and how can they be improved?*
- *What is the impact of patenting procedures (e.g. duration of examination, list of prior art citations, etc.) on licensing and valuation?*

Encouraging valuation and exploitation: What could government do (or not)? [Session 6]

51. Various efforts have been made by national and regional governments, international organisations and business groups to foster and promote the valuation and exploitation of patents and to encourage firms to make better use of patents for improving firm competitiveness and national economic performance. These efforts have taken many forms, from convening workshops and seminars to formulating guidelines and revising relevant legislation, to establishing databases of licensable patents. As the main objective of these initiatives is to support business processes, governments must, of course, be wary of excessive policy initiatives that could hinder the functioning of markets. They must also continue to provide the basic foundations for valuation and exploitation via improvements in the quality and speed of patent examination.

European initiatives

52. At the European level, the European Commission (EC) established a network of 70 Innovation Relay Centres (IRCs) in 1995. Services include help in matching buyers and sellers of technology (via an Internet-based system) and provision of advice on innovation, intellectual property, licensing and negotiation. These services are mainly targeted at technology-based SMEs. To date, the IRCs have facilitated about 1 000 technology transfer agreements, including signed agreements for the sale, licensing, distribution or joint development of new technologies.[51] The EC also created the Community Research and Development Information Service (CORDIS) which provides information about EU R&D programs and transferable technologies. In addition, a new safe harbour for licensing patents, know-how and software copyright at the European level entered into force in the European Union in May 2004 as part of a broader set of reforms to competition law reform that are expected to reduce bureaucracy and increase legal certainty.[52]

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49 See http://www.wipo.int/sme/en/documents/guides/technology_licensing.htm.

50 For further information, see http://www.oecd.org/document/26/0,2340,en_2649_34537_34317658_1_1_1_1,00.html.

51 See http://irc.cordis.lu/.

52 See press release (ref.IP/04/470) http://europa.eu.int/rapid/pressReleasesAction.do?reference=IP/04/470&format=HTML&aged=0&language=EN&guiLanguage=en.

53. In Germany, policy initiatives for the exploitation of patented inventions focus on funding and awareness-raising. The Federal Ministry of Education and Research (BMBF) provides support to universities for the establishment of regional patent exploitation agencies, such as the Patent Centre for German Research of the Fraunhofer Gesellschaft which manages inventions from universities.[53] The BMBF also provides partial funding for the INSTI network, which comprises 39 private and public regional institutions for the stimulation of innovation, exploitation of inventions and promotion of the patent system in general.[54] INSTI runs an Internet-based service called Innovation Market to link buyers and sellers of technology.[55] The BMBF has set up an SME patent action fund (KMU-Patentaktion) that offers financial support to SMEs for expenses ranging from patent application to exploitation. To further expand the use of patents as collateral for bank loans, regional patent information centres (PIZs) are co-operating with the German Patent and Trademark Office (DPMA) to make available more patent information and raise awareness of intellectual property. Several PIZs intend to enhance their patent valuation and exploitation services in the near future.

Japan

54. Intellectual property policy has become one of the major national concerns in Japan since the formulation in 2002 of the Intellectual Property Policy Outline, which aims to revitalise the Japanese economy through intellectual property. After the enactment of the Basic Law on Intellectual Property in 2002, the Intellectual Property Policy Headquarters released a Strategic Program for the Creation, Protection and Exploitation of Intellectual Property which includes more than 250 action items in 2003 (annually revised) (IPPH, 2003). In 2003, a demonstration experiment was completed under the leadership of the study group for securitisation of patents in the Ministry of Economy, Trade and Industry (METI) to identify and address issues related to patent securitisation.[56] In relation to a law related to securitisation, a revised Trust Business Law has been in force since December 2004 which abolishes the limitation of eligible property in trust business – that is, intellectual property becomes eligible property and expected to diversify financing methods. In addition, an attempt is underway in the Industrial Structure Council to establish valuation methods for intellectual property, including patents, trademarks and copyrights.

United States

55. Efforts in the United States have centred primarily around the licensing of inventions resulting from publicly funded research. The Bayh-Dole Act of 1980 allows small business firms and non profit organisations including universities to elect to retain title to inventions derived from federally funded R&D. Since then the number of patent application and revenues from patent licensing of these organisations have been increasing, even though only the small number of them generate substantial income from licensing activities (AUTM, 2004).[57] More recently, legislation has been introduced to the US Congress to reform the patent system, with the primary objectives of bringing the US system closer into line with international systems and to improve patent quality. Nevertheless, provisions of recent bills have possible implications for valuation and exploitation. The Patent Quality Assistance Act of 2004, introduced into the 108th Congress in October 2004, contained among other things, a requirement that a court not issue an injunction unless it finds irreparable harm for a patentee, and that such a decision consider "*the extent to which the*

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53 This agency is also involved in the exploitation of inventions made by SMEs and individual inventors.

