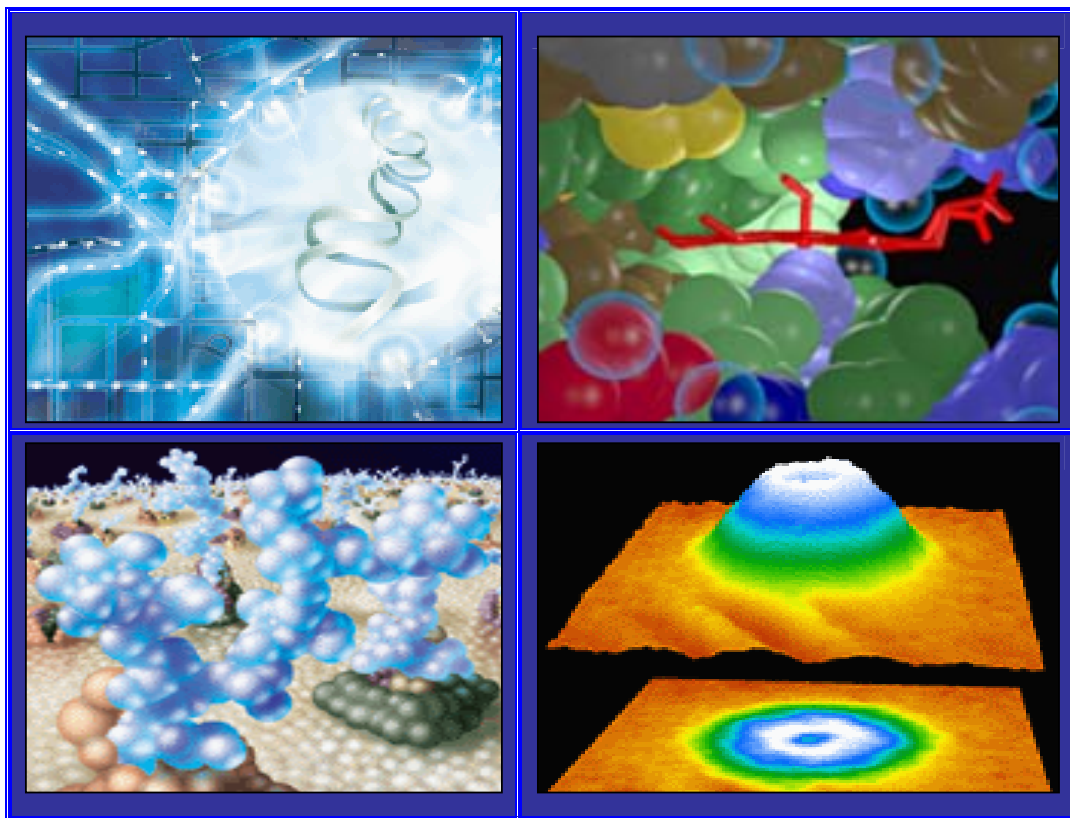


UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE

INTELLECTUAL ASSETS: VALUATION AND CAPITALIZATION



UNITED NATIONS

UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE

SERIES: INVESTMENT PROMOTION

**INTELLECTUAL ASSETS:
VALUATION AND CAPITALIZATION**



UNITED NATIONS

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FOREWORD

A rising knowledge-based economy has posed challenges in all areas of human life, including acquisition, generation and dissemination of knowledge, organization of the innovation process and commercialisation of intellectual assets. New information and communication technologies allow closing the gap between invention and its utilization, between the inventor and investor. At the same time, a present patent system, designed in the industrial epoch, has loop-holes, which makes the existing protection of the rights of inventor extremely porous in the light of the capabilities of new technologies, and the inventor increasingly vulnerable, undermining his or her incentive to further innovate.

A situation in the area of the capitalization of intellectual assets is far from being conducive to the inventor. The valuation of intellectual assets is not properly standardized. Small and medium-sized venture companies are unable, due to a high price of valuation, benefit in full from their inventions and do not own enough investment resources to convert their own inventions into products.

Furthermore, small and medium-sized enterprises, operating under a constant financial pressure, do not have enough capacity to identify a right patent, which could lead to an enhancement of their products or the production of new ones. Those small and medium-sized companies, which succeeded to overcome this barrier, have grown into big businesses, employing thousands of workers, while providing consumers with new products and services.

Finally, companies, operating on the competitive edge, show that they have been winning because of their heavy investment in new technologies and products. At the same time, the value structure of new competitive services and products has increasingly shifted towards intangible (R&D) inputs. The value of some of the new products like those of Microsoft or Dell, for example, are a product of knowledge.

This growing role of innovative resources in generating new value poses a number of challenges facing the corporate sector, Governments and the society at large: how to evaluate the intangible contribution and, hence, corporate portfolio, how to stimulate innovating thinking, etc.?

It is obvious that the knowledge-based economy sets its own rules and conditions. To better understand the nature of this phenomenon and better prepare to meet its challenges, a longer and more focused dialogue is needed.

The challenge facing transition and emerging market economies is even greater. They have simultaneously to design new means to capitalize intellectual assets, which were inherited from the past, and to transform their institutional framework to ensure the sustainability of innovative activities.

In the light of the above, the UNECE decided to convey a meeting of high-level experts on valuation and capitalization of intellectual assets. Some interesting suggestions made by experts and successful solutions highlighted in their presentations are collected in the publication below. They show that countries of the region share the same concerns and are eager to learn from each

other. The UNECE hopes that this compilation of ideas and experiences may inspire a further thinking on possible means and ways of effective utilization of intellectual assets to the benefit of societies at large.



Brigita Schmögnerová
Executive Secretary
United Nations Economic Commission for Europe

PREFACE

The emerging knowledge-based economy raises concerns to which both groups of UNECE member countries, developed and transition economies, have not yet found solutions. These are:

- management of intellectual resources;
- valuation of intellectual capital;
- commercialization of inventions;
- intellectual property valuation;
- efficiency of the utilization of intellectual assets;
- promotion of innovation, and other issues.

Innovation and commercialization in the field of technology are not as prevalent as they could be. Fresh ideas are needed for selective intervention in key areas if there is to be a real breakthrough. Intellectual assets have so much potential, yet investment will only flow where there are clear opportunities to build and recover future value.

The innovation and technological capabilities of a country are clearly correlated with long-term growth and social progress. Countries without such capabilities will be increasingly marginalized in the globalizing world driven by innovation and new technologies. To sustain innovation, all countries also need to modify continuously their institutional, information and innovation systems and provide incentives and a supportive environment for human resources development.

One pressing need is for innovation and technological policies that promote value generation from intellectual assets. Though there exists tremendous potential, these will only be realized if the right conditions are in place to attract investment.

To date, while Governments have been aware of the importance of the rich intellectual base in a high-level educational system, especially in science and applied engineering, the approach of Governments to innovation has tended to be *laissez faire*. It had been expected that FDI with skill and capabilities in R&D and marketing could automatically stimulate innovation in the domestic enterprise sector.

However, this has not happened to the extent desired and the expectation of “spillovers” from FDI into the domestic technological sector may have been exaggerated, given that foreign investors seek to protect their intellectual properties and so deliberately restrict their dissemination to local enterprises.

In the light of the above, UNECE decided to organize the First Meeting of the High Level Task Force in the form of a Round Table on “Valuation and Capitalization of Intellectual Assets”, which was held on 18-19 November 2002 at the Palais des Nations, Geneva (Switzerland). The key objectives of the Round Table were:

- to help to identify the most important challenges faced by public and private sectors in this area; and
- to enable members of the High Level Task Force to set up work priorities.

The participants in the Round Table reviewed existing practices and methodologies of valuating intellectual capital, including valuation of intellectual assets (inventions), intellectual property rights (patents), valuation of managerial flexibility, stock market valuation of companies, and R&D project valuation.

The issue of commercialisation of intellectual assets, in particular inventions, in countries in transition and emerging market economies gained a prominent place in the debates. The successful experiment of the Canadian Government in accelerating the process of innovation and commercialization of inventions raised great interest from the government representatives of these countries. This indicates the need to share experience and this is exactly where the UNECE could and should assist its member States.

The articles below contain some ideas and examples on how the challenges of the knowledge-based economy could be met. They are presentations made by participants in the Round Table on Valuation and Capitalization of Intellectual Assets. I would like to express my appreciation to these participants, as well as to the UNECE staff members, who made this publication possible, especially Mr. Andrei Maevski, Ms. Alison Mangin, Ms. Tatiana Apatenko and Mr. Mitja Jarh.

Larissa Kapitsa
Director
Coordinating Unit for Operational Activities
United Nations Economic Commission for Europe

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ACRONYMS AND ABBREVIATIONS

CIS	Commonwealth of Independent States
EC	European Commission
EC/DG	European Commission/Directorate General
EU	European Union
FEE	European Federation of Accountants
HIT	Highlight innovation trends
IASB	International Accounting Standards Board
IBM	International Business Machines Corporation
IC	Intellectual capital
ICO	Innovation and commerce organizations
IFIA	International Federation of Inventors Associations
IP	Intellectual property
IPR	Intellectual property rights
OECD	Organisation for Economic Cooperation and Development
PCT	Patent Cooperation Treaty
IPC	International patent classification
GNP	Gross national product
R&D	Research and Development
PPP	Public Private Partnerships
SME	Small and medium-sized enterprise
TEGOVA	European Group of Valuers' Associations
TRIZ (TIPS)	Theory of Inventive Problem Solving
TUIT	Technology Unit Investment Trust
UNECE	United Nations Economic Commission for Europe
VC	Venture capital
WIPO	World Intellectual Property Organization
WTO	World Trade Organization
WTO/TRIPS Agreement	World Trade Organization Agreement on Trade Related Aspects of Intellectual Property

PART ONE

**UNECE HIGH LEVEL TASK FORCE ON VALUATION AND
CAPITALIZATION OF INTELLECTUAL ASSETS**

**ROUND TABLE ON VALUATION AND CAPITALIZATION OF
INTELLECTUAL ASSETS: SUMMARY OF DEBATES**

by Andrei Maevski, Economic Affairs Office, UNECE

Introduction

The Round Table on Valuation and Capitalization of Intellectual Assets, held in Geneva on 18 and 19 November 2002, was attended by participants from the following countries: Armenia, Belarus, Belgium, Bulgaria, Canada, Croatia, Czech Republic, Denmark, Hungary, Italy, Kazakhstan, Norway, Poland, Portugal, Republic of Moldova, Russian Federation, Slovakia, Spain, Sweden, Switzerland, United Kingdom, United States of America and Yugoslavia, as well as a representative of the European Commission.

The list of participants and other documents prepared for the meeting and conference papers/presentations, can be found at the Website: <http://www.unece.org/operact/enterp/taskf.htm>.

The work of the meeting was structured under four panels. Below are short summaries of discussions held at these panels.

Opening session

Ms. Larissa Kapitsa, Director, UNECE Coordinating Unit for Operational Activities, opened the Round Table by explaining the main reasons for organizing a High Level Task Force. The UNECE was focusing its activities on the promotion of a new, knowledge-based, economy and was looking for ways to assist Governments' efforts to accelerate the development of a new economy.

According to Ms. Kapitsa, a new emerging economy has challenged all economic and social actors: the corporate sector, Governments and society at large in the countries of the UNECE region, in areas such as: management and capitalization of intellectual resources; evaluation of corporate portfolio; accounting and taxation; protection of inventors; sustainability and efficiency of innovative activity. .

As is known, economies in transition inherited a distorted infrastructure for supporting innovation. In the past, the State had a monopoly over innovative activities; it was the sole venture capitalist and the owner of all intellectual products. It was therefore its responsibility to promote, finance and commercialise innovations in all their aspects. Under the new circumstances and with the breakdown of the old system, companies, inventors and Governments are facing difficulties in linking together all the elements of the support system due to lack of knowledge, on the one hand, and resources, on the other. At the same time, the intellectual assets accumulated over the past decades need to be effectively utilized, while the stock of intellectual products needs to be evaluated and commercialised. This, however, cannot be achieved without having a proper support system in place.

In the light of the above, Ms Kapitsa invited the participants to come up with concrete proposals concerning the future directions of work of the

UNECE in the area of evaluation and capitalization of intellectual assets.

The Chairperson of the Round Table, Ms. Karin Keyes Endemann (National Research Council, Canada) welcomed participants and underlined that the key objectives of the meeting were to identify the most important challenges faced by the public and private sectors of both developed and transition economies in putting the innovation process into real motion for the benefit of the further development of national and world economies.

This problem is particularly complex as it covers many aspects that require a thorough examination and concrete actions on the part of many actors: public and private sectors, academic circles and international organizations. Although the growing contribution of intellectual capital to economic growth and development is widely recognized, there are still difficulties experienced by Governments, corporate sector, small and medium-sized enterprises, and finally intellectual property right holders in valuating and managing intellectual capital. Intellectual assets have so much potential, yet investment will only flow where there is clear opportunity to build and recover future value.

The innovation and technological capabilities of a country clearly correlate with long-term growth and social progress. Countries without such capabilities will increasingly marginalize in the globalizing world driven by innovation and new technologies. To sustain innovation, all countries also need to modify continuously their institutional, information and innovation systems, and provide incentives and a supportive environment for human resources development.

Panel I: Management of Intellectual Resources

The panel was chaired by Ms. Jadranka Svarc (Ministry of Science and Technology, Croatia). The participants in the panel discussed the contribution of intellectual capital to economic growth and development – challenges for the public and private sectors as well as public management of intellectual resources and corporate management of intellectual assets.

Ms. JiNan Glasgow (United States of America) made a comprehensive presentation on intellectual asset management. She outlined modern trends towards the intellectualisation of assets, stressing that intellectual capital is now considered a crucial resource and that the company strategy often depends on its IP position. She further referred to modern tools needed for IP management and presented a Patent Matrix Diagram that was developed by her company. This tool with great potential for further development has already been proved to substantially reduce time and costs in the drafting and prosecution of patent application, and it is an ideal complement to TRIZ (Theory of Inventive Problem Solving). The Patent Matrix simplifies the understanding of patents, patent law concepts and terminology. It is applied to IP portfolio management, strategic research planning, investment/value development, IP knowledge sharing, patent development and IP mapping and assessment. She also introduced TRIZ methods and basic principles that enable solutions to be found which have already been identified somewhere before.

Mr. Jan Taug (Norway) spoke about capital interconvertibility in complex organizations. Identifying various capital species in the use and understanding of how to convert them into more tradable forms of capital is a complex task. He explained how unique knowledge and relational skills have facilitated capital conversion to nurture innovation and growth. He further dwelt upon the parts and the process that drive the transformation of capital species and demonstrated how one organization used its previous knowledge-based organizational activities that had driven value in the past to develop a new integrated business model based on intangible capital forms.

Mr. Guido Haesen (European Commission) presented a few lessons learned through the implementation of innovation projects within the Fifth European Community R&D Framework Programme that was initiated with the aim of developing, validating and monitoring methodologies for the promotion of innovation. He stressed that successful innovation was based on sharing knowledge between various groups of socio-economic actors involved in the implementation of a complex project and the

added value of their cooperation. Trust, accountability and ability to find a common language of knowledge in a predominantly competitive environment are essential if knowledge sharing is to be successful.

Mr. Eskil Ullberg (Sweden) made a presentation on strategic questions regarding the patenting system. Patenting has become a strategic tool for companies since not a single patent but a patent portfolio can secure market access, and risk and uncertainty management is the key to understanding the strategy of the patenting system. The main goal is to create an efficient patenting system that combines both private and public interests and to involve users of the patents.

Mr. Aris Kaloudis (Norway) presented some views on the policy issues related to the management of intellectual assets, in particular on how it was possible to use different standard valuation guidelines as a management tool at the public policy level. These guidelines are important initiatives to establish a transparent market for intangibles, to better allocate resources in the knowledge-based economy and, finally, to contribute to macroeconomic stability. The importance of interaction between various actors in the innovation process as a learning process was underlined.

Mr. Hanno Roberts (Norway) briefly presented the outcomes of the four projects that had been recently implemented in Norway on the issue of intellectual capital. They were focused on value creation within the SME sector; measurement of intellectual capital for the sake of its management; transparency and disclosure in external reporting; and collaboration as a knowledge production process.

Concluding the debate under Panel I, Ms. Svarc emphasized that intellectual resources emerged as a main factor that explained the difference in economic growth among countries. Today, there is a shift from the traditional industrial and political economy to the knowledge-based economy with knowledge and human capital as the key driving forces. The new economy has a great impact not only on developed countries but also developing, transitional and, nowadays, accession countries that have a chance to catch up

with others using their brains: knowledge and human capital. However, it is recognized today that knowledge stock and human resources in those countries are largely overestimated because they are measured only by formal education and training, not by commercially viable knowledge and economically relevant human capital.

While developed countries are developing sophisticated methods of valuation of intellectual resources, financial cash flows, searching patent databases and pleading for better matrixes, better measurement methods and clear rules, the less developed countries lack the rules, methods and know-how in general. There is a big gap in the consulting, public and legal support and general awareness of IPR issues. There is also a gap in courses and training through the education system for the formation of human capital. Addressing the problem of discrimination in patenting on different levels is also called for: company level where small and start-up companies cope with powerful multinationals, and global level which favours those with more experience and capable human resources. On the other hand, developing countries are in a happy position because they can use the latest achievements and the best practices of others, but they have to form their capital for catching up.

Education, training and mentorship in management of human capital are therefore a prerequisite for establishing the proper IPR system. All countries cannot avoid today collective learning in managing intellectual resources, and it seems to be more learning by fighting than learning by doing. We are all also facing today certain concerns and resistance to patenting especially in high-tech and public research areas, because patenting can limit free flows of knowledge and, at the final stage, innovation too.

However, empirical analyses of innovation and statistical data show that innovation and fast growing industries increasingly depend on science, while direct commercialisation of R&D results is not still wide and common. The business sector expresses a growing interest in cooperation with the research sector, using its methods, techniques and, of course, knowledge. The academic community and public laboratories seek more protection for their results because

they have realized that some long-term research can bring large commercial pay-offs.

The first task is therefore to encourage science-industry cooperation or Public Private Partnerships (PPP) that has proved itself as a useful mechanism for sharing knowledge, know-how and intellectual assets. The example of Canada is a good illustration. PPP is a basis for building up national and regional innovation system in general, and the IPR system in particular. Science-industry cooperation in different modes like consortia, joint ventures, cooperation instead of competition, etc. could be self-regulatory mechanisms for both, focusing public research on profitable and industry-interested areas, as well as for an adequate implementation of the IPR regime.

Finally, she underlined that: first of all, there was no way out but to strengthen the capabilities in the management of intangible resources and intellectual assets - the prerequisite for structural adjustments to the new economy; secondly, it was necessary to make a good balance between proprietary and non-proprietary knowledge and; thirdly, PPP could serve as a common platform for fostering both economic growth and proper implementation of the IPR system.

Panel II: Commercialization of Intellectual Capital

The panel was chaired by Mr. Peter Rouse (Geodesia, United Kingdom). It discussed such issues as deriving value from intellectual assets, investing intellectual capital, and commercialisation through collaboration.

Ms. Karin Endemann (Canada) presented a general overview of the Canadian innovation system, in particular an interaction between the public sector and industry. It is characterised by a multiplicity of federally and privately funded organizations involved in knowledge development and a decentralized system with the funds and the decision making power resting with individual organizations and universities. As a result, PPP is the fabric from which Canada is woven. Effective management and ease of transfer of intellectual property to private industry and other client organizations are critical factors in the rapid exploitation of the R&D results. She

also described the recently launched Innovation Strategy, Industrial Research Assistance Programme, networks of advisers and federal partners in technology transfer. She further outlined the major barriers to technology transfer from the Government to industry and suggested some recommendations on making the management of IP assets effective.