54 For details see, http://www.insti.de (German).

55 For details see, http://www.innovation-market.de (German). Furthermore the BMBF has set up a nationwide network of Inventors-Clubs for sole inventors, students, apprentices and pupils.

56 This is the first case of patent securitisation in Japan. The press release related to this activity is available online at http://www.c-direct.ne.jp/japanese/uj/pdf/10104815/00013128.pdf (Japanese).

57 Many countries have since developed similar regimes for governing the patentability of the results of public research.

patentee makes use of the technology claimed by the patent".[58] Such provisions would limit the ability of patent trolls to demand compensation for patents they do not exploit. In a similar vein, the Patent Act of 2005, introduced into the 109th Congress in June 2005, includes a change of the injunctive relief provisions that would make it more difficult for patentees to win receive injunctions against accused patent infringers.[59]

Tax incentives

56. In addition to the specific initiatives outlined above, a number of countries have taken steps to encourage patenting and licensing via the tax system. In general, countries in Europe, North America and East Asia provide similar tax treatment related to the patents: royalties received are treated as taxable income, and taxes are paid at the prevailing corporate income tax rates; expenses related to patenting, purchase of patents and payment of patent royalties are deductible from taxable business income and not taxed. However, some countries provide special incentives for patenting income. The Irish government offers a full tax exemption for royalty income generated by the licensing of patents that result from R&D conducted in Ireland. Hungary offers a 50% deduction on royalty revenues. France and Greece offer reductions in capital gains taxes under certain conditions (Warda, 2005).

Reporting guidelines

57. In a number of countries, steps have also been taken to assist firms in publicly reporting information about their intellectual assets, including their patents and other intellectual property. The governments of Denmark, Germany and Japan, for example have worked with industry and other relevant stakeholders to develop guidelines for non-financial disclosures of information regarding intellectual assets, and the European Union, through its MERITUM project, has supported similar efforts:[60]

- *Intellectual Capital Statements: The New Guideline*, Ministry of Science, Technology and Innovation, Denmark, 2003.[61]
- *Intellectual Capital Statement – Made in Germany*, Federal Ministry of Economics and Labour, Germany, 2004.[62]
- *Reference Guideline for Intellectual Property Information Disclosure*, Ministry of Economy, Trade and Industry, Japan, 2004.[63]

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58 Patent Quality Assistance Act of 2004, H.R. 5299, 108th Congress. There are some concerns that the current provision already stipulates that an injunction is granted "in accordance with the principle of equity" and that the bill too strongly emphasises commercialisation (Carlin and Holowacz, 2005). Some observers note that the costs of litigation are often greater than the fees demanded by so-called patent trolls (Baker, 2005).

59 Patent Act of 2005, H.R. 2795, 109th Congress.

60 For information on MERITUM, see *Guidelines for Managing and Reporting on Intangibles*, MERITUM, 2002. A number of firms have also experimented with approaches for reporting investments in intangibles, including patents. For example, Skandia Corp. developed a prototype intellectual capital report that received considerable attention. See http://www.skandia.com/en/ir/annualreports.shtml.

61 http://www.videnskabsministeriet.dk/cgi-bin/theme-list.cgi?theme_id=100650&_lang=uk.

62 http://www.bmwa.bund.de/Redaktion/Inhalte/Pdf/B/br-wissensbilanz-englische-fassung,property=pdf.pdf.

63 http://www.meti.go.jp/english/information/downloadfiles/cIPP0403e.pdf.

58. These guidelines aim to redress weaknesses in financial accounting standards, which do not address intangible assets. They provide guidance to firms on how to prepare reports that disclose qualitative and quantitative information about their intellectual assets and the contributions of those assets to firm performance. It is hoped that such disclosures will provide relevant information about the value of firms and improve the efficiency of financial markets.

What can governments do (or not)?

Suggested issues for discussion:

- *How effective have been recent policy initiatives to encourage IP valuation and exploitation?*
- *What are the most urging priorities (if any) for government intervention in this field?*
- *What are some of the limits to government action?*

Conclusion

59. Intellectual assets, such as patents, play a pivotal role in fostering innovation and economic growth in a knowledge-based economy. Effective management and exploitation of intellectual assets can improve business performance and competitiveness. Patents are an important element of a firm's intellectual asset portfolio and are increasingly managed as assets by companies. They are increasingly utilised to access financial markets (using patents as certificates of quality or as collateral), bought, sold and traded in technology markets, notably through licensing contracts.