Ms. Natalia Karpova (Russian Federation) made an extensive presentation on the major challenges in the commercialization of intellectual assets and indicated some ways to meet some of them. Commercialisation is a process that consists of several stages and each stage has its own problems. The following main problems were mentioned: financing R&D by the public and private sectors; search for partners; intellectual property rights and their distribution between various actors (investors, enterprises, governments), including the right of prior use; choice of different forms of IPR protection (patent and commercial secrets); assessment of competitiveness of the intellectual product; choice of forms for commercialization; reinforcement of national export control; lack of mechanisms to resolve international conflicts in the IP area; growth of the volume of parallel imports; compulsory licensing; piracy and counterfeiting on the IP market, etc.

Mr. Robert Pitkethly (United Kingdom), speaking on the commercialization of intellectual assets, put forward an issue of precise definition of intellectual assets and legal appropriability of intellectual asset. He further stressed that commercialisation of intellectual assets needed to include the management of intellectual property rights, as well as the people and processes involved. As far as incentives to invest are concerned, he presented some results of the recent Survey of UK Venture Capitalists: granted patents are the most attractive IPR for venture capitalists; IPR is the most significant factor for investors in the chemical, pharmaceutical and biotech industries that are considered to be low density patent areas; equally the lack of IPR is more serious in the above industries; and patent applications in these sectors can still help attract venture capital.

Mr. David Nicholas (United Kingdom) presented the practical experience of the Wessex Business

Link Company on a simple way of getting people to work together on commercialisation of intellectual assets – “virtual” company focusing on an inventor. This is a collaborative agreement by which a team of genuine experts in different areas is put around a sole inventor. This team has to produce a business proposition working together. They are issued with “virtual” shares that are worthless but which will become real shares when the money is found. This method has produced modestly impressive results – almost half the suitable projects resulted in the establishment of new business. Such an approach was supported by the Government, and it is now planned to extend it to the whole country. The question is, why not to the whole of Europe.

Concluding the debate under Panel II, Mr. Rouse stated that during the meeting a number of recurring themes had been encountered, all centred on human experience. Innovation and commerce, intellectual and social capital, collaboration and dialogue, incentive and reward – these are dynamic conditions that spring from and are sustained by the essential human qualities of trust and fairness.

The value of a business can no longer be measured solely by a reference to historical performance based on financial accounting standards. Value is now seen to rest in the innate ability of an organization as a whole to adapt to changing market conditions, to recognise opportunity, to learn and to share knowledge gained, to initiate and develop relationships with others.

The value of so-called “intellectual capital” is ultimately founded in an individual and collective willingness to participate in future wealth creation. Collaboration is recognised as central to success in the knowledge-based economy and yet its realisation in the context of business is in its infancy. Inclusiveness is now both commercially and socially desirable and achievable.

The success of the “virtual” company method developed and proven by Wessex Business Link in the United Kingdom demonstrates what can be achieved when people with complementary skills are brought together and given a fair and transparent framework for sharing in risk and reward. At the grass roots level of small business,

individual inventors and entrepreneurs, the issues are very basic indeed. In order to collaborate, people have to find one another. Once they have done so, they need to know how to structure their interrelationships. They need ready access to sources of finance and the know-how to communicate their business proposition. They need to be able to reach their intended markets.

The Internet is the new communications paradigm and one that can be harnessed, alongside traditional business networks and organizations, to provide a channel and context for collaboration. Just as developments in so-called “e-government” find citizens’ needs being met by reference to their particular situation (called life or business “episodes” in the United Kingdom system), so the Internet provides a mechanism for drawing people and resources to particular commercial opportunities.

Providing the right incentives and context for innovation and commercialisation is a common challenge for policy makers of all countries at every stage of development. Economic conditions may vary, but the human condition varies little when it comes to doing business. Collaboration and sharing of knowledge between countries and policy-makers promise benefits for all and the UNECE provides an ideal forum for such activities as regards the economies of its member States.

Panel III: Valuation of intellectual capital: existing practices and methods

The panel was chaired by Mr. Timothy Hoad (Department of Trade and Industry, United Kingdom). It discussed the following issues: valuation of patents, copyrights and trademarks; valuation of corporate intellectual portfolio, and intellectual property valuation standards.

Mr. Anatoly Kozyrev (Russian Federation) noted that the three background papers submitted under this panel did not contradict each other and reflected similar positions of the authors. He presented three examples which illustrated synergy, the other algebra and externalities. The first example concerned the production of high quality golf clubs made of titanium. In the beginning the producers decided to lower the production costs in order to receive more profit.

But then they were advised to buy the trademark of a famous western firm and their profits increased tremendously. The second example concerned the production of precious stones and showed that having several technologies to produce a certain product is worse than having one best technology in terms of profit making. The third example concerned the satellite launches and showed that distribution of shares between different parties involved in the project did not correspond to the intellectual input provided by these parties. The existence of many competitive projects that are aimed at the same goal decreases the value of the best project.

Mr. Poul-Eric Nielsen (Denmark) made a brief presentation of IPscore 2.0 which is a unique valuation tool developed to provide comprehensive valuation of patents and technological development projects. The assessment of patents and projects is done in five categories (legal status, technology, market conditions, finance and strategy). In order to obtain the best results from using this tool it is necessary to attract as many staff from different business units as possible to participate in these assessments. The focus on promoting dialogue and communication between the people involved is therefore the most important feature of this tool.

Mr. Robert Pitkethly (United Kingdom) presented his paper on valuation of patents. He stressed that for a long time valuation had been a controversial issue like a lottery when somebody did not know what ticket was going to win. So, there is a dilemma for any evaluator – on the one hand, the invention to be patentable should be unique, on the other hand in most valuation methods an evaluator should look at other patents to make some correlation about its value. He briefly reviewed some patent valuation methods using top-down and bottom-up approaches and dwelt specifically on option valuation methods. He described some of the advantages of option based valuation approaches that were undoubtedly a useful and potentially powerful framework in which to consider management of a company's patent portfolio and other IPR assets. This method was already being used in some specific situations and should be developed further despite possible difficulties.

Mr. Markus Reitzig (Denmark) presented his paper on valuing patents and patent portfolios from a corporate perspective meaning strategic investment perspective. He underlined that his paper was complementary to Mr. Pitkethly's survey on patent valuation methods mentioned above and it further developed the ideas contained therein. He outlined a definition of patent value using such determinants as patent duration, novelty and breadth, etc. He further spoke in detail on some general conclusions about the validity, availability and cost of computing such indicators of patent value as backward and forward citations, family size, etc. He also underlined that any IP valuation method to be credible should be applicable in practice and theoretically founded. Despite some shortcomings, a simplistic indicator evaluation method had already provided a value added to the company management especially when large portfolios of patents needed to be evaluated quickly.

Messrs. Raffaele Oriani and Maurizio Sobrero (Italy) presented their views on assessing a market valuation of a firm's technological knowledge using the real option perspective from the researchers' point of view. They underlined the importance of studying the impact of privatisation and liberalization programmes on innovation, the role of financial markets for evaluating innovation and described some challenges for public institutions, namely universities, in the exploitation of innovation, in particular in terms of research funding. They further addressed the issue of the effect of market and technological uncertainty on the market value of R&D investments and concluded that uncertainty had a positive impact on the stock market valuation of a firm's technological knowledge. Finally, they outlined the main areas for further action as follows: harmonization of the IPR reporting rules and obligations; public disclosure of innovation-related information by private firms; diffusion of new valuation methods among financial investors; and the adoption of the real option method to account for uncertainty.

Mr. Hanno Roberts (Norway) briefly outlined the guidelines for measurement and management of intellectual capital at the firm level that had been developed by the Norwegian Association of Financial Analysts. The focus of these guidelines

is on what capabilities firms possess and how they handle them.

Mr. Vladimir Socha (Czech Republic) in his presentation on intangible assets and intellectual property referred to the most commonly used international standards for valuation of intangibles. IP valuation in the emerging market economies has a short history and lacks consistency in applying valuation standards and valuation experience. There is a need to create awareness in Governments of the importance of proper intangible assets valuation and its impact on the development of the national economy, and to support training programmes for local appraisers in order to increase the reliability and quality of their work.

Concluding the debate under Panel III, Mr. Hoad pointed out that valuation of IP assets depends on other intangible factors. Sometimes usage of technology by itself is not the right way to extract value from an invention. Sometimes, linking to an already well-established brand with a good access to market, and the trust and confidence of consumers may bring much more financial profit. When starting an evaluation one should look at it in the broader context taking into account also some surrounding factors involved. The most important prerequisite in properly assessing the value of anything is to create conditions for dialogue, discussion between those involved both inside and outside the organization – quality of discussion is one of the most important factors in making proper capital allocation decisions.

The real option theory for valuation is very useful if one thinks about it as a dynamic, not a static, process and its effective use depends on the quality of expertise in assessing uncertainty and the quality of assumptions but not the accuracy of mathematical calculations.

Speaking about the actual access to finance itself, he pointed out that in order to get the money you have to be able to construct a value proposition and to present it to a potential investor in such a way as to persuade him to put his money into a deal that he considers to be of interest to him. So there should be a balance of interests between the user and supplier of the finance.

When you start thinking about providing help to the people in need, you are usually ready to tell them what to do. But in many cases, they desperately need concrete help, since they are too busy to follow your do-it-yourself kit of advice. So it is recommended that an option of providing direct concrete help should also be considered.

Panel IV: Sustaining innovation process

The panel was chaired by Mr. Anatoly Kozyrev (Academy of Sciences, Russian Federation). It focused on discussing such issues as: capacity building for innovation, different models of financing for innovation, protection of innovators' and authors' rights, and incentives for entering into innovative activities.

Mr. Guido Haesen (European Commission) spoke of some of the EC experiences in dealing with sustainable innovation processes in a holistic manner. He underlined that innovation is not just about technology but more about human resources, and IPR is not the only tool to promote innovation. Sharing knowledge, synergy and learning by interaction are the most important features to be promoted in order to sustain the innovation process. All actors should be involved in this process, including industry, in particular SMEs and trade unions.

Ms. Natalia Karpova (Russian Federation) stressed the importance of human capital as the main source of growth of any company, in particular innovators and authors. Human resources should be considered as social capital and Governments should make all efforts to secure the protection of this capital both in terms of ownership and moral rights. It involves the protection of rights to receive a concrete share of a company's profit from the realisation of concrete innovations based on a specific contribution to its creation, additional pension benefits and tax reductions.

Mr. Eric James Iversen (Norway) presented the results of the study sponsored by WIPO on patent applications in Norway during a 10-year period. The study clearly shows that the majority of SMEs use the patent system to derive value from the accumulated knowledge by filing patent applications at the Patent Office. At the same time, it is evident that SMEs withdraw their

patent applications more often than the larger entities. There are many factors behind this phenomenon, but the most obvious one is a problem for smaller companies to have access to funding at critical stages of the patent application and development process.

Mr. Leonid Shevelev (Russian Federation) underlined the importance of stimulating those involved in innovative knowledge creation. He outlined some measures which needed to be taken in this respect, including by his own country. He also underscored that without such measures; the problem of brain drain would become very serious and not only for the Russian Federation.

Mr. Shevelev then focused on the role of government structures in promoting the innovation process in the iron and steel industry. He noted some problems that impeded the innovation process. Many good R&D results in the iron and steel sphere are left unclaimed due to the absence of guarantees from cooperating consumer industries to buy the product or technology to be developed upon those results. There are also good innovations but their high quality is not matched by the quality of other components used for the production of the same goods and, as a result, the best innovations are also left unclaimed. He cited an example where innovations aimed at reducing steel consumption in various industries resulted in the emergence of excessive capacities of iron and steel plants that had a negative effect on national economic development (creative destruction). In this regard, he called for the relevant government structures to pay more attention to these problems.

Concluding the debate under Panel IV, Mr. Kozirev underlined that during the discussions a number of recommendations had been put forward, addressed to Governments, NGOs, independent professionals and the Task Force itself.

The recommendations to the Governments were in fact given in Ms. Endemann's presentation. All that was being done by the Government of Canada to create favourable conditions for innovation was not only correct, but also self-evident. The Government of the United States of America has been doing practically the same and the results are also good. The Governments of

other countries, including CIS countries, should use the positive experience of these countries to the maximum extent. Information on this experience is available and can be accessed through the Internet. However, this experience is being used rather little. It may be because it is the experience of countries from another continent. If the High Level Task Force recommended the Canadian and US experiences among the best practice examples, countries of the UNECE region could easily absorb them.

The recommendations to independent professionals and SMEs are formulated in the report of Mr. Guido Haesen (EC). The main recommendation is that in order to compete with large companies it is necessary to join forces and organise exchange of information and experience. Possible forms of cooperation were also suggested.

The Task Force should concentrate its efforts first of all on removing contradictions between standards that are used in valuation of intellectual and intangible assets. The whole complex of such standards is a complicated system that includes national, European and international valuation standards as well as standards of financial accounting. The European valuation standards elaborated by TEGOVA are used for valuating all assets that influence the cost of business, including assets that are not on the enterprise balance. That is why they are better fitted for the valuation of intellectual capital and business within the knowledge-based economy than international standards. For the same reason, the TEGOVA standards cannot be coordinated with international standards of financial accounting. On the contrary, international valuation standards are coordinated with international standards of financial accounting that are obligatory but are badly adapted to the new challenges. Such fundamental contradictions cannot be overcome at the level of professional societies that develop international and national valuation standards. In order to do this, it is necessary to go to the higher level that is not limited by narrow professional frames and to consider the situation as a whole from the investor's point of view. The High Level Task Force could do this since it consists of professionals of different profiles.

Closing session

Concluding the debate, Ms. Endemann underlined that the mandate of the UNECE was to help emerging and transition economies to address the challenges in improving their climate for innovation and harmonizing their economies with those of the EU. The meeting provided an excellent opportunity to share ideas and develop new networks with IP professionals from different countries and different sectors — public, private and academic. It was an open discussion of topics, both theoretical and practical. There was not enough time to explore all the topics in depth, but it was apparent that the participants had a lot to learn from each other, and that this meeting had whetted their appetite for more such discussions.

The major themes which had been running through the discussions, were: human resources management is critical to the success of public private partnerships; innovation systems require considered attention to ensure their effective development; that training of all of those involved in the innovation systems will be essential to achieve success; and there is a need to effectively manage innovation processes to ensure that they are efficient and appropriate.

As Chairperson of the meeting, she put forward the following recommendations for the future work of the Task Force:

- (a) The scope of the Task Force should be as broad as possible to enable continuing discussions on a wide range of issues, but each meeting of the Task Force should be focused to foster targeted discussions;
- (b) At the future meetings of the Task Force, the emerging and transition economies should

identify and communicate the areas in which they require assistance. These areas then should be compiled into themes for discussion at workshops that will allow in-depth practical discussion on areas of importance to these economies. The emerging and transition economies might perhaps wish to consider holding a prior meeting to focus their needs on the areas of greatest significance to them — this could, in fact, be done via the Internet;

- (c) The Task Force should broaden its scope to include the development and nurturing of SMEs as well as technology transfer, as these are integral elements of IP management and regional development;
- (d) All countries participating in the Task Force should share information on their innovation systems, training of human resources, etc. in order to identify challenges, explore best practices and generate opportunities to work together in the future.

She thanked the UNECE secretariat for the preparation and coordination of the meeting. She also thanked all the speakers for their excellent contributions that stimulated open dialogue and discussion, as well as all the participants for their thoughtful comments and questions.

Other business

During the meeting a questionnaire was distributed among participants asking them to suggest recommendations on the future work directions of the High Level Task Force. The recommendations received will be analysed and taken into account in the planning of the Task Force's future work.

LIST OF DOCUMENTS AND PRESENTATIONS

(Available at the following Web site address: <http://www.unece.org/operact/enterp/taskf.htm>)

Information Notice (OPA/CONF.1/2002/1)

Programme of the meeting

List of participants (OPA/CONF.1/2002/INF.1)

Panel I:

Intellectual Asset Management, by Ms. JiNan Glasgow, SPORE, LLC/Glasgow Law Firm, PLLC, United States of America

IC reflections, by Mr. Jan Taug, Norwegian Research Institute, Norway

Capital Inter-convertibility in Complex Organizations, by Mr. Jan Taug, Norwegian Research Institute, Norway and Mr. Hanno Roberts, Norwegian Association of Financial Analysts, Norway

Managing Complexity – the New Challenge (OPA/CONF.1/2002/7) and Power Point presentation, by Mr. Guido Haesen, Enterprise Directorate General, Innovation Directorate, European Commission, Luxembourg

Strategic Questions Regarding the Patenting System – Global Market Access Demands IPR Protection, by Mr. Eskil Ullberg, Service Management Group, Sweden

Valuation as a Tool to Sustain Innovation, by Mr. Aristidis Kaloudis, Research Council, Norway

Bringing What to the Table?, by Mr. Hanno Roberts, Norwegian Association of Financial Analysts, Norway

Panel II

Technology, Innovation and Commercialisation – Intellectual Assets-Opportunities for Selective Research, background paper by the UNECE secretariat (OPA/CONF.1/2002/5)

Canadian Perspective of IP Management: Interaction between the Public Sector and Industry, and Power Point presentation by Ms. Karin Keyes Endemann, National Research Council, Canada

Commercialisation of Intellectual Assets, by Mr. Robert Pitkethly, Oxford Intellectual Property Research Centre, United Kingdom

Panel III

Valuation of Intellectual Property and Assets (OPA/CONF.1/2002/3), by Mr. Anatoly N. Kozyrev, Russian Academy of Sciences, Russian Federation

Valuation Tool IPscore 2.0 (www.ipscore.com), by Mr. Poul-Eric Nielsen, Patent and Trademark Office, Denmark

The Valuation of Patents (OPA/CONF.1/2002/6) and Power Point presentation, by Mr. Robert Pitkethly, Oxford Intellectual Property Research Centre, United Kingdom

Valuing Patents and Patent Portfolios from a Corporate Perspective (OPA/CONF.1/2002/4),
by Mr. Markus Reitzig, Copenhagen Business School, Denmark

**Assessing the Market Valuation of Firms' Technological Knowledge using a Real Options
Perspective**, by Messrs. Raffaele Oriani and Maurizio Sobrero, University of Bologna, Italy

Intangible Assets and Intellectual Property, by Mr. Vladimir Socha, American Appraisal, Czech
Republic

Panel IV

From Collaborative Initiatives to Holistic Innovation (OPA/CONF.1/2002/7) and Power Point
presentation, by Mr. Guido Haesen, Enterprise Directorate General, Innovation Directorate,
European Commission, Luxembourg

Valuation as a Tool to Sustain Innovation, by Mr. Eric James Iversen, STEP-Group, Norway

RECOMMENDATIONS OF THE HIGH LEVEL TASK FORCE

(contained in the responses to the questionnaire)

1. The High Level Task Force touched on some very difficult but important issues. However, before it embarks on a specific IP assets covers quite a number of aspects starting from social questions connected programme it would be helpful to know how this fits in with other UNECE priorities, and with the work by other organizations such as WIPO and the EC.
2. The problem of valuation and capitalization of with the inventors to the strategy of the largest transnational corporations. It is therefore necessary to identify the main issues, prioritise them and determine their information base in order to use it in practice. Further work should be carried out taking into account the above analysis and the specificity of valuing trademarks as objects of industrial property
3. The Task Force should develop a clear focus. Looking at the countries present, it might be useful to put a focus on countries in transition. A starting point would be to inquire into those countries' needs and necessities in the field of intellectual assets and IPR. The peculiarities of the process of transition should be taken into consideration. IPR are a good starting point but should not be at the centre of the Task Force. The field is much broader and the focus should be on the final objective that is "innovation" and finally economic growth. An UNECE objective is aid. The learning of experience that western countries have could therefore be used in a very productive way to help countries in transition to establish IPR systems and to promote IC commercialisation.
4. The Task Force should include representatives of SMEs (organizations and accountants). Common standards of IP valuation for international dispute resolution are needed. The scope of IPR evaluation should cover such issues as labour market – social costs; natural environment – environmental costs; innovation – evaluation costs.
5. There are already many different actors/ players working on this topic – let the UNECE Task Force have a role in bringing these players together (OECD, EC/DG Enterprise, IASB, FEE, national employers associations and research councils) and act as a platform. This means also shrinking the agenda considerably. The main issue becomes the exchange of experiences and policy intents (not best practice because these practices are highly content dependent). Avoid the patent issue: there are other bodies that can deal with that better. Focus on the issue of the intellectual capital/assets at national level and supra-national exchange of experience. This is a good United Nations role; a knowledge-sharing round table on IA/IC policies at national level. A more daring focus would be to bring together the various national sector organizations (away from the prying eyes of their national governments) and let these share their experience and sector-level wishes. Sector organizations are (a) close to the field of practical change, (b) tend to act as gatekeepers on innovation cluster activities and nodes in networks of collaborating firms, and (c) are usually locked up in a national mindset on which the United Nations can act as an "unlocker" to make them see that they can learn from each other as well as avoid reinventing the wheel. Finally, I sense a strong isolation of the United Nations and the proposed Task Force from already established work done by the EC/DG Enterprise and the OECD. Why not hook up with these, and leverage the European impact of coordinated statements? The funny thing is that we have been talking about collaborative models of innovation and IA/IC of firms, but this message should also apply to the institutions, i.e. to the UNECE. How believable is a message on the dangers of smoking when the doctor delivering this message is smoking himself? There is an enormous gap in competence and understanding of the issues between the participants of western and

- eastern Europe. Unfortunately, this seriously hampers the stated goals.
6. To work out a concept (matrix) of valuation tasks on the basis of information provided at the meeting. To establish and consider the relationship between all the participants. To prepare a glossary of terms (including Russian). To conduct training at various levels. To set up extra-mural academy for studying valuation issues
 7. The UNECE should be more focused on capitalization of IA in transition economies.
 8. More practical application/best practices/commercially available tools should be included in the substantive programme.
 9. The Task Force has to decide what it wants to be. What is heard is IA are covered in balance sheets, specifically IPRs and patents. The agenda had a very different focus. I would like to see more focus on IC (assets) from the innovation point of view. How can we create more/better with the resources (non-financial) that we have? Not how can we protect what we have. I would not be interested in participating in a discussion looking only at improving our patent system. I recommend: Understanding knowledge production in countries; connecting initiatives across borders; how to create better entrepreneurial policies that support SMEs; invite companies and investors to give their stories.
 10. To work out a glossary of terms used (in three languages) for the better understanding of issues under discussion. To organize under UNECE a study tour abroad (for example Canada, Norway) to gain from their experience and its application in practice. To prepare a training material jointly with International Licensing Transfer Organization on: management of intellectual assets; valuation of IC/IA; and licensing of IP. To issue a collection of papers/presentations of the present meeting which is extremely important for economies in transition. At the next meeting to consider issues of international business culture based on knowledge.
 11. To organize a special meeting devoted to the issues connected with state policy on intellectual property created in the course of implementation of the state orders to consider:
(a) distribution of IPR between the state and R&D workers; (b) system of state control over utilization of these rights and control of assigning these rights to foreign entities; (c) state participation in the creation and support of innovative structures (state and private) dealing with promotion of innovations developed in the course of implementation of the state orders; (d) assigning state-owned IPR – state bodies involved in this process, assigning of IPR on the basis of inclusive, non-inclusive licenses, full assignment of IPR, state approaches to assigning rights at national level and abroad; (e) system of state incentives (administrative, economic etc.) for stimulation the market penetration of the innovations created in the course of implementation of the state orders and R&D. To invite the participation in this meeting of representatives of state bodies and innovation structures dealing with the working out of state policy in this area from EC countries, USA; CIS, Canada; South-east Asia and other countries, in particular transition economies. It is expedient to issue a collection of short speeches of the participants in the present meeting and distribute it among countries.
 12. The inventors would like us to consider the following. The state agencies can play a useful role in identifying and where appropriate helping sole inventors to protect and develop them. We need to know more about best practices in the area and a compendium would be useful. The Task Force needs to look at the long-term needs relating to education on IP issues. TRIZ is now taught in schools in Korea. It should be part of the school curricula. It is estimated that only 2% of patents filed reach commercial validity. We need to consider if 98% are of no-value – surely not. How do we improve the conversion rate to the benefit of mankind?
 13. The word “protection” has been used very, very often over these two days. It is certainly essential, but IPR is not the driving force in protecting knowledge. A European Union study (2001) stated that only 14% of the managers in the EU countries consider patents are “the” way to protect their knowledge. Most managers protect their knowledge by leading the field. Common standards seem to

be not very applicable. Much more important is to split the complex process of sharing knowledge into more “measurable” parts and indicate “indicators of success”. All actors must be part of this intellectual assets process. The industrial input should be stressed and speeches from the “users” should be considered in future.

14. To implement recommendations put forward by the panel chairs of the Round Table.
15. The Task Force should continue its work. It would be useful to invite other developed countries (such as Germany, Austria) and the patent managers of big innovative firms (such as IBM). Preliminary distribution of copies of the slides of all presentations.
16. Promotion of commercialisation of patents and other IP assets through an innovation network assembling universities, research institutions and technology receptors. Development of human mobility programmes aimed at getting an unformatization of methodologies and languages. Development of benchmarking actions to promote cooperation between countries with different experiences in the field of IPR and innovation practices. Development of regional cooperative actions (in EU) to promote synergies and correction of asymmetric aspects in the field of IPR and innovation
17. Improving the capacity of governments to stimulate the diffusion of information, knowledge and innovations. Improving national capacities to understand the role of IP and its capitalization in the economic growth. Specific problem in the transition economies. Encourage the education of the local professionals on IPRs and its commercialisation such as: patent agents, patent attorneys, and technology brokers. Improving the capabilities of local producers to understand the role and use the knowledge and innovation. Encourage the professional networks of IP and licensing experts. Encourage communication between universities and industry.
18. We should share information on the IP systems and innovation systems etc. in our cooperative countries in order to (a) understand the situation in other countries, (b) identify the challenges in other countries, (c) explore best practices around the world, (d) identify opportunities to work together. We need to broaden the field of discussion to include SME development and technology transfer as both of these are an integral part of IP management. It would be useful for the next meeting to have delegates indicate: (a) the major challenges they are facing, (b) in what areas they would like advice or assistance from others. Then, UNECE could bundle these interests and requests into well-defined workshops which would focus on the major areas. We could then offer expertise advice, share ideas and best practices. This would enable more in depth and practical discussions in areas that are pertinent and targeted to members’ needs.
19. It is important to formulate the priorities for the Task Force and to try to establish a common strategy.
20. Harmonization of rules for IC reporting. Public disclosure of IC information by traded companies. Extensive training on IPR management, organizational methods, tasks and problems. More generally, as a methodological approach, carefully examine academic research in all the fields that have dealt or are dealing with these topics. Be wary of what we call “best practices”, unless they can indeed be compared to other alternatives and demonstrate a comparatively higher efficiency.
21. Creation and work of venture enterprises using innovation and new technologies.
22. A guide on valuation methods would be useful but is the UNECE the right body?
23. To work out the matrix of aims and targets of valuation. The starting information material is presented in reports that can be systemized: information systems – investors – business. To find out and consider the activity of intermediaries – experts, venture capital - from the point of view of improving the validity of information. Glossary of terms in five languages. Removing contradictions between approaches to property valuation: state property, property of state enterprises, SMEs, stock companies.

PART TWO

MANAGEMENT OF INTELLECTUAL RESOURCES

MANAGING COMPLEXITY - THE NEW CHALLENGE

by Messrs. Francisco Fernandez Fernandez, Guido Haesen, Jean-Claude Venchiarutti, European Commission, DG Enterprise, Directorate Innovation & SMEs

Introduction

More than the capacity to produce or acquire elementary knowledge, the intangible assets of complex knowledge and information become predominant in a knowledge society. Meanwhile, most of this knowledge (especially the tacit knowledge) is locked up in enterprises or organizations, which fear that sharing these intellectual assets could result in the loss of important competitive cornerstones of their existence. The challenge is then finding ways to make groups of socio-economic actors become successful in the implementation of sustainable and accountable innovation by *competitively* sharing knowledge (co-optition) under an *open-source* approach.

During the 5th European Community R&D Framework programme (1999-2002), *Innovation Projects* were initiated with the aim of developing, validating and monitoring methodologies for the promotion of innovation. These projects elaborate on mechanisms that go beyond conventional technical competencies and adaptation, to develop cooperative relationships within and amongst project consortia.

The objective was to create a portfolio of transnational projects, initiated by groups of socio-economic actors, which develop reusable and replicable methods, tools or networks to support the continuous process of knowledge supply to enterprises, and which integrate economic, organizational and social aspects in this process.

By implementing these *Innovation Projects* and launching accompanying measures, industry-led international partnerships of enterprises, research institutes and universities exchange views with partnerships of support organizations such as local authorities, industrial associations or trade unions. Together they have invested considerable efforts to demonstrate technological solutions for identified needs and, more importantly, they have examined non-technical barriers to innovation such as poorly articulated demands of the target audience, cultural differences in international cooperation and sustainability in innovation.

The Challenge

To optimize intellectual assets in the global competitive environment, all actors in the socio-economic tissue have to be open to new ideas, new ways of working together, and have to learn how to benefit from them. A frame of mind therefore has to be available, enabling people to seize the opportunities created by change. For some, the ability to change is elusive, for others change will create strategic advantages. Both radical and incremental change, or innovation, as key factors in industrial competitiveness, sustainable economic and social development, cannot exist in a vacuum. Within the boundary conditions of innovation, all actors must anticipate their strategic role in order to bridge the diverging interests of business and institutional arenas. To quote Louis Pasteur "Chance favours the prepared mind".

Whereas the emergence of favourable regulatory systems, sustainable environmental conditions

and socially acceptable solutions are the challenges of our institutional organizations, business competitiveness, to a large extent, depends upon the development of adequate skills in new businesses, effective partnering and collaboration with existing structures, the ability to learn from others and trust.

The actors of these two “worlds” initiated a number of projects together with joint actions through accompanying measures to build a test bed for Innovation Systems where integrated models for understanding, managing and prioritising business decisions encounter the political framework for success. Representing a ‘bottom up’ approach, this action focused on a societal subset of market applications. Partners, actively involved in the process, express their need to share knowledge and enhance know-how. If the adaptation in a technology transfer process can be tackled by organizations in the enterprise environment, anticipation of the technological acceptability must include a wider range of innovation actors. Institutional organizations, social and economic partners have to communicate and cooperate in a business environment where competition is predominant. But they have a different conception of needs and solutions and consider acceptability of a technological solution in their specific context with a specific “language”. To overcome this “barrier of language”, facilitation mechanisms are a full part of each innovation. Since innovation is a process that also requires adaptation, anticipation and different aspects of organization, Innovation Systems have to tackle the innovation process in a holistic way.

The promotion of favourable business environments for continuous improvement of innovative enterprises and customised competence development is envisaged in these Systems, but also scope has to be given for identifying tendencies to stimulate, facilitate and encourage the latent know-how of the partnership through awareness campaigns and improved communication strategies.

These new combinations of knowledge are bound to explore the capacity of managing relationships within the consortium and outside the boundaries of a project. If most projects are initially built on the individual interest of participating

organizations, the successful innovation is based on sharing the knowledge available in the consortium and the added value of community cooperation. Setting the frame of such a relationship, positioning the consortium as an entity towards the actors outside the consortium seems to be an important key to success. Building structures of socioeconomic responsibilities can result in new regional or local claims for self-regulatory mechanisms or self-mobilisation and could demand a redefinition of societal needs and related policies.

A Model Case

For such a horizontal phenomenon caused by a broad spectrum of factors and actors, the very low market penetration of environmentally friendly biodegradable lubricants (biolubs) for inland and coastal water activities could be taken as a typical example. Technologically speaking, there is no problem in introducing biolubs as a replacement for water polluting lubricants. The real problem is the change itself, and the need to break a polluting order. Biolubs are applied on Austrian, Swiss and German lakes because these applications have been stimulated through governmental initiatives. The barriers to wider acceptance of the current generation of alternative lubricants are not technical. Although cost is a major issue, as bio-lubricants are about twice as expensive as their traditional equivalents, the potential market for environmentally friendly products is enormous. Not only do the manufacturers of traditional lubricants need to be convinced of the growing demand, but water companies, shippers, recreational groups, managers of harbours and chandlers, need to receive targeted, factual information and the means to compare. The process cannot be successful if “outsiders” such as original equipment manufacturers (OEMs) are not willing to extend their machine guarantee to the use of these biodegradable lubricants. The practical experiences gathered by a consortium of competing industrial partners, universities, research institutes, associations and regional authorities, point out that governmental initiatives are important as a first incentive for a successful introduction of biolubs. In order to realise a sustainable substitution, these initiatives should be enforced and demonstrated through

showcases, where prime movers and ‘new networks’ take the lead.

Sustainable economic development demands innovation that fits the social and environmental context. Regional or sectoral agencies and non-governmental organizations can act as catalysts for the necessary exchange of knowledge between policy-makers and potential suppliers of technological solutions, while consultants and interest groups may facilitate action. Individual consortia, which share similar kinds of problem, may form groups that bring together different organizations and technologies. Knowledge transfer becomes the vehicle for addressing convergent non-technical barriers, and for the development of methodologies and structures to overcome them.

This new approach stimulates a culture of “thinking otherwise” in both policy and process. It promotes the creation of high-level intra-(INTRA-preneurship) or intercompany innovation infrastructures, developing competencies that enable enterprises to grow in new dimensions

Innovative Corporate Mechanisms

From an economic point of view, each organization needs to produce products and services that correspond to client demand and with the most efficient use of available financial and human resources. Through sharing of tacit knowledge, the intelligence becomes collective, the intangible factors for successful innovations become apparent at the organizational, managerial and social level. Collective intelligence implies technical, economic and human valorization of the available intelligence in order to launch a positive dynamic to mobilize competencies. Today the environment of the enterprise has evolved due to new technologies but most of all due to new ways of communication. At the same time, the valorization of competencies needs to be reviewed because individual knowledge creates great added value to the enterprise through flexible networking and co-opetition. New ideas are economically sustainable, if such networks identify the possible obstacles and solutions in an early stage of development. Therefore, clusters show the way to work together, to go beyond the

boundaries of individual competencies and foster possible other solutions.

HIT (Highlight Innovation Trends) is one of three clusters of projects with similar themes that were launched during 2001, each trying out new concepts for innovation platforms. Enabling participants to work together and exchange good practice, platforms for cooperation can be established on a permanent basis — and will provide support for future innovation.

One of the projects in the ‘HIT’ cluster is led by a Swedish Trade Union Confederation, and involves SMEs, trade unions, universities, municipal authorities and regional development agencies. Their primary aim is to adapt and test new tools for the assessment, validation and development of competence at individual, company and regional levels. By computerizing employees' life and career histories and keeping confidential personal details under restricted access, aggregated data of available competencies have been made accessible via an internet-based open source programme to companies and institutions throughout their region.

The system allows individual competencies to be pooled as related resources. This not only enhances corporate cooperation between local companies (EXTRA-preneurship) but also enables local authorities to establish long term strategic plans such as long-life education. The practical benefits have already been illustrated by a Swedish SME, employing 15 people. Their production machinery broke down, and the plant had to shut down while they waited three weeks for a technician to come all the way from Munich to repair it. Someone in the neighbourhood of the Swedish SME recognised the technician - he happened to have worked with him in Germany some years previously. It turned out that this local worker had the same training, and could have fixed the damaged machinery. If the regional competence network had been up and running, the SME could have immediately identified the available competence and spared that company three weeks lost production.

The meeting of ‘HIT’ cluster’s project coordinators decided jointly to deal with the issues of innovation culture and data privacy, addressed by the ‘regional competence’ project,

as crucial elements in the management of intellectual assets. As a spin-off, the potential for mutually beneficial synergies was identified between the 'regional competence' project and a high-tech local-development project to help SMEs plan their strategy on emerging technology trends. Sharing development work on both softwares would be profitable, more efficient and less expensive.

Conclusion

To share intellectual assets, innovating organizations should move towards groups of actors which are able to provide a broad multicultural and multidisciplinary platform for knowledge transfer. Being more orientated towards the holistic approach of innovation, the consortia should aim at maximum involvement, maximum knowledge sharing and widening the focus on economic, organizational and social aspects of innovation.

Based on the analysis made by the actors in the above-mentioned projects, both business and institutional dynamics will require the integration of existing organizations and structures to disseminate the shared knowledge of solutions and exploit their diversity. Such knowledge transfer becomes the vehicle for investigating and addressing convergent non-technical barriers in order to develop methodologies and structures to overcome them. Involving elements from the educational sector strengthens this "learning" component.

It is therefore essential that we continue to develop our understanding of companies' interactions with their clients, competitors, suppliers, investors and institutional bodies. Companies are often the products of weak networks where knowledge transfer is kept to the minimum, rather than the reverse. There is real potential to improve the innovation capacity by stimulating the cross-border clusters, dealing with intangibles.

Partners from widely differing organizational and industrial profiles have been invited to take part in these cluster meetings. Each outlined the non-technical barriers to innovation that it faces, and

what it expected to gain from participation in the group. With accompanying measures, as facilitating mechanisms, platforms have been created to identify shared opinions derived from common experience.

These workshops form a stepping stone towards a new, integrated approach to innovation. The outcome encourages partners from a wide range of organizations to contribute to systems that allow specific problems to be solved using the collective experience of the whole group. Seeing transfers of knowledge and technology in their full environmental, social and economic context is important in a global economy. Such insights - awareness of environmentally acceptable technology, for example - can be a valuable component of marketing and image-building strategies not only for an enterprise but also for a region or a sector.

If people, in fragmented and encapsulated structures, are prepared to think outside their framework, and to share ideas and abilities, companies can convert themselves from mere 'technology providers' into 'problem solvers'. One of the challenges for today's businesses is to find solutions to emerging problems while remaining open to opportunities created by future technological development - and, more importantly, by evolving perceptions of what change is possible and permissible.

Trust between collaborating partners will remain essential if knowledge sharing is to be successful, however. The foundations of mutual confidence make ongoing cooperation between organizations and across borders much easier. Creating the conditions for flexible innovative collaboration will be a major step towards improved technology acceptance and a stronger perception of accountability.

Together with the results of previous experiments, the knowledge acquired so far enhances that pre-existing power or dominant positions are not crucial in the spread of benefits. This leads us to believe in the real potential to export the concept of managing complexity beyond the European dimension that the present legal framework imposes.

PART THREE

VALUATION OF INTELLECTUAL CAPITAL: EXISTING PRACTICES AND METHODS

EVALUATION OF INTELLECTUAL PROPERTY AND INTANGIBLE ASSETS

*by A.N. Kozyrev, Central Economics and Mathematics Institute,
Russian Academy of Sciences*

The purpose of the present paper is to provide a succinct but fairly full description of the current status of theory and practice in the valuation of intellectual (intangible) capital, including econometric research, the professional valuation of intellectual property and intangible assets, as well as new approaches to the valuation of knowledge-based business.