60. The relative novelty of these issues creates a need to improve knowledge and information, both quantitative and qualitative, about intellectual property exploitation and valuation. It also generates demand for an integrated policy framework in order to enhance economic growth. These are exactly the needs that the conference on "Intellectual property as an economic asset: key issues in valuation and exploitation" will attempt to address and fulfil.

REFERENCES

Anand, B.N., and T. Khanna (2000), "The Structure of Licensing Contracts", *The Journal of Industrial Economics*, 48(1), 103-135.

Arora, A., A. Fosfuri, and A. Gambardella (2001), *Markets for Technology: The Economics of Innovation and Corporate Strategy*, MIT Press, Cambridge, Mass.

Association of University Technology Managers (AUTM) (2004), *AUTM Licensing Survey: FY 2003, Survey Summary*.

Baba, R. (2003), "Are Patent Strategies of Japanese Companies OK?" Introductory Chapter, in Samejima, M., ed., *Patent Strategy Handbook*, Chuokeizai-sha, Tokyo.

Barker, D.G. (2005), "Troll or No Troll? Policing Patent Usage with an Open Post-Grant Review", 2005 Duke L. & Tech. Rev. 0009. http://www.law.duke.edu/journals/dltr/articles/2005dltr0009.html

BMBF (2004), *Technologie und Qualifikation für neue Märkte.* http://www.technologische-leistungsfaehigkeit.de/de/1869.php.

Carlin, J., and E. Holowacz (2005), "The Patent Quality Assistance Act of 2004", *New York Law Journal*, 233(32). http://www.fitzpatrickcella.com/images/pub_attachment/attachment297.pdf.

Chesbrough, H. (2003), *Open Innovation: The new imperative for creating and profiting from technology*, Harvard Business School Press, Boston, Mass.

Cohen, W.M., A. Goto, A. Nagata, R.R. Nelson, and J. P. Walsh (2002), "R&D Spillovers, Patents and the Incentives to Innovate in Japan and the United States", *Research Policy*, 31, 1349-1367.

DLA (2004), *European Intellectual Property Survey*.

Ernst & Young, and Ementor Management Consulting (2000), *Management and Evaluation of Patents and Trademarks*, Consultants' Analysis Report for Danish Patent and Trademark Office. http://www.innovationskraft.dk/publications/reports/analysis_patent_trademark/management_and_evaluation_of_patents_and_trademarks.pdf.

European Commission (EC) (2000), *Funding of New Technology - Based Firms by Commercial Banks in Europe*, Brussels.

European Patent Office (EPO), Japan Patent Office (JPO), and United States Patent and Trademark Office (USPTO) (2004), *Trilateral Statistical Report 2003 Edition.* http://www.jpo.go.jp/torikumi_e/kokusai_e/tws/tsr2003/ch2.pdf.

Federal Trade Commission (FTC) (2003), *To Promote Innovation: The Proper Balance of Competition and Patent Law and Policy*. http://www.ftc.gov/os/2003/10/innovationrpt.pdf.

Financial Accounting Standards Board (FASB) (1978), *SFAC No.1, Objectives of Financial Reporting by Business Enterprises*.

Financial Accounting Standards Board (FASB) (1984), *SFAC No.5, Recognition and Measurements in Financial Statements of Business Enterprises.*

Financial Accounting Standards Board (FASB) (1985), *SFAC No.6, Elements of Financial Statements.*

Financial Accounting Standards Board (FASB) (2001), *SFAS No.141, Business Combinations.*

Gans, J.S., and S.Stern (2003), "The Product Market and the Market for "Ideas": Commercialization Strategies for Technology Entrepreneurs", *Research Policy* 32, 333–350.

Grindley, P. C., and D. J. Teece (1997), "Managing Intellectual Capital: Licensing and Cross-licensing in Semiconductors and Electronics", *California Management Review* 39(2), 8-41.

Gu, F., and B. Lev (2004), "The Information Content of Royalty Income", *Accounting Horizons*, 18(1), 1-12.

Hall, B.H., A. Jaffe, and M. Trajtenberg (2000), "Market Value and Patent Citations: A First Look", NBER Working Paper 7741.

Hall, B. H., and R. H. Ziedonis (2001), "The Patent Paradox Revisited: An Empirical Study of Patenting in the U.S. Semiconductor Industry, 1979-1995", *RAND Journal of Economics*, 32(1), 101-128.