1. BASIC CONCEPTS, AIMS AND TYPES OF VALUATION

The concept of “intellectual capital” (IC) is used essentially by managers in the administration of personnel and intangible assets, in creating a favourable image of the company with the aim of attracting investment, and in valuing a knowledge-based business with a view to sale or purchase. It is broader than the more usual concepts of “intellectual property” (IP) and “intangible assets” (IA). At the same time, it is close in meaning to the concept of “intangible capital” used in work on econometrics at least since 1990. The most important concepts used in this paper also include “institution”, understood as the totality of legal norms, rules and standard forms of behaviour, and “transaction”, understood as the basic element of microeconomic analysis.

1.1. Valuation of a knowledge-based business and of intellectual capital

1.1.1. Econometric valuation of intangible (intellectual) capital

In the classic work of Griliches¹ on the use of patent statistics in economic measurements, intangible capital is the natural non-observable variable which raises the market value of a company and which depends on the quantity of the patents it holds, the volume of investment in research and development² and other similar factors. Associated with the presence of intangible capital in a company is the raising of its market value above the replacement value of tangible assets, taking into account the “going concern” factor. This last stipulation is important. In the professional valuation of a business, the “going concern” factor is customarily taken into account and linked with the asset of the same name. This asset is related to the number of intangible unidentified³ assets. Its value is determined as an addition to the replacement value of the tangible assets, calculated using a standard scale for each type of business. The work cited refers to the raising of the market value of a company above the replacement value

¹ Griliches Z. 1990.

² Not applicable to English version.

³ In addition to the “going concern” factor, unidentified assets include goodwill.

of its tangible assets by taking this addition into account, i.e. one of the intangible assets (the going concern) is not included as a component of intangible capital.

Of interest for research, as also for the business, is the dependence of the calculation value obtained on observable indicators, including investment in research and development and the number of patents obtained. Econometric research (Griliches Z. 1990) has shown that for large public corporations there is a practically linear relationship between investment in research and development, the number of patents obtained and the rise in the value of intangible capital. It should be noted that in this context the value of intangible capital was obtained as the difference between the market capitalization⁴ and the replacement value of the tangible assets taking into account the “going concern” factor, i.e. the market capitalization of a company (the product of the share price and the number of shares) was taken as its market value. Such a substitution is in practice unavoidable, since large public corporations are almost never sold as one unit. Accordingly, the standard definition of market value as the most probable price has no meaning in the case of such corporations. At the same time, it is easy to calculate the market capitalization of a public corporation on the basis of data from open sources, and this is very convenient for researchers. However, it is precisely for public corporations that the existence of such a relationship is of more theoretical than practical value.

The established dependences could be of practical value only in cases where, when a company is bought or sold, difficulties arise in defining its market value using standard methods (Pratt S. 1989) which are based on comparable sales analysis or cash flow discounting. In such cases the possibility of assessing the value of intangible capital on the basis of patent statistics could offer a fully acceptable way out of the situation. The company’s market value could be calculated as the sum of the replacement value of the tangible assets, the value of the going concern (defined using the table) and the value of the intangible

assets. However, in practice this possibility is not available.

It was possible to establish the existence of a linear relationship between the volume of investment in research and development and the number of patents obtained only for large companies which possess thousands or tens of thousands of patents. For small and medium-sized companies such a simple relationship does not exist. Indeed, currently such a dependence probably does not exist for large companies either, since there has been a substantial rise in the proportion of research and development whose results are not patented. For example, the results of investment in software development are not generally patented. For the same reason, in most cases there is currently no linear relationship between the number of patents obtained and the value of intangible capital, including for large public corporations.

The most impressive example in this area is the Microsoft company. According to the latest financial report, its market capitalization on 1 August 2001 was \$380 billion. The net worth of the company at that date was an eighth of that sum - \$47,289 million. All long-term assets, including software rights, totalled \$5,275 million. Meanwhile Microsoft is known to possess fewer patents than such companies as Xerox and IBM, though its market capitalization is higher.

Nevertheless, the search for appropriate observable indicators should not be regarded as hopeless. The work by Griliches referred to above was at the time almost the only success among many attempts to find an application of patent statistics as an economic indicator. The key to this success was the correct selection of observable groups of indicators and the successful definition of intangible capital. It is all the more surprising that his work is currently unknown to the community of IC specialists.

1.1.2. Valuation of intellectual capital at the time of the sale of a business

In theory the market value of a knowledge-based business should not be different from the market value of any other business generating the same financial results. In accordance with the principle

⁴ Griliches used the term “stock market value”, not “market capitalization”.

known as the “Modigliani-Miller theorem”,⁵ **the value of a company depends only on the size of the cash flow generated by its activities and does not depend on its asset structure.** However, experience offers grounds for doubting the correctness of this assertion.

The market value of a company (as distinct from its price) is a magnitude used in calculation. The actual price may be substantially higher or lower, depending on the specific circumstances in which the transaction is accomplished. Yet these differences must not completely invalidate the valuation of the business by professional valuers.

IA valuation is the most delicate part of valuation of a business. It is essentially in this context that the valuation of a business normally precedes the evaluation of IA. First, the market value of the business as a whole is determined using the income approach and/or comparable sales analysis. Then the market value of tangible assets is assessed. The valuation of IA as a whole is obtained as the difference between the market value of the company or business and the value of its tangible net assets (assets after deduction of liabilities). Only then are IA valued separately, if at all. This approach to the valuation of IA or IC is usually called the “return-on-assets” (ROA) method. Subsequently the value of IA and the value of the business are refined in the light of these refinements. The reverse sequence of actions (from assets, including IA, to the valuation of the company as a whole) is practically impossible, since as a rule there are simply not enough data to permit separate valuation of IA.⁶

In addition, the ROA valuation procedure tallies with the principles of bookkeeping and with the fact that usually by no means all IA at the time of the sale of the company are reflected in its balance sheet. As long as IA constituted a relatively small part of the value of a company, this did not cause any problems. The difference between the price of the sale-purchase of a company and the value of its net assets was reflected in the balance sheet as goodwill. This automatically took into account the value of all

IA not recorded on the balance sheet. However, as the knowledge-based economy expanded, this practice ceased to tally with the facts. According to data published in 1994 by the United Kingdom Accounting Standards Board, the sums paid for goodwill rose from 1% in 1976 to 44% in 1986. In 1996, i.e. a further 10 years later, it had become clear that there was no point in attributing such a difference to goodwill, since it constitutes up to 90% of the value of transactions. Accordingly, accounting practice changed. An increasing proportion of the sum received is attributed to identifiable assets, principally IP. Substantial changes were made in standards governing accounting of IA in 1999.

Modern approaches to IC, developed in the main by authors from northern Europe, Australia and the United States, go much further, requiring yet more radical changes in the principles governing the valuation and recording of IA and citing many examples of a striking lack of correspondence between the indicators of market value used for calculation purposes and the real price of transactions in the knowledge-based business sector. The clearest and most persuasive of these examples is the acquisition of the Lotus company by IBM for \$3.5 billion in the context of a balance-sheet value of \$226 million and falling profitability (Edvinsson L, Malone M.S. 1997), as well as the repeated revaluation of the “Very Useful Company” with evaluation errors involving a factor of three (Stewart T. 1997) on each occasion. Of greatest significance in these requirements is that in valuing a knowledge-based business, the human capital which is a component of IC must be taken into account. It is quite obvious that in the acquisition of Lotus the buyers took into account the outstanding qualities of the company’s management and programmers. However, it does not follow that they must be taken into account in the composition of the IA and reflected in the balance sheet. This runs counter not only to specific standards, but also to fundamental bookkeeping principles.

1.1.3. Valuation of intellectual capital when attracting investment

Similar problems arise in connection with the valuation of IC for purposes of attracting investment, when this may involve other direct or portfolio investment or the purchase of shares in

⁵ Nobel economics laureates in 1990.

⁶ This view is disputed by the proponents of the direct intellectual capital (DIC) method.

public corporations by small shareholders. In this way, if Microsoft shares were to be valued on the basis of dividends, they ought to stand at a fraction of the actual level (judging by actual stock exchange prices). Of course, in buying Microsoft shares, potential shareholders must take into account not only the flow of dividends, but also capital investment, i.e. future growth in the value of the company. Yet even this does not fully explain what is happening. All that may be safely affirmed is that the expectations of small investors are reflected in share prices. These expectations are highly optimistic, despite a series of court cases which have caused a substantial drop in the price.

If in the case of Microsoft the expectations of investors (small investors first and foremost) may be explained in terms of Microsoft's exceptional reputation and belief in its unsinkability, this explanation will not work for small companies. However, very high (even excessive) expectations may be observed practically throughout the sector connected with software production and Internet services. Indeed, something similar is occurring in all science-intensive business, especially in the United States. The question arises: how do all these companies attract investors? The answer, it seems, is that they manage to successfully display their IC and persuade investors of the urgent need to invest in them, despite the absence of profits at present and in the foreseeable future.

To display IC is not always to publish a report on IC. The main element here is the creation of an image of a company which is sure to succeed. As practice shows, this happens fairly often, whereas most such successful businessmen have no concept of the practice of publishing reports on IC. Nevertheless, the practice of IC accounting and publishing reports on IC exists. On the basis of this practice the structure of IC may be assessed.

1.2. The structure of intellectual capital

A fairly full overview of practice in the preparation and publication of reports on IC is to be found on the web site of the Danish Trade and Industry Development Council.⁷ It is clear from

this overview that a universal conception of the structure of IC has yet to be accepted. Nevertheless, a few general principles have already been developed. For example, human capital is identified as a separate item in all reports. The remaining part is also subdivided into a number of items, and a component known as market capital (relational capital, customer capital or brand capital) is usually identified. This part is related to the company's situation in the market, its links with customers and partners. The remaining part, which is rather heterogeneous in composition, is then called structural capital.

1.2.1. Human capital

The term "human capital" was introduced into scientific parlance at least as early as 1962 (Machlup F. 1962), in connection with the knowledge economy (Machlup F. 1984). In the history of the IC movement (Sullivan P.H. 2000, pp. 238-240), the account begins with the publication of a monograph in Japanese (Itami H. 1980). This testifies to the isolated nature of the IC movement within the community of management specialists.

Human capital is not only a trained and assembled workforce, but also good management, and contracts with outstanding specialists in the area covered by the business. For example, the managers of Lucent Technology, when trying to illustrate the company's merits, first draw attention to the number of Nobel laureates working in the Bell Laboratory. The Laboratory with its unique scientific potential constitutes the principal wealth of the company, although this potential cannot be regarded as an asset in the usual sense. Human capital also includes know-how, which is inseparable from a specific individual. The use of such know-how usually requires not only knowledge of how certain things are done, but also the ability to perform the corresponding functions. This skill is seen most clearly among jugglers. Something similar takes place in surgery, where it is not enough to know how an operation is carried out — one must know how to perform it at the required level - and also in many other areas of human activity. This also relates to what is known as tacit knowledge. In order to manage human capital successfully, management must monitor roughly the following set of parameters: education; vocational skill;

⁷ Not applicable to English version.

work-related knowledge; vocational leanings; psychometric characteristics; work-related skills.

Human capital is not reflected in the breakdown of the company's assets, since it does not belong to the company. There is a juridical technique which makes it possible to bind the most valuable specialists to a company with the help of rewards and commitments (golden handcuffs) and to reflect contracts with them in the composition of IA. However, this technique cannot be applied to all workers. A simpler way of binding staff to a company is to make workers shareholders or co-owners of the company. This form is also not universal. Besides, the problem arises of the property rights of dismissed workers etc.

Significant problems arise in connection with taking investment in human capital into account and measuring the results obtained. Under the rules of financial reporting, the cost of staff training must be classified as expenditure and not investment, though from the viewpoint of management accounting it would be better to include it as investment. In order to assess the results of such investment, many companies devise rather complex accounting systems basically comprising qualitative indicators. The shift from qualitative to quantitative indicators expressed in money terms is rather problematic. At best one may expect the presence of dependences being fulfilled for large companies with thousands of employees.

1.2.2. Structural capital, including intellectual property

Structural capital is the most heterogeneous part of IC. It covers IC rights, information resources, instructions and methods of work, the way the company is organized, etc. For all its heterogeneity it is structural capital which most corresponds to what is called IA. Structural capital encompasses systematized knowledge, including know-how, which is in principle inseparable from individuals (workers) and from the company. Thus know-how is a part of both human and structural capital. This is very important to an understanding of the phenomenon of the loss of IC value (impairment) in the event of disloyal (opportunistic) behaviour by employees or their dismissal.

1.2.3. Market (customer) capital

Market capital conventionally includes: trademarks and service marks; company names; business reputation; the presence of insiders in partner or client organizations; the existence of regular customers; repeat contracts with customers, etc. (Brooking A. 1996). Only part of this list can be called assets in the narrow sense of the word. For example, people who foster the interests of one organization while working in other organizations cannot be considered as assets, although from the viewpoint of ensuring the success of the business these are very important assets. The concept of "customer capital" was introduced in 1993 by Herbert St. Onge, when he was working with the Canadian International Bank of Commerce. It must be acknowledged that the identification of this component of the total mass of IP is an outstanding achievement.

The measurement of market capital in any quantitative indicators, including its valuation separately from other components of IC, is pointless in most cases, although the quantitative measurement of individual parts of market capital is possible. Many companies show the quantity of regular consumers of their products, for example, the number of registered users of a software product, subscribers to a newspaper, etc. It has long been common to value trademarks and service marks, and recently brands, in money terms. Specifically, the Interbrand company regularly publishes the results of calculations of the value of leading brands. However, there is no unanimity among specialists concerning the relationship between the concepts of "trademark", "brand" and "reputation". Indeed, many of them consider the term "brand" to be jargon. Correspondingly, there is no agreement on what Interbrand is actually valuing.

With some reservations one can assume that the valuation of brands using the Interbrand technique means the valuation of market capital as a whole. In its publications Interbrand indicates the market capitalization of companies whose brands are valued, and separates out the part of the value attributable to IA (i.e. to IC). In this part the method of calculation is very reminiscent of the valuation of intangible capital, which was mentioned above, or valuation of IA

using the “big cauldron” method (Desmond G.M., Kelley R.E. 1988). It is then used to obtain the value of the brand, with a different percentage for different companies, but how this is determined is unknown. In order to discuss the results of the calculations of Interbrand objectively, greater openness is necessary on the key issue - the formula by means of which the value of a brand is separated out from the value of IC as a whole.

1.3. Relationship between concepts

As already noted above, the concept of IC is broader than IP or IA, although here a number of substantial reservations must be made. All three concepts differ not only as to their sphere of application, but also as to the persons who use these concepts. In other words, they enter into the professional jargon of various professional groups. The concept of IC is used basically by managers, the concept of IP by legal specialists, and the concept of IA by professional valuers and bookkeepers. Of course, managers, bookkeepers and professional valuers also use the concept of IP, but they coarsen it and, as a rule, make it much narrower. Managers and valuers perceive IA in a significantly broader sense than bookkeepers, etc.

1.3.1. Intellectual capital and intellectual property

The concept of IC as formulated in the Convention establishing the World Intellectual Property Organization (WIPO) is very broad. It embraces all rights relating to literary, artistic and scientific works, the performances of performing artists, phonograms, and broadcasts, inventions in all fields of human endeavour, scientific discoveries, industrial designs, trademarks, service marks and commercial names and designations, protection against unfair competition, and all other rights resulting from intellectual activity in the industrial, scientific, literary or artistic fields. In this context IP includes not only property rights but also moral rights, including the right to integral performance, the right to a name, etc. These rights by no means necessarily give rise to revenue. Consequently they cannot be categorized as IC.

The subsequent stage in refinement relates to individual types of IC. The most significant of

them relate to the different concept of know-how in the concepts of IP and IC, and also the relationship between the concepts of “trademark” and “brand”.

From the business point of view it is customary to distinguish three types of know-how: that which is not dissociable from a specific individual (employee), that which is not dissociable from a company, and that which is dissociable in general from an individual and from a company. Juridical protection is extended only to the third type of know-how. Only such know-how may be considered to constitute the assets of a company in the full sense of the word. However, in its actions management must take into account the existence of the three types of know-how.

A brand is the commercial equivalent of a reputation. It is reputation, and not a trademark, which constitutes the obligatory element that is present in all variants of the use of the term “brand”. This term is widely used by specialists in advertising and management and by professional valuers. In this context “brand” may also be understood as the name of a well-known company, and the name of a popular good, and a well-known trademark. However, the presence of a trademark is not mandatory. Consequently, to link a brand with a trademark is not entirely correct. Moreover, unlike a trademark, the term “brand” has no legal definition. However, IC management implies the identification and valuation of brands themselves, and not trademarks.

1.3.2. Intellectual capital and intangible assets

The relationship between the concepts of IC and IA is equally complex, if IA is understood in the precise accounting sense. It is customary to define IA as any long-term assets which are not linked directly with any tangible object. For a long time IA were considered to include any assets for which no place had been found among other “normal” assets. Consequently the composition of IA is highly heterogeneous. The best-known of them - goodwill - is obtained as the difference between the price of buying a company and the value of its net assets - i.e. it is essentially a bookkeeping fiction which is not connected with any specific object apart from the company as a whole. The same applies to “going

concern”, although this asset arises in a completely different manner. These assets are called unidentifiable assets or goodwill-type assets. Essentially they constitute bookkeeping fictions. Moreover, IA include a multitude of identified assets, i.e. assets linked with a specific non-material object (an invention, a trademark, etc.), improvement of leased property, a contract, etc. The basis for accounting of any such asset on the balance sheet is usually the existence of outgoings on acquiring or creating it. In other words, the balance sheet reflects not assets as such, but bookkeeping operations linked to their acquisition.

IP rights constitute only a part of identified IA. This is the most significant part of such assets, but by no means all. In this context a significant part of the IP rights belonging to a company are not reflected on the balance sheet, as they did not arise in connection with any bookkeeping operations. Most often copyright is not reflected on the balance sheet because it arises by virtue of the creation of a work, while the corresponding costs can be recognized as expenditure.

Thus IA may include assets which are not at all related to IC (for example, improvement of leased property), while many components of IC do not form part of IA, if IA are understood in a bookkeeping sense. In principle components of IC which do not belong to the company, including human capital and part of market capital, cannot form part of IA. In addition, copyright and neighbouring rights that belong to a company are not usually taken into consideration in a company’s IA, although in theory they can be. Experience shows that many companies do not seek to reflect such assets in their balance sheets, although they do seek to display them to potential investors. As a result a huge gulf is created between the balance-sheet value of a company and its market capitalization. In the case of Microsoft this gulf reached two orders of magnitude (100 times) in 1999. Roughly the same may be observed with many Internet companies. From this point of view the desire to reflect IA more accurately in balance sheets (Wyat A. 2002) is questionable.

It should not be concluded from the above that bookkeeping needs to be changed radically. Here we are dealing with the fundamental

contradictions between the principles of bookkeeping and the properties of the knowledge economy (or the algebraic properties of knowledge itself). Bookkeeping is based on the principles of ordinary arithmetic. If there is an increase somewhere, then there must be an equivalent decrease somewhere else. Knowledge is subject to completely different algebraic rules (non-rivalrousness); it lacks the quality of scarcity (Stiglitz J.E. 1999). Three Nobel laureates have drawn attention to this property (L. Kantorovich, W. Leontief, K. Arrow). This has gone unnoticed in the literature on IC. These contradictions may be smoothed over, but they cannot be overcome. Indeed, there are grounds for considering that the scope for smoothing over the contradictions is almost exhausted, i.e. international financial accounting standards in this regard are close to perfection. In this context bookkeeping information remains one of the most important sources of information used in valuing a business and taking decisions on the investment of capital in one company or another. But it must be supplemented by other forms of accounting.