Harhoff, D., F.Narin, F. M. Scherer, and K. Vopel (1999), "Citation Frequency and the Value of Patented Inventions", *The Review of Economics and Statistics*, 81(3), 511-515.

Harhoff, D., F. M. Scherer, and K. Vopel (2003), "Citations, Family Size, Opposition and the Value of Patent Rights", *Research Policy*, 32, 1343–1363.

Harris Nesbitt (2004), *Asset-Backed Update.* http://www.securitization.net/pdf/secnewsletter_feb04.pdf

Heller, M.A., and R.S. Eisenberg (1998), "Can Patents Deter Innovation? The Anticommons in Biomedical Research", *Science*, 280, 698-701.

Hildebrand, M.J., and J. Klosek (2004), *Intellectual Property Due Diligence: A Critical Prerequisite to Capital Investment.*

Hillery, J.S. (2004), *Securitization of Intellectual Property: Recent Trends from the United States*. http://www.iip.or.jp/summary/pdf/WCORE2004s.pdf

IBM (2002), *Annual Report 2002*. http://www.ibm.com/annualreport/.

IBM (2003), *Annual Report 2003.* http://www.ibm.com/annualreport/.

IBM (2004), *Annual Report 2004.* http://www.ibm.com/annualreport/.

Information-Technology Promotion Agency, Japan (IPA) (2004), *Report of IPA Intellectual Property Study Group*, IPA, Tokyo.

Intellectual Property Policy Headquarters (IPPH) (2003), *Strategic Program for the Creation, Protection and Exploitation of Intellectual Property.* http://www.kantei.go.jp/foreign/policy/titeki/kettei/030708f_e.html

Japan Institute of Invention and Innovation (JIII) (2003), *Survey on Patent Valuation System in Patent Licensing Market*, JIII, Tokyo.

Japan Institute of Invention and Innovation (JIII) (2004), *Survey on Verification and Evaluation of Patent Valuation System Based on Patent Licensing Contracts*, JIII, Tokyo.

Japan Patent Attorneys Association (JPAA)(2002), *Report of Survey of Needs for Intellectual Property Valuation*, JPAA, Tokyo.

Japan Patent Office (JPO) (2000), *Patent Valuation Indexes for Technology Transfer*, JPO, Tokyo.

Japan Patent Office (JPO) (2002), *Survey on Technology Trend of Patent Application: Post Genome Related Technology*, JPO, Tokyo.

Japan Patent Office (JPO) (2004), *Results of the Survey on Intellectual Property-Related Activities, 2003*, JPO, Tokyo.

Kalamas, J., G. S. Pinkus, and K. Sachs (2002), "The New Math for Drug Licensing", *The Mckinsey Quarterly*, 4.

Kaplan, R. S., and D. P. Norton (2004), *Strategy Maps: Converting Intangible Assets into Tangible Outcomes*, Harvard Business School Press, Boston, Mass.

Kato, H. (2003), "Technical Standards and Patent Pools: Actual Conditions and Problems", in *Trends of Licensing Agreements in the Industrial Sector and Subsequent Economic Problems*, Institute of Intellectual Property, Tokyo.

Lamoreaux, N.R., and K. L. Sokoloff (2002), "Intermediaries in the U.S. Market for Technology, 1870-1920", NBER Working Paper 9017.

Layton, R., and P. Bloch (2004), *IP Donations: A Policy Review*. International Intellectual Property Institute, Washington, DC. http://www.iipi.org/reports/IP_Donations_Policy_Review.pdf.

Lerner, J., J. Tirole, and M. Strojwas (2003), "Cooperative Marketing Agreements between Competitors: Evidence from Patent Pools", NBER Working Paper 9680.

Marcinkowski, M. (2000), *Donating Intellectual Assets.*

Nielsen, P.E. (2004), "Evaluating Patent Portfolios - A Danish Initiative", *World Patent Information* 26, 143–148.

OECD (2002), *Genetic Inventions, Intellectual Property Rights and Licensing Practices: Evidence and Policies*, OECD, Paris.

OECD (2003), *Turning Science into Business: Patenting and Licensing at Public Research Organisations*, OECD, Paris.

OECD (2004a), *Networks, Partnerships, Clusters and Intellectual Property Rights: Opportunities and Challenges for Innovative SMEs in a Global Economy*, OECD, Paris. http://www.oecd-istanbul.sme2004.org

OECD (2004b), *Patents and Innovation: Trends and Policy Challenges*, OECD, Paris.