1.3.3. Intellectual capital accounts (experience in the countries of northern Europe)

Intellectual capital accounts prepared and published by a few companies constitute a supplement to traditional accounting reports. These accounts are viewed as an instrument for measuring IC, managing it and displaying the company’s attraction to investors. Such accounts are of two types. The more detailed account is prepared for internal requirements, first and foremost for management and to display to the staff of the company for the purpose of consolidating common efforts. The abbreviated report, which omits information that is not intended for public distribution, can be prepared for publication with the aim of attracting investment or for distribution to potential investors.

It is essentially the published accounts which are available for research. They are based on a variety of models for the presentation of information and bear a variety of names, such as “Holistic accounts” (Rambøll), “Quality accounts/ethical accounts” (Consultus), Navigator (Skandia), “Human resource accounts” (SCAA, ABB, Telia). Nevertheless, all these accounts

may be viewed as IC accounts - they must all show the investor how the company is moving from its present situation to the situation which it can and should occupy.

The “What there is” section generally contains visualized information on the company’s present resources. A significant part of this information is of a non-financial nature. Information on human resources, customers, technology is supplied in the form of graphs, figures, etc.

The “What is done” section contains essentially non-financial information concerning the efforts of management to develop the company’s IC. Special attention is paid to the development of human capital, customer care, access to technology.

Finally, a third section, “What happens”, displays movement towards the set target. In this section financial indicators are essentially used to show how the company’s IC is making it possible to generate profit through the appearance of new goods or services which customers need.

IC accounts cannot stand alone. They become important only when seen in a context. This context is the vision of the management system and the competition form. In this context IC accounts supply a new reality. They give a more adequate idea of the new reality than the traditional IA. IC accounts make it possible to throw light on the astounding gulf (involving a factor of 10 and even hundreds) between the balance-sheet value and the market capitalization of companies. In addition, a fairly profound meaning is contained in the differentiation of the components of IC, separating out human capital, market capital, etc. Under the IC approach, if the company loses one of these components, then its entire IC is impaired, and consequently so is the company itself. This involves a clear violation of the principle known in the theory of corporate finance (Brealey R.A., Myers S.C. 1991) as the law of conservation of value. According to this principle, **the value of an integral unit is equal to the sum of the values of its parts**. In the case of components of IC this principle may be used only in order to give each of the parts of IC a certain value. However, for the purposes of practical decision-making it is not only unproductive, but causes confusion. This is very

important. In order to draw attention to it Edvinsson even states that the value of IC components must not be added, but multiplied! Then it is obvious that if the value of one of them is zero, the value of the entire IC is zero. IC accounts just show relatively weak points and the efforts of management to regulate the situation, and offer hope that as a result the value of the whole business will rise sharply.

Practice shows that potential investors readily acquaint themselves with IC accounts. For them it is not so important that the IC valuation should be expressed in monetary terms, but the clear presentation of data is very significant.

It should be pointed out that the reaction of investors to IC accounts requires further research. In the period 1995-2000, decisions on investment in knowledge-based business were taken too often without proper preparation, and even in the absence of any business plan. This enables us to speak of excessive expectations on the part of investors. But it was this very period that saw the main wave of enthusiasm regarding IC accounts.

1.4. Valuation of patents and sales licences

Valuation of patents and sales licences is a relatively thoroughly studied problem. There is extensive literature on this subject, some of it of very high quality (Romary J.M. 1995). In this paper, attention will focus on individual aspects which are essential for an understanding of the remainder.

1.4.1. Parties in licensing agreements and negotiations

It is when a patent or licence is sold that IP is the object of the sale-purchase. Consequently, in this case one may speak of the market value of IP and methods for determining it.

Where the price of the licence is concerned, the parties to the licensing agreement are pursuing not mutually exclusive but opposing goals. The licensor (the seller of the licence) is interested in the highest possible price, the licensee (the buyer) the lowest. Here lies the difference of principle with corporate transactions, where the goals of the parties may coincide, and with the valuation of damage when exclusive rights have been

violated, when the parties are pursuing mutually exclusive goals.

Negotiations on the price of a licence or patent normally take place with the participation of professionals, each of the parties appointing a team for the negotiations. Even in principle the question of independent valuers does not arise here. This is very important to an understanding of the differences between IP valuation and valuation of other assets, if valuation is understood as a type of professional activity. It is when determination of the market value of IP for the purpose of sale is involved that the participation of independent professional valuers is not required. As a rule, the team for the negotiations is formed of legal specialists, patent lawyers, technical specialists and specialists in the market for the goods to be produced under licence.

1.4.2. Types and scales of payment

The following circumstance, which is important for understanding of the situation, is linked with the form of payments under the licensing agreement and what precisely should be understood by valuation. Professional valuers and specialists in trade in licences approach this issue from different viewpoints and reach different conclusions.

As a rule, payments under a licensing agreement consist of a lump-sum payment and percentage deductions from subsequent sales (royalties). There are many combinations of these forms, with royalties linked to various monetary or physical indicators, payment schedules, changes in the royalty rate over time, etc. The ability to correctly select the combination and propose well-founded royalty rates and the size of the lump-sum payment to a large degree determines the success of the negotiations. Here specialists in trade in licences understand valuation to be specifically the well-founded selection of royalty rates and the lump-sum payment. The shift from royalties to a lump-sum payment, i.e. the discounting of expected cash flows, is for them just a mental exercise. The contract indicates the royalty rates and the lump-sum payment.

It is precisely the discounting of all expected cash flows that professional valuers understand as IP

valuation. The key element in this process is the selection of the discount rate. However, if the settlement is carried out through the payment of royalties, the problem of selection of the discount rate simply does not exist. This is the significance of the use of royalties.

When selling a patent it is really essential to obtain its valuation in the form of a figure, i.e. not only to express the purchaser's expected profits in monetary form, but also to discount them in relation to the present moment, i.e. the moment of the conclusion of the deal. But the sale of a patent is a much rarer event than the sale of a licence.

1.4.3. Calculation of the royalty rate

The methods used in calculating the royalty rate for a specific transaction are fairly varied, but they are all highly approximate. The simplest of them are based on the use of tables of average royalty rates by industry and group of products. Such tables are compiled on the basis of data on a large number of deals. These data are sometimes published, but more often they are supplied against payment as a form of information service.

It should be pointed out that the use of tabular data creates a dangerous illusion of simplicity. The less one is prepared, the more readily one will use such tables, and the less critically one will look at them. Meanwhile, the selection of a baseline to which the tabular rate is applied is of critical importance - whether the price of the whole item produced under licence, or only part of it. More delicate questions relate to refinement of the royalty rate for specific cases. Such data cannot be obtained from the tables.

A more complex approach called the income approach involves direct calculation of the profits which the licensor who has bought the licence will receive, and the losses which will be borne by a licensor who has been deprived of a monopoly on the use of a patented design solution. If the licensor's losses are smaller than the licensee's profits, then there are objective grounds for the conclusion of a contract. The problem lies in the extraordinary difficulty of calculating the profit obtained by one party and the loss suffered by the other. This problem is barely discussed in the literature on valuation of IP and IA, since it goes far beyond the boundaries

of this topic. Nevertheless, it can be the subject for thoroughgoing scientific study.

1.5. Valuation of damage when exclusive rights are violated

Valuation of damage when exclusive rights are violated is the area of valuation activity where the parties (the victim and the violator) have practically no chances of reaching agreement. More precisely, if the parties find a common language, the case passes smoothly into the sphere of trade in licences, i.e. the violator becomes a licensee. Cases of interest are those where it is impossible to reach agreement on the extent of the damage, including criminal cases of piracy.

1.5.1. Valuation of harm caused by pirates in the field of copyright and neighbouring rights (audio, video, software)

In court cases concerning violations of copyright and neighbouring rights which have caused significant harm, the victim usually institutes proceedings specifying the amount of the harm, while the violator or his counsel demonstrate that the question of harm on such a scale does not arise.

The method for calculating the harm alleged by the victims is normally based on the proposition that one pirated copy of a music album, film or computer program displaces one legal copy of the same work from the market. Of course, this approach does not suit the violator. However, the problem lies not only in his or her refusal to acknowledge the result obtained, but in the fact that this refusal may be well founded. If the court and the victim do not succeed in demonstrating to public opinion that the decision taken by the court on the basis of the proceedings brought by the victim is fair, it cannot be regarded as fully satisfactory. If such situations arise systematically, society may face much more serious problems than piracy. Consequently the principles on which the calculation of harm is built must be well founded in the framework of independent research, and society must acquire ownership of the results produced.

1.5.2. Valuation of harm caused when a right to industrial property is violated

In principle the same problem arises when valuing harm resulting from the violation of the rights of the holder of a patent or trademark. However, here it is less acute. In the case of a violation of a right to a trademark, the consumer usually turns out to be not only on the side of the victim, but one of the victims, having been sold a forgery instead of the branded product. In the event of real or alleged violation of a patent, the product manufactured in violation of the patent does not normally differ in price from the lawfully manufactured product, or does not differ very substantially. Consequently, the assumption that one unit of the product manufactured lawfully is displaced by one unit of the counterfeit product is quite realistic. For the same reason no conflict arises between the victim (the patent holder) and the consumer.

1.5.3. Standardization of approaches to valuation of harm

In this way, the problem of valuing harm caused, or, to be more precise, the problem of justifying the basic principles applied in valuing harm caused, is most acute for violations in the sphere of copyright. In a few countries, for example France, the victim is not obliged to demonstrate each time that the valuation method it proposes is scientifically well founded. There are standard approaches which enable the court to reach a decision fairly expeditiously. In countries where such standard principles are not applied, for example in Russia, each piracy case becomes a major problem for the investigators and the court. This points to the urgent need to develop such principles which can be recommended for inclusion in the legislation of all countries.

2. VALUATION METHODS

To date the best-known, most complete and most precise of the published works on IP and IA valuation is that of Smith G.V. and Parr R.L. (2000). In addition, there are excellent aids to the valuation of trademarks (Smith G.V. 1997) and the valuation of early-stage technologies (Razgaitis R.S. 1999). A brief synopsis of the current literature on this topic is provided below.

2.1. The income approach (method)

The income method in its broad sense is considered to be the principal method of establishing the value of IP rights. The comparative sales method (the market method) and the cost approach may be used to supplement the income method.

The income method has many variants, which are often referred to as separate methods. Principal variants of the income method:

- Method D1 - Royalty relief;
- Method D2 - Discounting/capitalization of advantages in income;
- Method D3 - Discounting/capitalization of cost savings.

Each of the three main variants can be applied in two modified forms, designated by the letters (a) and (b). Modification (a) is based on the capitalization of the average profit or cash flow, while modification (b) is based on the discounting of expected cash flows or expected profits. In each case either profit (before or after tax) or cash flow may be selected as the indicator of profitability. The modifications of all three basic variants of the income method which have the best underpinnings in theory, and at the same time are the most complex, are based on cash flow discounting, while the simplest modifications are based on direct capitalization of profit. Selection of a method is defined as a compromise between a desire for a high-quality result and a judicious desire for simplicity in the valuation procedure.

2.1.1. Cash flow discounting

In order to establish the market value of IP rights, method D1 is most convenient, used either in modification (a) with capitalization of profit (before tax) or in modification (b) with discounting of expected profit (also before tax). This method is most suited for valuing patents and licences for sale.

The basis used for the calculation is the assumed licence payments in the form of royalties - regular payments calculated as a percentage of the earnings received as a result of the realization of production under licence. The size of the royalties is determined in the light of previous experience,

using a special table of standard industrial royalties or some other relatively simple method.

The calculation method may be broken down into the following seven stages:

1. A forecast is prepared of the volume of sales from which the payment of royalties is expected. The forecast is prepared in physical and value terms and broken down by year or shorter interval.

2. The royalty rate is determined. If experience in the sale of licences of a similar type is lacking, the data are taken from the tables of standard royalty rates. The tables are also published.⁸

3. The economic life of the patent or licence is determined. It may be significantly shorter than the legal life, if the invention becomes obsolete before the validity of the patent expires.

4. Expected payments in the form of royalties are calculated. As a rule, royalties are deducted from the volume of sales in value terms for the periods into which the entire economic life of the patent or licence is broken down. But royalties calculated on the basis of the number of units of manufactured production are also used.

5. From the expected payments in the form of royalties are deducted all costs associated with maintaining the patent in force etc. (if they are of the same order of magnitude as the expected royalties).

6. The discounted flows of the profit obtained from payments in the form of royalties are calculated. The discounting coefficients are determined on the basis of the sphere of application of the invention and of industrial and individual risks.

7. The discounted value of the profit flows for the entire period is determined. For this discounting operation the profit flows are added together.

The flow of profit in the current year is recorded with coefficient 1. It is considered to consist of those resources which are received or must be

⁸ But they do not provide very good guidance, as different authors cite contradictory data.

paid immediately.⁹ For each subsequent year the discounting coefficient is obtained by multiplying the coefficient for the preceding year by the value

$$1/(1+r)=100/(100+\text{discount rate})$$

where **r** is the discount rate expressed in decimals (it is equal to the discount rate in per cent divided by 100). The sum obtained is known as the present value (designated **PV**¹⁰). It may be expressed by the formula:

$$PV=CF_0+1/(1+r)\times CF_1+[1/(1+r)]^2\times CF_2+\dots+[1/(1+r)]^T\times CF_T$$

where **PV** is the discounted value of the final sequence of the flows **CF**₀, **CF**₁, **CF**₂, ... **CF**_T, the index **0** corresponds to the current year, the index **T** to the last year of use of the asset being valued.

The advantages of method D1(b) are: (1) the ability to use it both in valuing IA (IP rights) which are already being used and in valuing IP rights whose use is only proposed; (2) relative simplicity of use; (3) the ability to use standard industrial royalty rates. Method D1(a), as a rule, produces a valuation which is too crude, but it is simpler to use.

The other variants of the income method are recommended for use when the method of relief from royalties is not applicable. For example, when establishing the value in use of rights to know-how, it is better to use the method of capitalization of cost savings.

When establishing the investment value of an investment in the form of IP rights in the registered capital of a new corporate body or portfolio of IP rights being used in an investment project, the method of discounting of advantages in income should be used.

2.1.2. Direct capitalization

Capitalization is a simpler procedure than discounting. However, its use is recommended when the asset being valued is already in use and

generating a steady income, or there is a need for a rapid fairly crude valuation of an asset which is expected to generate a steady income. Profit is a more convenient indicator for capitalization than cash flow.

Capitalization of profit makes it possible to determine fairly precisely the value of an asset in cases where the profit from the use of the asset being valued is steady. For example, this profit is constituted of licence payments (royalties) for the use of a patented invention which are constant in volume, while the asset being valued is made up of exclusive rights arising from the patent for the invention. The profit before tax is used in the calculation, since the purpose of the valuation is to determine the market value of the asset. It is assumed that the asset is taken into account off the balance sheet or on the balance sheet with the valuation according to minimum value. On the sale of the asset for price **V**, i.e. the calculated market value, this entire sum will constitute the profit before tax.

In order to determine the market value for the existing use of an asset which is generating a steady income, the annual profit (before tax) obtained from the use of the asset being valued during the current year must be multiplied by a special multiplier **M**:

$$V=M\times(\text{profit from the use of the asset during the year}).$$

If the profit is constant, the multiplier is calculated according to the formula:

$$M=1/r_0=100/(\text{rate of capitalization}),$$

where **r**₀ is the rate of capitalization for steadily operating enterprises in the industry concerned, expressed as a decimal (it is equal to the rate of capitalization in per cent divided by 100). If the profit is steadily growing at rate **g**,

$$M=1/(r_0-g).$$

To obtain the valuation of an asset generating a steady or steadily growing profit, use is made of multipliers and rates of capitalization calculated using special methods on the basis of stock market data. Usually a capitalization rate is selected of between 10% and 50%, corresponding to the values of the multiplier **M=10** and **M=2** respectively. For IA the rate of capitalization is

⁹ When valuing investment projects the zero term of the discounted cash flow is generally negative. In examples of calculation of the value of IP rights given in textbooks, it is usually equal to zero.

¹⁰ Not applicable to English version.

usually higher than for other assets and for the business as a whole. For the valuation of the business, multipliers from **6** to **8** are most often used, while in valuing IA the multiplier may be equal to **3-5**.

2.1.3. Merits and shortcomings of the income approach

The advantage of the income approach is that it is universal, theoretically well-founded and makes it possible to determine precisely that value of the asset (market value, investment value, etc.) which must be determined in accordance with the type of transaction being conducted and the purposes of the valuation. The principal shortcoming of the income approach is the complexity involved in obtaining the necessary initial information for the calculations.

2.2. The market approach

The market approach to the valuation of assets (including IA) is first and foremost a comparison-of-sales method. In addition, under the market approach it is customary to consider other methods based on the use of generalized information on market sales.

2.2.1. Comparison-of-sales method

The comparison-of-sales method in the traditional sense is practically not applicable in the sphere under consideration, except for the valuation of rights to programs for computers being transferred on the basis of shrink-wrap licences. The comparison-of-sales method may also be used to supplement the income method. However, all transactions in which the need arises to value IP are rather unique. It usually proves impossible to find suitable similar deals.

2.2.2. Use of industrial indices (standard royalty rates)

One of the variants in the application of the market approach may be considered to be the use of standard industrial royalty rates. The literature describes cases where such industrial standards were established spontaneously and functioned for a number of years (Romary J.M. 1994).

2.2.3. Merits and shortcomings of the market approach

The market approach has two undoubted merits. Firstly, it is based on the use of market information, and secondly, it is simple to use. However, the second merit can very easily prove to be a shortcoming. The simplicity of use of the market approach is merely apparent. The standard royalty rates for specific types of product, industrial indices and other indicators produce very approximate guidance for the conduct of actual transactions. The entire difficulty lies in taking into account the individual features of a specific transaction, and it is here that the market approach provides no guidance.

2.3. The cost approach

The cost approach is viewed in the literature on IP valuation as one of three possible approaches. It is considered suitable only as a supplement to the income method (if the valuation is not for bookkeeping purposes). This approach, like the previous two, can be applied in a number of variants.

2.3.1. Cost of asset reproduction (reinstatement)

The most consistent application of the cost approach is the direct calculation of the costs of activities whose outcome was a patentable invention, computer program, etc. It should be emphasized that what is involved is not accounting of costs with reflection in the accounts, but simply calculation. As a variant it is possible to calculate which costs would be required for the conduct of the same activities taking into account the prices and rates of payment on the date of the valuation. Such calculations are often carried out when immovable property is being valued. However, with regard to IA they generally have no meaning. The result of creative activity is too much a result of creativity, and not a cost.

2.3.2. Replacement costs

Roughly the same can be said of another variant in the application of the cost approach, at the root of which lies the idea of replacement of one asset by another which is of equal value from the viewpoint of the function performed. To a certain

extent this substitution is also possible with respect to IA. For example, the replacement of one entertaining film by another which is similar in content normally has no major significance, if the public merely wishes to pass the time happily, the advertiser to place the advertisement and the cinema owner to sell tickets. However, the possibility of making such a substitution is the exception rather than the rule.

2.3.4. Shortcomings in the cost approach

The cost method has one very significant shortcoming. The valuation obtained using this method bears no relation to the real value of the asset being valued (of course, this applies only to IA).

3. INSTITUTIONS

The transformation of knowledge, reputations and other intangible values into capital which generates revenue and is measurable in monetary terms is effected by institutions which constitute the soft infrastructure of the market. These institutions include: (1) copyright and patent rights, other institutions of intellectual property, legislation on competition; (2) bookkeeping records of IA; (3) the customs of business, including standards and methods of valuing business and IA, which are used by professional valuers, technological brokers, etc.

3.1. Professional valuation

IP valuation is an extensive sphere of activity which only partially intersects with the sphere of professional valuation, i.e. the professional assessment of the value of property, including IA. It includes the valuation of patents and licences for sale and valuation of harm caused when exclusive rights are violated. Both have only an indirect relationship with the activities of professional valuers. The same may be said regarding the valuation of early-stage technologies. In this section the subject of the analysis is not so much the valuation of IP as that part of the institution of professional valuation which relates to the valuation of IA.

3.1.1. Organizations of professional valuers and valuation standards

In most countries valuation activities are regulated by professional organizations of valuers, which draw up and adopt their own standards of valuation. These standards are mandatory for the members of the organizations.

There also exist associations of self-regulating organizations of valuers, created at the national, European and worldwide level for the purpose of harmonizing standards governing valuation activities. The most prestigious of these organizations is the International Valuation Standards Committee (IVSC). This Committee (IVSC) draws up and regularly publishes additions to and changes in international valuation standards, on the basis of which the self-regulating organizations in the various countries draw up their own standards.

The sphere of activity of professional valuers is traditionally divided into subject areas, among which there is no such field as IP valuation. An exception to this rule is Russia, where IP valuation is a separate field and the corresponding option exists during training of valuers in institutions of higher education. In the countries of Europe it is customary to make a separate subject area of the valuation of IA, the valuation of IA always being closely linked to the valuation of businesses. In the United States in general the valuation of businesses and IA are regulated by a single standard. There is sufficient justification for this, principally unity of approach and methodology for the valuation of businesses and IA. The same unity of methodology in valuing a business (enterprise) and IA is characteristic for other countries, including Russia.

Another but no less important justification for combining the valuation of a business and valuation of IA is linked to the growth in the role of IA in the value of companies. The author of *The Age of Reason*, Charles Handy, wrote that the IC of a corporation is usually three to four times greater than the value of all its tangible assets. However, as early as 1966 Leif Edvinsson considered these data to be obsolete. Then he valued the range of this indicator for the majority of companies at between 5:1 and 16:1. Between 1996 and 2001 the importance of IC grew

steadily. In other words, the value of present-day companies is basically determined by the IC they possess. At the same time, the value of IC must be spoken of with care, since IC to a large extent consists of elements which in principle are not sold, and consequently have no value in the generally accepted sense. In any event, one may not speak of the market value of IC. In this context one may speak of the value of a business and the value of a company as a whole, since companies are sold from time to time; each transaction in this sphere gives rich food for analysis and reflection.

3.1.2. Valuation of intangible assets according to international standards

The international valuation standards adopted in 2001 consist of standards proper and guidance for their application. Specifically, guidance note No. 4 is devoted to the valuation of IA. It should be noted that up to 2001 IVSC was unable to adopt a single official document on IA valuation — there were only drafts. This fact points first and foremost to the complexity of standardizing the valuation of IA and the responsible approach adopted by IVSC to this problem.

At the same time, guidance note No. 4 adopted in 2001 should not be regarded as a success. It is too strongly imbued with the standard thinking intrinsic to professional valuers and the insufficient understanding most of them display of the specifics of the subject. The concepts and methods used in the valuation of IA are generally the same as in the valuation of other types of assets. The specifics of valuation of IA are expressed too weakly, and the classification of IA is very approximate. Thus, all elements of market capital are combined in the concept of goodwill, elements of human capital (or more precisely, its traces) are included in the concept of going concern as “intangible elements of the value of an operating business”. The explanation of IP is absolutely unintelligible. Of course, one can assume that in the national standards of each of the countries this concept will be correctly interpreted in the light of the specific features of the national legislation in this field. But another explanation is much more likely - a not very sure grip of the subject.

The same explanation can be advanced for the absolutely serious approach to the cost method - in particular, the detailed consideration of the “cost of recreating” the intangible asset and the “cost of replacing all of its constituent parts”. In relation to the greater part of IA these arguments look odd.

Overall a fairly large portion of the guidance is wasted in a surprisingly limp manner on recommendations, some of which are correct but absolutely not specific to IA, while others are not applicable to IA. In this connection the adoption and publication of this guidance must be regarded as a failure. Indeed, there are grounds for supposing that IVSC as currently constituted is absolutely not ready for methodological work in the field of IA valuation.

3.1.3. Valuation of intangible assets using European standards

In November 2000 the European Group of Valuers' Associations (TEGoVA) published new valuation standards,¹¹ which are supplemented by methodological guidance. One of the guidance notes — No. 8 — is devoted to valuation of IA, including IA which are not included in a company's balance sheet. Moreover, the notes reflect a new paradigm of the evaluation of a business, based on the theory of IC. The content of the IA which are subject to valuation offers fairly convincing evidence of this. According to the note, all IA subject to valuation, including IA which are not taken into account in the balance sheet, are divided into three categories:

1. Goodwill of a business (undistributed intangible assets);
2. Personal goodwill; and
3. Identifiable intangible business assets.

Business goodwill is inseparable from the company and may be taken into account on the balance sheet after its sale in accordance with the principle set out in 2.4.2. Personal goodwill, as a rule, is linked to the person of the head of the company, is not transferred when it is sold and consequently is not taken into account when its value is calculated, except in cases where, after a

¹¹ European Valuation Standards/The European Group of Valuers' Associations. The Estate Gazette, 2000-460 p.

change of company ownership, the same person continues to head it.

Identifiable business IA can be individually valued if a finite economic life can be attached to them, and if over that period they produce benefits for the business. Usually this category includes IP rights and other similar assets, including know-how, information resources,¹² lists of customers, etc.

In addition, under guidance note No. 8 IA include:

- Trained and assembled workforce;
- Favourable labour agreements;
- Affiliation agreements;
- Favourable leases;
- Favourable supply contracts;
- Favourable insurance contracts;
- Employment contracts;
- Covenants not to compete;
- Customer relationship;
- Permits;
- Technical libraries and newspaper libraries;
- Other intangible assets.

Of the entire list of potential IA, the following definitely form part of human capital: personal goodwill, trained and assembled workforce; favourable labour agreements; employment contracts. These assets, as a rule, are non-transferable. Exceptions are employment contracts which provide for the possibility of transferring the recruited person to another company. In addition, know-how forms part of both human capital and structural capital.

Human capital, as stated above, cannot be the property of the company. In this lies a difference of principle from the property rights arising in particular from the obligations of the employees of a company. At the same time, human capital plays almost the leading role in shaping the value of the company. Property rights, as a rule, can be included as part of IA, and contracts with the most valuable employees may be transformed

into company property by the use of a fairly refined legal technique.

Customer capital is represented in guidance note No. 8 by such IA as covenants not to compete and customer relationship. Some IP rights should probably also be included here, including rights to: trademarks, service marks, names of places of origin of goods, brand packaging, brand names. In this context IP rights may be taken into account on the balance sheet, but covenants not to compete and customer relationship, as a rule, may not. In other words, here there is yet another gulf between the composition of IA in the valuation and the bookkeeping sense.

The specific features of guidance note No. 8 set out above provide grounds for affirming that this guidance has been drawn up on the basis of a theory of IC, or at least taking it into account. However, note No. 8 does not contain any recommendations concerning the effecting of measurements or calculations that differ from the standard valuation procedures. Nevertheless, the note concedes that, where necessary and justified, methods of calculation may be used which are different from those specified in the standard. This rule is customary for this type of normative document.

3.2. Taking into account intangible assets

Bookkeeping is justifiably considered as one of the basic elements of “soft” infrastructure. Correspondingly, IA accounting is one of the most important institutions which ensure the transformation of intangible values into capital.

3.2.1. Taking into account intangible assets in accordance with the international standard

International accounting standard (IAS) No.38, on intangible assets, which lays down a procedure for taking into account and reflecting IA in accounts, was drawn up by the International Accounting Standards Committee (IASC) Board as one of its last - in July 1998. Apart from the standard referred to, taking into account IA is touched on by the provisions of IAS 22, on business combinations (revised 1998), IAS 36, on impairment of assets (approved by the IASC Board in April 1998), and several others. IAS 38 directly relates only to identifiable IA, and only

¹² In the Russian Federation information resources are considered as material objects under the Information, Computerization and Protection of Information Act and consequently must be recorded not as intangible assets but as fixed capital.

those which are not specifically dealt with in other standards. Thus, IAS 38 does not apply to financial assets, rights to exploration or development and extraction of minerals, petroleum, natural gas and similar non-renewable resources. In the first place IAS 38 relates to IP. Taking into account assets of the goodwill type is regulated by IAS 22, which is perfectly logical, since bookkeeping goodwill arises as a result of precisely such operations.

IAS 38 provides that the company should recognize IA, at cost, if and only if:

- (b) It is expected that future economic benefits relating to the assets will flow to the company; and
- (c) The cost of the asset can be measured reliably.

The two requirements are applied both to IA acquired externally and to those generated internally (para. 19). In this context IAS 38 contains additional criteria concerning recognition. Not recognized as assets are internally generated goodwill, original trade names (marks), publishing titles, slogans, customer lists and items similar in substance.

From here it is fairly obvious that practically all costs connected with the generation of IA in the broad sense are taken into account as expenditure (for example, costs of research, training, advertising, etc.), while IA generated in this process are not taken into account on the balance sheet.

In the Russian-language version IAS 38 uses not the terms NIR [scientific research] and OKR [development work], which are usual for legal normative instruments, but the concepts of “research” and “development”, defining them as follows.

Research is original and planned investigation undertaken with the prospect of gaining new scientific or technical knowledge and understanding.

Development is the application of research findings or other knowledge to a plan or design for the production of new or substantially improved materials, devices, products, processes,

systems or services prior to the commencement of commercial production or use.

Under paragraphs 42 and 43, expenditure on research is always recognized as an expense when it is incurred. That is predetermined by the impossibility of demonstrating at this stage a link between the IA being generated and probable future economic benefits.

To all appearances, this rule embodies the most fundamental difference between the IAS approach to taking into account research costs and the Russian approach to the same issue. The Russian bookkeeping rules do not forbid capitalizing costs for NIR and OKR. This is mistakenly perceived by many specialists as conferring an additional degree of freedom. In fact this IAS norm relieves the bookkeeper of the need to take the same correct decision each time. This is like the railing which separates the pedestrian from the carriageway or the spectator on a high observation platform from its dangerous edge.

The phase of creation of IA which is known as development is much more open to analysis and relatively safe in the sense that a negative result may appear. At the same time, it is more capital-intensive. Consequently, under paragraph 45 of IAS 38, development costs should be recognized as IA if the company can demonstrate all of the following:

- (a) The technical feasibility of completing the intangible asset so that it will be available for use or sale;
- (b) Its intention to complete the intangible asset and use or sell it;
- (c) Its ability to use or sell the intangible asset;
- (d) How the intangible asset will generate probable future economic benefits. Among other things, the enterprise should demonstrate the existence of a market for the output of the intangible asset or the intangible asset itself or, if it is to be used internally, the usefulness of the intangible asset;
- (e) The availability of adequate technical, financial and other resources to complete the

development and to use or sell the intangible asset; and

- (f) Its ability to measure the expenditure attributable to the intangible asset during its development reliably.

“If an enterprise cannot distinguish the research phase from the development phase of an internal project to create an intangible asset, the enterprise treats the expenditure on that project as if it were incurred in the research phase only” (IAS 38, para. 41).

In other words, if the risk of obtaining a negative result is lower, but costs rise, and may consequently lead a loss of proportionality in relating them to expenditure for one year, then the restriction is relaxed. Translated into imagery this means that the railing ceases to be continuous, and that specially placed passages and signposts appear in it.

Externally there is little connection between all this and the algebraic properties of information, knowledge, inventions, etc. However, the lack of a connection is misleading. The connection may be perceived if one examines the motivation of investment in research and development. On the one hand, this investment may not lead to any positive result. On the other, if the result is positive, it may be used in many ways. It is precisely because of the possibility of making a number of uses of individual positive results obtained against a background of almost chronic failures that investment in research and development pays off at the statistical level. To one degree or another this conclusion may be applied to other IA for which, under IAS 38, the costs of creation are recorded as an expense.

Outlays on advertising, the development of successful slogans and generally the creation of a company image, it seems, have little in common with outlays on research, but there is something common here. This common feature appears most clearly in the dependence of the effect on the size of the company, its turnover. If a successfully chosen slogan or trademark leads to 1% growth in the volume of sales or the price of the good, the effect is proportional to the size of the company, while costs for the development of a slogan or trademark do not depend on company size.

Roughly the same thing happens with the results of research. If research makes it possible to raise the productivity of labour or the quality of the goods produced, the effect in monetary terms will be directly proportional to the size of the company, or, more exactly, to the scale of use of the result obtained.

The aspect of taking goodwill into account is considered in IAS 22, on business combinations, in the section on the purchase of one company by another. The definition of the concept formulated in paragraph 42 of IAS 22 leaves no doubt that it is a question of a purely bookkeeping concept of goodwill: “Goodwill arising on acquisition represents a payment made by the acquirer in anticipation of future economic benefits. The future economic benefits may result from synergy between the identifiable assets acquired or from assets which, individually, do not qualify for recognition in the financial statements but for which the acquirer is prepared to make a payment in the acquisition.”

“Any excess of the cost of the acquisition over the acquirer’s interest in the fair value of the identifiable assets and liabilities acquired as at the date of the exchange transaction should be described as goodwill and recognized as an asset” (para. 41). Otherwise “goodwill”, i.e. “the full difference between the acquirer’s interest in the fair values of the identifiable assets acquired less the cost of acquisition”, is recognized as negative.

“Goodwill” should be amortized on a systematic basis over its useful life. The amortization period should reflect the best estimate of the period during which future economic benefits are expected to flow to the enterprise. There is a rebuttable presumption that the useful life of “goodwill” will not exceed 20 years from initial recognition (para. 43). If the presumption of the 20-year term is disputed, the “goodwill” is checked annually in relation to the decline in value, and here the reasons for the disputing of this assumption are revealed, including losses from impairment of the assets (IAS 36).

In this way, international standards include a technique which makes it possible to minimize the negative consequences of the fundamental contradiction referred to above.

3.2.2. *The contradiction between valuation and accounting standards*

Bookkeeping or financial accounting is a more conservative institution than that of professional valuation. Consequently contradictions arise between them.

Most obvious are the contradictions between the TEGoVA 2000 standard and IAS 1999. In particular this relates to the valuation and taking into account of IA. The list of assets liable to valuation and that of assets taken into account on the balance sheet does not coincide. In addition, guidance note No. 8 to the TEGoVA 2000 standards recognizes this fact to be unavoidable. The assets liable to valuation include “personal goodwill” and “trained and assembled workforce”, but as separate assets. The standard for accounting of IA assumes that goodwill is one asset, while “trained and assembled workforce” is taken into account in the asset “going concern”. This difference is easily explained. The fact is that financial accounting is not intended for use in decision-making. Management accounting, including accounts on IA, exists for these purposes. Valuation is needed for management purposes rather than for financial reporting. The problem is that valuation is also needed for financial reporting.

3.2.3. *Hierarchy of valuation standards*

Currently a definite hierarchy of standards of professional activity has been established. Insofar as the holders of money - the most liquid form of capital - are investors, it is they who set the tone in the standards “market”. The standards of financial reporting are adapted to their requirements, and standards of valuation must adapt to the standards of financial reporting. This is the path taken by the development of international valuation standards adopted by IASC. As a result a situation is being created where the TEGoVA 2002 standards, which are more advanced and more closely correspond to the goals of valuation activity, cannot compete with international valuation standards. At the same time, guidance note No. 4 on intangible assets to the international valuation standard corresponds neither to the IA concept nor to practical requirements, as was mentioned above. Moreover, the contradiction which has arisen

cannot be resolved within the professional community of valuers, for at least two reasons, each of which is sufficient. Firstly, there are too few specialists among professional valuers who properly understand the problem, including the legal subtleties and the presence of contradictions of a fundamental nature. They will always constitute a minority, including in the ruling bodies of self-regulating organizations. Secondly, valuation standards must be adapted to standards of financial reporting. This is no longer an internal problem of the community, but an external requirement.

3.3. **The intellectual property regime and the protection of rights**

The IP regime comprises legislation on IP, and also institutions which ensure the effective application of this legislation, including the effective protection of exclusive rights in the event of their violation.

3.3.1. *Dependence of market capitalization on the effective protection of IP*

There is a fairly obvious link between the effective protection of IP, on the one hand, and the market capitalization or market value of knowledge-based companies on the other. In the first place this relates to companies whose business is linked to the production of software, printed output, and also audio, video and cinema production. For such companies the key question is effective protection from unauthorized copying of their output, and the issue is becoming more acute as copying technology and telecommunications develop.

A valuation of the harm caused to such companies by the violators of copyright and neighbouring rights (pirates) is needed not only in order to understand the scale of the problem but also to underpin court cases. In a few countries, for example Russia, the problem of valuation of harm is very acute. In order to obtain a guilty verdict and punish pirates, the prosecution must demonstrate the existence of harm on a large scale. However, to link the actions of a specific pirate with the losses borne by the victim is very difficult.

If the problem is approached from a strictly scientific point of view, the economic aspects of the problem of violation of exclusive rights and efforts to combat it may most conveniently be studied through the example of the sound recording industry. There are several reasons for this. Firstly, the International Federation of the Phonographic Industry (IFPI) continuously collects and analyses information on the state of the industry, and publishes data on the scale of violations of copyright in various countries. Secondly, the main output of the sound recording industry - music albums - is fairly homogeneous. Essentially they are issued on compact discs. The albums manufactured in breach of copyright virtually do not differ in quality from lawfully manufactured albums with similar content. Lastly, the violations themselves are relatively homogeneous. Essentially they involve the manufacture and sale of music albums on compact discs without the permission of the holders of exclusive copyright to the works being performed and neighbouring rights to the recording (phonogram). This last very significant condition (homogeneity of violations) ceased to be fulfilled only with the growth of the Internet and the appearance of the MP3 standard. Violations of copyright in the field of video were more heterogeneous from the very beginning. For example, in this field enormous harm is caused by what are known as “ragged copies” of films (copies recorded from the screen during showings in competitions). However, quantifying this damage is extremely difficult. Matters are even more complex in the field of software. Here the areas of application and the categories of consumer are very diverse. Consequently simple approaches are inadequate to say the least.

3.3.2. Transaction costs in the protection of exclusive rights

Analysis of the practice of the courts shows that the balance between the transaction costs of law enforcement bodies during judicial prosecution of pirates, on the one hand, and those borne by pirates in organizing illegal business on the other, is changing in favour of the pirates. This is an objective obstacle to effective efforts to combat piracy. According to estimates by specialists from the Russian Ministry of the Interior’s Investigating Committee who have practical experience in this field, the investigation of a

single case of piracy demands time and resources comparable with the cost of investigating three murders. Such a high price throws doubt not only on the possibility of fully eradicating the phenomenon of piracy, but also on the desirability of expending efforts and resources on attempts to combat it. It is essential to reduce the costs of investigation and the judicial system.

The most radical solutions aimed at reducing transaction costs in the prosecution of pirates are contained in a law adopted in 1998 in the United States and known as the Digital Millennium Copyright Act. In particular, this law extends legal protection not only to copyright performances but also to the technical facilities used in their protection, prohibits the use of certain types of technology, etc. However contentious such solutions are, in diverging far from the idea of copyright, it seems that there is no real alternative to them.