Otsuyama, H. (2003), "Patent Valuation and Intellectual Assets Management", Chapter 5, in Samejima, M., ed., *Patent Strategy Handbook*, Chuokeizai-sha, Tokyo.

Picone, T. A. (2002), "Pharmaceutical Licensing during the Revolution", Chapter 10, in Goldscheider, R., ed., *The LESI Guide to Licensing Best Practices*, John Wiley & Sons, New York.

Pitkethly, R. (2002), *The Valuation of Patents : A Review of Patent Valuation Methods with Consideration of Option Based Methods and the Potential for Further Research*, submitted to High Level Task Force on Valuation and Capitalization of Intellectual Assets organized by United Nations Economic Commission for Europe (First meeting, 18-19 November 2002).

Ramb, F., and M. Reitzig (2004), "Who Do You Trust While Bubbles Grow and Blow? A Comparative Analysis of the Explanatory Power of Accounting and Patent Information for the Market Values of German Firms", LEFIC Working Paper 2004-07.
http://ep.lib.cbs.dk/download/ISBN/x656409427.pdf

Razgaitis, R. (2004), "U.S./ Canadian Licensing in 2003: Survey Results", *Les Nouvelles*, Journal of the Licensing Executives Society, 39(4), 139-151.

Rivette, K.G., and D. Kline (2000), *Rembrandts in the Attic: Unlocking the Hidden Value of Patents*, Harvard Business School Press, Boston, Mass.

Rogers, R.S. (1999), "Battling for Blockbusters", *Chemical & Engineering News*, February, 1999.

Roland Berger (2005), *Applicant Panel Survey 2004, of Intentions for Filing Patent Applications at the European Patent Office and Other Offices.*

Schankerman, M. (1998), "How Valuable is Patent Protection? Estimates by Technology Field", *The RAND Journal of Economics*, 29(1), 77-107.

Schankerman, M., and A.Pakes (1986), "Estimates of the Value of Patent Rights in European Countries during the Post-1950 Period", *The Economic Journal*, 96(384),1052-1076.

Scheffer, G.v., D. Loop, and St. Lipfert (2005), "From Patents to Finance," *Intellectual Asset Management Magazine*, February/March 2005, 37-39.

Shapiro, C. (2001), "Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard-Setting", in Jaffe, A. et al. eds., *NBER Innovation Policy and the Economy*, 119- 150, MIT Press, Cambridge, Mass.

Sheehan, J., C. Martinez, and D. Guellec (2004), "Understanding Business Patenting and Licensing: Results of a Survey", Chapter 4, in *Patents, Innovation and Economic Performance* - Proceedings of an OECD Conference, OECD, Paris.

Smith, G.V., and R.L. Parr (2000), *Valuation of Intellectual Property and Intangible Assets Third Edition*, John Wiley & Sons, New York.

Takahashi, T. (2005), *Intellectual Assets Strategy and Corporate Accounting*, Koubundou Publishers, Tokyo.

Thomson (2004), *2003 Form 20F*. http://www.thomson.net/EN/Home/Investor/AnnualReports.htm.

United States Patent and Trademark Office (USPTO) (2000), *Patent Pools: A Solution to the Problem of Access in Biotechnology Patents?* http://www.uspto.gov/web/offices/pac/dapp/opla/patentpool.pdf.

Vonortas, N.S., and YJ. Kim (2004), "Technology Licensing", Chapter 10, in *Patents, Innovation and Economic Performance* - Proceedings of an OECD Conference, OECD, Paris.

Walsh, J. P., A. Arora, and W. M. Cohen (2003), "Effects of Research Tool Patents and Licensing on Biomedical Innovation", in Cohen, W. M. et al., eds., *Patents in the Knowledge-Based Economy*, The National Academics Press, Washington, DC.

Warda, J. (2005), *Taxation of Patents and Patent Rights, A Country Review, A Progress Report Submitted to the European Patent Office* (unpublished paper).

Washington CORE (2002), "US Survey", Appendix of *Report on Financing in Patent Licensing Market*, The Japan Technomart Foundation, Tokyo.

Watanabe, S. (ed) (2002), "Issues of Accounting Surrounding Intellectual Property", Chapter 7, in *Intellectual Property - Strategy, Valuation and Accounting*, Toyo Keizai, Tokyo.

World Intellectual Property Organisation (WIPO) (2003), "Valuation of Intellectual Property: What, Why and How", *WIPO Magazine*, Sep-Oct., 5-8.
http://www.wipo.int/sme/en/documents/wipo_magazine/09_2003.pdf