An additional means of lowering transaction costs in prosecuting pirates is the simplification of procedures when counterfeit products are seized and declared to be counterfeit and the harm caused is assessed. Comparison of practice in France and in Russia clearly shows that difficulties in combating piracy in Russia are largely the result of the fact that the process is overcomplicated. Measures to combat piracy can be made speedier and more reliable by standardizing the rules for determining harm suffered by the holders of the rights as a result of violations.

3.3.3. Lowering transaction costs by standardizing procedures

The difficulty in standardizing the rules for assessing the harm caused by pirates does not arise from the absence of calculation methods. Sound recording companies and organizations fighting piracy propose an adequate number of very simple and understandable calculation methods. They are all based on the assumption that each unit of a pirated product (for example, a pirated copy of a music album) displaces from the market a unit of a similar product which has been manufactured lawfully. Bearing in mind that the pirated product costs a fraction of the price of the original and is practically no different in quality, this assumption is equivalent to assuming that

demand for the product in question is inelastic. In this way, the question of the uniform application of standard principles applicable by companies in assessing the harm they have suffered is directly linked to the question of the elasticity of demand for their products.

Analysis of data published by IFPI (The recording industry in numbers 1996-1999), using simple mathematical models (Kozyrev A. 2000), shows that the assumption of the inelasticity of demand for music albums does not contradict the factual data, if this demand is considered on a large scale (at the country level). In other words, the average consumer of audio products who has access to a CD player consumes roughly four new music albums per year. In countries with a high level of audio piracy, two or three of these four albums are pirated; in countries with a low level of piracy, all four albums are legal. Consequently, one may expect that in the complete absence of cheap pirated products, consumer spending on acquiring new albums will increase, and demand for them will not fall.

Of course, a similar approach cannot be applied to software. First of all, software is too heterogeneous in its purpose, complexity, price, etc. One can identify types of program for which demand cannot be elastic. For example, operating systems fall in this category. An operating system must be installed in every computer, however much it may cost. The situation is less clear in relation to various utilities. And it is quite obvious that there are a huge number of programs which people buy in pirated form only because these programs form part of a package recorded on one CD. Bearing in mind the importance of efforts to combat piracy in the field of software, on the one hand, and society's very ambiguous attitude to it on the other, this problem must be studied with great care, including at the international level. If not, there is a risk of a negative reaction in society to the actions of anti-piracy organizations and the courts. Very telling in this regard is the example of the arrest of the Russian programmer Dmitry Sklyarov in the United States. Many Russian software

manufacturers, considering the Digital Millennium Copyright Act a very progressive law, did not wish to speak of this publicly, fearing a negative reaction from society (not the authorities!). In order to avert situations where the decisions of courts in some countries are perceived with hostility by the public in other countries, it is desirable to draw up international principles for assessment of harm. In this case the negative reaction, if there is one, cannot be so severe.

CONCLUSIONS

1. There is a definite gulf between theoretical investigations in the field of the knowledge economy, some of which are very profound, and the investigations of practitioners from the IC movement. The latter throw doubt on the applicability of certain fundamental theoretical propositions, including the Modigliani-Miller theorem and the law of conservation of value. At the same time, the practitioners do not notice the fundamental algebraic properties of knowledge and information which are well known in the theory, and do not see the unavoidable contradictions in market institutions.
2. In order to overcome the contradictions between valuation standards constructed on the basis of the IC approach and the standards of financial reporting, there is a need for joint efforts by the scientific community, practitioners of IC valuation and associations of investors with an interest in more adequate reflection of the value of companies in reports. This problem cannot be solved by a handful of valuers alone.
3. There is a need to develop simple principles for the valuation of harm caused by piracy in the sphere of sound recording, software production, the cinema, etc., which will be recognized by authoritative international organizations. The existence of such principles will make it possible to raise the effectiveness of efforts to combat piracy in the former socialist countries.

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THE VALUATION OF PATENTS: A REVIEW OF PATENT VALUATION METHODS WITH CONSIDERATION OF OPTION BASED METHODS AND THE POTENTIAL FOR FURTHER RESEARCH

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1. INTRODUCTION

Intellectual Property Rights (IPRs) are viewed as being of increasing importance in many fields of business. However, one potential hindrance to their being considered of significant value, is the lack of appreciation of practical methods of valuing them particularly early in their life under conditions of uncertainty about their future prospects. Lack of practical valuation methods under such conditions can lead to sub-optimal decision-making in the course of managing an IP portfolio.

This paper considers the case of patents whose value constantly needs assessing during the application process, on renewal and for licensing, purchase and sale negotiations. Current practice in patent valuations are reviewed as is relevant literature gathered from a number of fields including accounting methods, discounted cashflow (DCF), related decision tree analysis (DTA) methods, and econometric methods based on renewal and stock market data.

Particular attention is also paid to option pricing theory based valuation methods for real assets and frameworks are proposed for its application to the task of valuing patents. In particular it is suggested that one implication of studies of renewal data based models by Pakes et al showing that option values decline with patent life is that conservative filing decisions are usually justified.

Option based valuation approaches are thus proposed as a useful and potentially powerful framework in which to consider management of a company's patent portfolio and other IPR assets, and the difficulties of a rigorous application of the method form a fruitful field for future research.

Intellectual Property Rights (IPRs) can be highly valuable rights playing a key role in many fields

of business. However their value has been highlighted largely through their involvement in relatively rare but highly conspicuous transactions and litigation concerning successful businesses. In recent years concerns about IPR valuation have centred on Brand Valuation especially in the wake of takeover bids such as the Nestle bid for Rowntree in 1988 (Barwise, Higson et al. 1989). More recently this concern has broadened to include all Intangible Assets (Arthur Andersen & Co. 1992). However such concerns are primarily based on an accounting perspective. In contrast, attempts to assess IPR value and particularly the value of patents in order to make management decisions about them earlier in their life when their future value is highly uncertain has received far less attention.

The problem in the case of patents is particularly complex due to the, sometimes lengthy and certainly complex, application process involving initial uncertainties about both the technical and commercial success in competitive markets of the underlying technology as well as uncertainties about the legal challenges which can occur both during the application and subsequent enforcement.

Advances in the past two decades in the understanding of the valuation of options over financial assets under uncertainty and more recent applications of that work to what are known as "real options" over non-financial assets under uncertainty have shown that many accepted valuation methods neglect the value of managerial flexibility.

Most IPRs are subject to at least decisions regarding licensing and sale. However, Patents are subject to a particularly wide range of decisions both whilst they are being applied for and following grant. Patents thus involve both a high degree of flexibility in how they are managed and also a high degree of uncertainty as to their eventual value. They are thus likely to be

a case where a consideration of real option valuation methods may give valuable insights into and potentially more accurate and useful estimates of their value than are available at present.

This paper aims to review firstly, exactly what patent valuation involves. Secondly, existing general methods of patent valuation and some of their advantages and shortcomings. Thirdly, the basic ideas behind option valuation methods and the literature relating to real options relevant to option based patent valuation methods. Finally, the issues involved in the application of real option pricing principles to individual patents and patent applications will be reviewed. The conclusion comprises immediate practical implications and a description of the potential for further research in this area.

This paper is aimed at a mixed audience of economists, patent lawyers, business strategists and mathematicians interested in this field. It is therefore concerned more with concepts than mathematics. It draws on an earlier working paper (Pitkethly 1993) where I first explored the ideas but incorporates numerous revisions and additional sources, particularly in the area of understanding and applying real option valuation methods. It is hoped that whilst many readers may already be familiar with some aspects they will equally find other aspects that are unfamiliar. If this creates a bridge between different fields and viewpoints and provokes new ways of thinking about patent valuation in practice and new multi-disciplinary research into the area it will have achieved its objective.

One explanation which has been offered for the imagined ills of the patent system is in the words of *The Economist* in 1851 that "Patents are like lotteries in which there are a few prizes and a great many blanks" (*Economist* 1851). That might suggest that an accurate assessment of the expected value of individual patents might lead to the demise of the patent system. However, whilst similar valuations have not diminished the appeal of lottery tickets and even though the law of large prizes seems to apply as much to patents as lottery tickets; one can also say that patenting is not a zero sum game. My patent fees and costs do not fund your patented pharmaceutical's monopoly profits. A better appreciation of the

value of patents and applications should therefore enable the system to work more, not less efficiently.

2. INVENTIONS, PATENTS AND PATENT APPLICATIONS

Before beginning any discussion of patent valuation it is necessary to make quite clear exactly what it is meant by the term. A patent can be described as an exclusive right of limited duration over a new, non-obvious invention capable of industrial application where the right - to sue others for infringement, is granted in return for publication of the invention. There is a distinction between the underlying invention which might be called the underlying intellectual asset and the intellectual property right (IPR) which confers exclusive rights over that invention as defined in the claims of the relevant patent.

This distinction is particularly important when it comes to thinking clearly about what is being valued. "Patent" is sometimes used in a very loose sense meaning either the underlying invention alone, the patent alone or both the invention and the patent and often the entire project of commercializing the invention. Furthermore in some cases "the invention" refers to a particular embodiment, in others anything within the scope of the patents claims.

However, the direct financial value of a patent or patent application per se, must be the value of the potential extra profits obtainable from fully exploiting the invention defined by the patent's claims in the patent's presence compared with those obtainable without patent protection. Projects comprising the commercialization of inventions and patents protecting such inventions are thus two different, even if closely linked, entities. In practice, dividing out the value of the patent per se from the value of a project comprising commercialization of an invention may be difficult and may not even be necessary in some cases. Nonetheless it is worth distinguishing between them.

That the two are distinct is shown by what happens if one of the two proves worthless whilst the other remains still valuable. Firstly, the ability to commercialize an invention may be valuable even if any associated IPRs are unavailable, have lapsed, been found invalid or of limited use. IPRs

are not essential to profitability and in any event many other non-IPR based means of appropriation may exist (e.g. Speed to Market, Control of complementary assets etc.). Secondly, if improvements to an invention or applications of it devised by others are commercially successful, the revenue from sale or licensing of the IPRs remains valuable even if the inventor no longer has any interest in direct commercialization. A patent is not just a right to protect one embodiment but includes the possibility of protecting anything falling within the scope of the claims.

A further complication in the case of patents is that patents do not come into existence as instantaneously as some other IPRs such as copyright. Some form of patent application process has to be gone through in which application is made to a patent office and following examination and perhaps negotiation as to the scope of the claims allowable, the patent is granted. Patent application procedures differ by country. Japan for example, allows examination to be deferred for up to seven years whilst most other countries do not. However, most patent systems have four major decision types confronting applicants and patentees; (i) Whether to file a patent application; (ii) Whether to continue with it (at a number of decision points in the application procedure); (iii) Whether to keep any patent granted in force or let it lapse; (iv) How to exploit the patent once granted (direct commercialization, licensing, a combination or outright sale).

At each stage of the application procedure the potential future benefits of continuing the application have to be balanced against the cost of proceeding to the next stage. However the costs can vary considerably in practice and the distribution of them over the various stages of the application procedure can vary too. Needless to say professional fees can considerably add to the initial official costs of applications and these also need to be taken into account. On the revenue side there are, as explained above, extra profits and/or licensing revenues due to holding a patent which are or might be available over the life of the patent.

A patent then is not a simple investment project involving initial costs and near certain future returns but a complex series of possibilities each involving costs and actual benefits or potential future benefits which unfolds over time under conditions often of considerable uncertainty as to the final outcome and with a considerable variety of courses of action open to patent applicants and patentees.

3. VALUING PATENTS AND PATENT APPLICATIONS

3.1. Why value patents?

For those managing both patent applications and granted patents it is essential to know the value of each sufficiently accurately if one is to make well-founded decisions about their management. Since only a small proportion of patents turn out to be of extraordinary value in the long run and given that IP department budgets are limited any methods which lead to a better understanding of the value of given patent applications or patents should be welcomed.

On 31 August 1993, a United States jury found that Honeywell had infringed a Litton Ring Laser Gyroscope patent and should pay \$1.2 billion in damages. This was somewhat less than the \$1.96 billion Litton claimed but nevertheless perhaps the largest ever award of damages for patent infringement. However, on 3 July 1996 the CAFC whilst upholding the jury's verdict on infringement awarded a new trial concerning damages saying that the study by Litton's damages expert Dr. Phillips was predicated on "speculation and unrealistic assertions" and supported the trial court's conclusion that Dr. Phillips' study was "pure fantasy".

Valuation of a patent or patent application whether explicitly or implicitly involves making judgements about the future in much the same way that stock market prices have embedded in them judgements of investors about the future performance of a company. In that respect some degree of "speculation" is unavoidable. All methods of patent valuation involve some element of forecasting ranging from forecasting

depreciation rates to forecasting future cashflows, market conditions, effects of competition and distributions and volatilities of returns to patents. The “speculation” necessary is all the more unavoidable since, decisions about continuing with patent applications and about paying renewal fees for granted patents have to be made. Even owners making quick unreasoned judgements on such matters are making implicit valuation decisions in addition to more explicit valuations necessary when considering licensing, litigation or sale. Owners cannot retreat into an assertion that valuation is optional and too difficult to produce any meaningful answers. Like the uncertainty it tries to account for it cannot be avoided. Therefore any insights which help put valuations and thus decisions about the management of patents on a more rational basis and help avoid accusations of “unrealistic assertions” and “fantasy” ought to be encouraged.

The first questions to be asked of any valuation are: who is doing the valuation?, for whom? and for what purpose? The one certainty about the Litton’s RLG patent mentioned above is that Honeywell’s experts did not value the cost of infringing it at the \$1.96bn that Litton’s expert did. However, whilst it is possible to use valuation methods to justify a particular point of view or conform to certain rules, the aim of this article is to try to pursue objective valuation methods. This is a similar problem to that encountered in valuing businesses and parts of businesses for internal management use in what is effectively part of the companies overall capital allocation problem. Objective valuation methods are needed to make management decisions for example to decide how much to pay for or invest in a business as part of the firms overall financial planning. In the same way objective methods are needed to decide how much should be spent on or paid for a given patent or patent application when the returns are compared with those available from other similarly risky uses the money might be put to.

The aim of valuing both patent applications and granted patents then is to enable those managing them to know their value sufficiently accurately and objectively to make well-founded decisions concerning their management.

3.2. What circumstances are patents valued in?

Obviously, early in the life of an invention, information concerning the eventual value of any patent on it is likely to be scarce. The people most likely to have this scarce information are firstly the inventor, who will usually know how significant an advance it is compared to other technologies. Secondly, the Patent Agent, responsible for drafting and prosecuting the application, who will have a view of the scope and quality of patent protection that might be obtained. Thirdly, those with responsibility for marketing the underlying invention, who can assess its success in the market, the potential sales that might benefit from patent protection whether directly or indirectly through licensing and furthermore the effects of competition in the absence and presence of patent protection.

Ideally use of an objective valuation method in conjunction with the expertise of these people should enable well-founded decisions about applications and the resulting patents to be taken. However, two problems exist, firstly, lack of any commonly accepted objective valuation method with which to process this information and secondly, the fact that the decision processes involved in valuation are subject to a number of potential biases.

For example, the decision to file a patent application is usually taken jointly by the patent agent who will for good reasons usually be reluctant to advise an inventor not to file an application and the inventor who will gain in prestige from the filing of the application. Furthermore for many managers the potential opportunity costs to their company and perhaps to their careers of not applying for a patent or not continuing with an application are potentially so much greater than the immediate financial costs that the best advice always seems to be “When in doubt, file an application!” (Grubb 1982). This seems correct but can it be justified? How can the doubt which makes it seem the correct course of action be quantified or accounted for? Indeed, can it ever be accounted for and patent applications valued better so that they can be managed better?

No manager wants to be remembered as the person who didn't patent a successful invention. Furthermore if the application costs are also negligible compared to overall development costs, deciding to develop the invention further may effectively decide most of the issues relating to patents and other IPRs. This is especially so where IPRs must exist to enable successful commercial exploitation, as with pharmaceuticals.

Similar considerations apply to decisions about other stages of the application procedure and to decisions concerning renewal fees for granted patents. Obviously in some cases the decisions are simplified by the legal position dictating the course of action. However in virtually all cases where this is not the case, a decision must be made as to whether the potential future benefits are worth the costs of the next stage in the application procedure or the next renewal fee. In such cases there do not appear to be any commonly accepted methods of valuing applications or patents in order to make such decisions. Only in the case of products where the income stream is well established and reasonably predictable is it relatively easy to use conventional project valuation methods.

There must therefore be the strong possibility of a bias towards conservative decisions to file, preserve or continue applications or patents wherever there is the slightest possibility of commercial success; in practice, in all but the most obviously worthless cases. Thus consideration is rarely given to objective valuation of patents or applications and patents are all too often renewed and applications pursued, not because they are valuable but because none can prove or wants to prove that they are not.

How can this state of affairs be improved on? Is it already the most efficient one? What implications might such considerations have in more commonly thought of valuation decisions in licensing, sale or litigation? First of all we should review existing valuation methods and explore what additional methods might overcome any shortcomings they might have and how such methods might be explored further and perhaps used to influence current practice. Finally we should try and avoid patent valuation's Scylla and Charybdis of oversimplification and

impracticality and at least aim for methods and insights which are both sufficiently sophisticated and practical.

4. POTENTIAL PATENT AND PATENT APPLICATION VALUATION METHODS

In valuing a patent — as distinct from any underlying invention, the fundamental issue as outlined above, is by how much the returns from all possible modes of exploitation of the patented invention are greater than those that would be obtained in the absence of the patent.

Making such a distinction is difficult even when the returns from the patented invention are well defined. However in the early life of the patent or application many other types of uncertainty are also involved. There will be uncertainties about both the technical and commercial success in competitive markets of the underlying invention as well as uncertainties about the legal challenges the application and subsequent patent may have to face during its life.

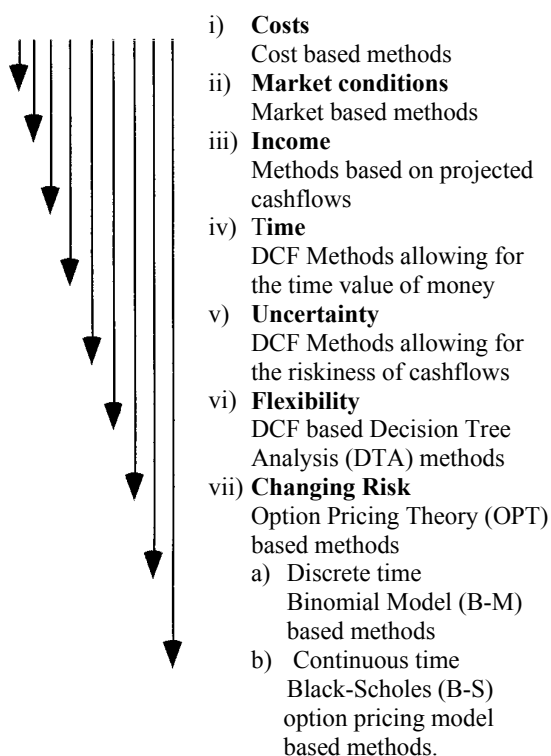
Describing the possible lives that a patent might live is thus a difficult task. A patent viewed as a financial project running from filing the application to expiry of the granted patent possibly twenty years later is thus a far from straight-forward one. All sorts of outcomes are possible and there are many stages in the application process when it may be abandoned or after grant, when annual renewal fees become payable, when the resulting patent may be allowed to lapse. Additionally, at the end of the first year from the initial application the applicant may decide to file corresponding applications abroad thus considerably expanding the "application" in the broader sense. Any decision tree describing it is thus going to be very complex and more of a decision forest.

Despite these problems a wide range of valuation methods which might be used have been described. Broadly speaking the writers fall into four main categories: accountants, patent agents, licensing executives¹³ and economists. A

¹³ *Patent Agent (or Patent Attorney)*: Someone with a scientific degree, trained and qualified in the law relating to patents and intellectual property who is employed in a company patent department or firm of Patent Attorneys/Patent Agents. Main skills are in drafting and

distinction also needs to be drawn here between assessments of overall average patent values which are the aim of many economic studies (which will be mentioned briefly later) and the valuation of individual patents which this paper is largely concerned with.

Russell & Parr divide all possible types of valuation of individual patents into Cost, Market and Income based methods, the latter of which includes simple DCF methods (Parr and Smith 1994). Arthur Andersen in a report on valuing intangible assets divide valuation methods into Cost, Market Value and Economic Value methods (Arthur Andersen & Co. 1992). However for the purpose of this discussion it is perhaps better to classify valuation methods for individual patents by the extra features they account for over and above less sophisticated methods. These can be summarized in increasing order of sophistication as:



prosecuting patent applications and advising on Patent law.
Licensing Executive : Someone employed, usually in a company patent/licensing department, to manage the process of licensing patents and other forms of intellectual property. Generally not legally qualified but with skills in marketing or locating licenseable technology and in arranging and negotiating licenses

The above categorization is not of course comprehensive and since its development the Black and Scholes equation has been adjusted in numerous ways to take account of extra features such as dividends, changing underlying asset volatility and changing interest rates. However, even the most sophisticated adjustments cannot take account of all factors. Option pricing theory concerning share options for example assumes that competition will abolish arbitrage opportunities and yet whilst substantially correct, small differences in transaction costs, trading practices and information flows may nonetheless give rise to apparent arbitrage opportunities when prices are compared with their theoretical values (Cox and Rubinstein 1985). It needs to be remembered therefore that any valuation method is merely a starting point or a help towards better decision making.

Before reviewing the various methods it should be said that we are concerned with the present value of individual patents. We are not concerned, at least here, with how they are to be paid for or whether they should be bought, sold or licensed. In theory at least an infinite variety of payment methods could be devised and each method could be reduced to a present value. It is this value, how much not how it might be paid that we are concerned with.

4.1. Cost based methods - Accounting for Historical Costs

Knowledge of at least the future costs of creating IPRs is needed as part of almost all valuation methods. However, valuation methods based on the historic costs of acquisition perhaps less any allowances for depreciation or obsolescence are worth only the very briefest of comment. Their most serious failing is that they make no allowance for the future benefits which might accrue from the patent. They are of no help other than in historical cost based accounting systems or where taxation methods dictate their use and useless for making rational decisions.

4.2. Market based methods - Accounting for Market Conditions

The aim of market-based methods is to value assets by studying the prices of comparable assets which have been traded between parties at arm's

length in an active market. Perhaps the most obvious case where the method might be said to work and the only case where the cost of an IPR is a possibly useful guide to its value is when the cost concerned is the price paid for the same IPR in a very recent comparable commercial transaction (Arthur Andersen & Co. 1992).

In other cases, comparability with other patents whose value is known from market transactions is the main problem. There is a risk that the comparisons made may not be justified and be no more than convenient measures of value. An important point made by Parr and Smith (1994) is that the transaction used may relate to an IPR whose use may not represent the best use of the IPR to be valued (it could even be the same IPR that has not been used optimally of course). For an IPR to be exploited to the maximum extent possible requires 100% of the potential protected market for the underlying invention to be accessed. Some sale or licensing agreements may prevent this and values derived from them will be suboptimal.

Market based valuation methods may also be based on comparable royalty rates. When deciding royalty rates there are of course numerous surveys which look at industry averages (1992), (Ishii and Fujiono 1994), (Sullivan 1994a). Such averages are often used as a basis for setting royalty rates in licensing agreements or in establishing damages in litigation. However, these are likely to exclude rational consideration of virtually all factors other than the, albeit important, one of what people think is the "market rate". The risk is that for a particular IPR this may be a serious misvaluation and use of such average royalty rates may merely perpetuate sub-optimal decisions by a few leading companies throughout an industry.

Royalty rates selected on some other basis than an industry average rate can also have problems. Royalty rates set using returns to R&D costs or return on sales figures for the company or industry for example run the risk of valuing costs or other factors rather than value.

One possible market based alternative to such valuation methods is described by Parr (1988). This involves the valuation of the "Patented Product" of a one product firm by calculating the

residual value after deducting all the value of all other known assets from the market value of the company. This is similar to the "Premium P/E" method which ascribes the additional price and thus P/E ratio paid for a business with significant IPRs to the value of those IPRs (Arthur Andersen & Co. 1992). Taking the residual value analysis one step further though, Parr determines the return to the "intellectual property" by calculating the proportion of the actual total return which can be accounted for by standard rates of return to tangible and other identified intangible assets thus leaving the return to the intellectual property as the residual. The percentage that this represents of the total revenue is then used as a base for a rate of return to the IP in licensing negotiations. In referring to the "Intellectual Property" and not the "Patented Product", the return is attributed solely to the presence of the patent enabling above average profits. In other words Parr's valuations give a value for the Invention plus the Patent and a measure of the return to the Patent but not a value for the Patent per se unless one takes the notional return and uses this to calculate a supposed NPV over the remaining life of the Patent.

However, whilst such a method may be a valid way of discovering the implicit market valuation of a "patented product", one cannot be sure that it provides an objective valuation. Furthermore it is arguable that use of a residual valuation method is impossible since one cannot be sure that the residual is really ascribable to the patent alone and not other intangible assets. Finally there are few companies with only a single product.

A more fundamental problem is that one is using a stock market valuation of the company as a basis for estimating the value of its IP and IPRs. One is thus making an assumption that the market is perfectly informed about the IPRs of the company and can calculate their value. If that is the case though, there is no reason why those who wish to calculate the value of the IPRs should not do the same calculations or have the same insights. If it is not the case, there is no reason why anyone should base their valuations on what is no more than a guess by others. This is especially so in the case of an internal valuation where the internal valuers should have more information than the external market.

In short, whilst cost and market based methods of valuation may be relatively easy to use they may not be providing answers which are as accurate as one might wish. As rigorous objective ways of calculating the value of a patent such methods still leave much to be desired.

4.3. Income based methods - Accounting for Future Value

Improvements on cost based methods of valuation include at least some forecast of future income from a patent and thus some appreciation of the value of the patent as opposed to just its estimated market price or its cost. This will inevitably also involve some element of forecasting the future cashflows. However it is only with the addition of trying to account for the elements of time and uncertainty in future cashflows as is the case with conventional discounted cashflow (DCF) methods that one begins to get valuation methods which have some sound theoretical foundations. There are no doubt some who propose methods using projections of future cashflows to value patents without taking account of time or risk but such methods can be ignored.

The key issue in these methods is how the forecast cashflow is arrived at. It may be possible to identify and or forecast particular cashflows which are associated with a particular IPR through licensing or through direct exploitation. Alternatively it may be possible to use ideas similar to those used in brand contribution methods (Arthur Andersen & Co. 1992) to calculate the contribution to a business of a given patent. This may involve study of the costs of unpatented goods, of the return on capital of unpatented goods, of the return on assets of unpatented goods or of the price commanded by unpatented goods with the actual financial data for the IPR related business. Such methods are in some senses market based methods since they rely on market-based averages. A further and very common method based on industry average royalty rates assumes that the income due to a patent per se is the royalty which would have to be paid by a licensee. Needless to say the same cautions apply as when setting royalty rates directly based on such average rates as described above.

4.4. DCF based methods - Accounting for Time & Uncertainty

Discounted Cashflow (DCF) methods of valuation are now used for all manner of applications. The two key factors they account for are the time value of money and to some extent the riskiness of the forecast cashflows. These two problems can be solved in two ways. Either by using a risk adjusted discount rate to discount the forecast cashflows, thus accounting for both factors at once. Or using certainty equivalent cashflows, in which forecast cashflows are adjusted to account for their riskiness and changing riskiness over time. These are then discounted at the risk free rate to account for the time value of money. The latter method separates the two issues of risk and time and can help avoid problems when the risk adjustment varies over time as it will with patents. However, it is not the aim of this paper to describe DCF methods in detail –explanations can be found in any textbook on corporate finance (Brealey and Myers 1984). What is worth discussing though are some of the peculiarities involved in valuing a patent using DCF techniques and some of the pitfalls of such DCF analyses are prone to.

One advantage of valuing patents with DCF methods is that since Patents have limited lifetimes one is not faced with the problem of estimating residual values for the cashflows beyond the edge of the forecasting horizon.

For a given project though the cashflow could be one of a wide range of possible cashflows. Assuming that the probabilities of the various outcomes are known the simplest (and most incorrect) DCF mode of analysis would be to simply work out all the possible cashflow outcomes and their probabilities, obtain the total expected cashflow and discount this using whatever discount rate the company currently used. However, such an approach ignores several factors. Firstly the discount rate used should always be one which reflects the risk of the cashflow concerned. For example if the project is not an average project for the company this will not be the same as the company's cost of capital. In practice using the assumptions of the capital asset pricing model and by finding quoted companies with cashflows of equivalent riskiness suitable discount rates can be obtained. Secondly,

with a multi-stage cashflow such as with a patent or patent application the risk associated with the cashflow will vary considerably over the lifetime concerned. That for a newly granted patent which is about to be litigated for the first time will be much riskier than for a 15 year old veteran which has survived many attempts to invalidate it. Use of a single constant discount rate actually makes the opposite assumption that the risk adjustment increases as the patent ages.

The general idea of a discount rate's risk premium component varying over time is dealt with, *inter alia*, by Hodder and Riggs who advocate the use of sequences of distinct risk phases in evaluating high risk projects whose risk varies from phase to phase (Hodder and Riggs 1985). This should be standard practice and is covered in most basic Corporate Finance books (Brealey and Myers 1984).

In practice this would mean splitting the valuation of the patent into several distinct phases, for example, from application to receipt of search results, from the decision to continue to commencement of substantive examination, from acceptance to the end of the first year after grant, from grant to the first year of commercialization and so on until the product becomes well established and the patent eventually expires.

Those articles which do deal with the valuation of patents or R&D from a DCF point of view do not usually take account of such considerations. Neil for example in writing on the valuation of "Intellectual Property" only uses a single discount rate and whilst not mentioning the variation of risk over a project's life takes the pragmatic view that small variations in the discount rate used will have a smaller effect than any possible errors in the forecast cashflow (1988). Parr (referred to earlier) also proposes the use of DCF method of valuation but also does not mention the possible variation in risk during the life of a particular piece of intellectual property (1988).

A further approach to uncertainty which uses DCF involves simulation methods. The simplest type involves sensitivity analysis where variables are each adjusted in turn to see the effect they have on final DCF values. Another example is that put forward by Stacey who advocates a probabilistic DCF approach (Stacey 1989). Since

all the information involved in making a decision about Intellectual Property is highly uncertain the best that can be done is to consider the costs and revenues probabilistically, the end result being a frequency distribution of NPV values. In Stacey's example and other so called "Monte Carlo" simulations all the variables in a model are adjusted at once according to individual probability distributions to produce an overall distribution of possible valuations. However such methods, as Stacey says, involve time-consuming and costly calculations and are constrained by the difficulties in establishing the probability distributions needed. A further issue not raised by Stacey is as to what the NPV frequency distributions mean. If the probability distributions of NPVs are produced using a risk free discount rate not the opportunity cost of capital the NPV distributions cannot represent actual NPVs since only time has been accounted for. If they do use an opportunity cost of capital the risk is so to speak double counted first in the discount rate and secondly in the NPV frequency distribution (Brealey and Myers 1984). Problems with NPV distributions are also discussed by Trigeorgis (1996). The real role of such simulations is to understand the way in which the values vary with the parameters of the model constructed.

4.5. DTA based methods - Accounting for Flexibility

In addition to the problems of selecting discount rates appropriate to the risk associated with the various stages in a patent's life and those of calculating the possible cashflows which might occur there is a third problem with simple DCF methods. This is that no account is taken of the various possibilities open to managers of a project or in the case of this discussion a patent. For example at various stages in the life of a patent or application it could be allowed to lapse or be abandoned. Following the initial application there is also the option to expand the patent family by making corresponding foreign applications.

To a certain extent simulations such as those described above can be used to try and account for the possible outcomes of management decisions though the same caveats outlined above apply. Where the number of such possibilities is limited though and the possibilities for management choice only occur at defined times

they may be accounted for by the use of some form of Decision Tree Analysis. This ought to be based on an underlying DCF analysis of each branch, starting with the final ones and working backwards in time to give a present value.

The big advantage of the DTA method over simple DCF analysis is that it builds in the value of flexibility encountered in a project or patent. This allows at least some account to be taken of the ability to abandon the patent though it does not solve the discount rate problem. The rates used ought to be appropriate to the risk involved at each stage and following each type of decision, whilst in practice a constant rate is usually used.

4.6. Option Pricing Theory (OPT) methods - Accounting for Changing Risk

The theory behind option pricing was primarily developed for use in pricing financial options and financial options markets have perhaps funded the research into and certainly provided the testing grounds for some of the underlying theories. We need to understand at least the outline of these concepts to use them in the context of patent valuation.

An option can be defined generally 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. Most obviously though the underlying asset can be a share in a company whose price varies over time as a form of random walk (usually assumed to be Brownian motion type of Markov process) and which one has a *call* option right to buy or a *put* option right to sell at or before a specified *expiry date* in the future at a prespecified *exercise price*. *European* options can only be *exercised* at the expiry date but *American* options may be exercised before expiry.

Options have in common with situations subject to DTA analysis the possibility of different outcomes each with different cashflows each having different risk which in each case evolves over time. However, we have seen how each stage in the DTA method should use a discount rate appropriate to the risk involved in that stage and that the risk and thus discount rate may well vary over time due to the differing nature of the payoffs and thus decisions at each stage.

Furthermore, in the case of most options the decisions normally associated with each stage in the DTA method do not have to be taken at any particular moment and the alternatives faced at each stage may not at first be precisely defined. In such a situation, however the problem is solved mathematically, some method which takes account of the continuous involvement of the values of underlying assets and the nature of the decisions involved is needed. In other words some means of accounting for changing risk is required since in the limit that the continuous variations involved are made up of an infinite number of discrete DTA stages each would need an appropriate discount rate to take account of the differing risks. In essence wherever there is the possibility of decisions being made there is a possible change of risk. Where the possible decisions keep changing the risk involved will also keep changing.

Another way of looking at the changing risk involved in an option is that as the time to expiry decreases, for an option presently “in the money”, the risk of the exercise price exceeding (for calls) or being less than (for puts) the market price of the asset decreases and thus the risk of the option ending up “out of the money” and not being exercised decreases. The key point in accounting for this changing risk of future cashflows is to find some means of risk neutral valuation. The certainty equivalent approach mentioned earlier in the context of basic DCF analysis is one possible approach however another and more powerful method is to use contingent claims analysis the underlying idea of which is used in both discrete time period type analysis and continuous time option valuation models.

4.6.1. Discrete time - Binomial Model (B-M) based methods

Contingent Claim Analysis begins to solve the problem of changing discount rates which conventional DCF/DTA methods cannot solve easily. It uses the basic assumption that the returns to a call option on a share are equivalent to those of a portfolio or ‘synthetic option’ consisting of borrowing some money and buying some of the underlying shares. If one assumes that there are no arbitrage opportunities the price of the option on an underlying share will be given by the price of this synthetic option. This allows

the construction of equivalent risk neutral decision tree probabilities so that the expected payouts can be discounted at the risk free rate. This avoids the need to set an appropriate risk adjusted discount rate for each branch in the tree.

Copeland and Weiner describe a number of situations in which non-financial “Real” options occur (1990) and in which a contingent claim analysis (CCA) valuation method can be used involving a portfolio of borrowing and shares being set up to replicate the returns of the project involving an option. One example used is a pharmaceutical R&D project (Copeland, Koller et al. 1990). Trigeorgis and Mason also discuss CCA analysis of options involved in a project (1987). CCA applied to a decision tree in the absence of any flexibility provides the same answers as a conventional DCF analysis since the use of a single discount rate does not then matter. For simple decision trees involving flexibility CCA is thus preferable to conventional DCF/DTA methods.

4.6.2. Continuous time - Black Scholes (B-S) Option Pricing Models

DTA methods can become inordinately complex resulting in what Trigeorgis calls “Decision Bush analysis” (1996). A further problem with DTA analysis methods is that whilst choices between courses of action with a few discrete outcomes may occur, in most cases a range of values is possible. In the case of share prices for example the range of values may be modeled as a log normally distributed process. A further problem is that decisions about the underlying asset or project may have to be taken continuously or the price of the underlying share may evolve continuously and not just at discrete stages. As mentioned above discrete stages involving different risk require different discount rates. Once one involves continuous decisions one has a

multiplicity of stages and thus the discount rate now changes continuously too, varying with the underlying asset value and time. Unlike DCF based DTA analysis using a single risk adjusted discount rate OPT methods accounting for continuous time such as the equation derived by Black and Scholes provide a solution to these problems.

Before moving on to discuss the application of OPT to patent valuation though a brief overview of continuous time OPT valuation methods as developed for financial assets may be helpful.

4.6.2.1. Financial Options

There has been a long history associated with option valuation methods dating back to at least around 1900 (Bachelier 1900), leading eventually to work by Boness (1964), Samuelson (1965) and Merton (1973). However, the key paper which described the valuation of options on financial assets was published by Black and Scholes in 1973, appropriately coinciding with the opening of the Chicago Board Options Exchange and a great expansion in the trading of such options on common stocks. As with discrete time CCA described above, their equation was based on the assumption that the returns to a call option on a share are equivalent to those of a portfolio or ‘synthetic option’ consisting of borrowing some money and buying some of the underlying shares. The Black and Scholes equation can in fact be derived from a discrete time based CCA analysis by letting the length of period studied for each stage in the tree tend to zero (Cox, Ross et al. 1979).

For the case of continuous time though, if one assumes that there are no arbitrage opportunities the price C of a European Call Option on an underlying share is (Black and Scholes 1973):

$$C = SN\left(\frac{(\ln(S/E) + (r + \frac{1}{2}\sigma^2)t)}{\sigma\sqrt{t}}\right) - Ee^{-rt}N\left(\frac{(\ln(S/E) + (r + \frac{1}{2}\sigma^2)t)}{\sigma\sqrt{t}} - \sigma\sqrt{t}\right)$$

The equation that Black and Scholes provided was based on several key assumptions: (i) interest rates are constant over time; (ii) share prices follow a random walk where the distribution of prices at the end of a given time period is log normal with the variance assumed constant overtime; (iii) only European options are considered; (iv) markets are friction free with no transaction costs, no margin requirements or other penalties for short sales and borrowing or buying any fraction of a share is possible; (v) dividend payments on the underlying share are excluded.

Thus options on an underlying asset can be valued given just the following information:

- i) S the current price of the underlying asset
- ii) E the exercise price of the option
- iii) t the time to expiry
- iv) σ the standard deviation of the underlying asset returns
- v) r the risk free interest rate.
- vi) N the distribution function for the asset price.

Tables can be made to calculate the value of puts or calls given $S / (Ee^{-rt})$ and t so valuing a simple call option need not be a particularly complicated operation. Furthermore the value of an option can be seen to increase:

- i) the higher the underlying asset value
- ii) the longer the time to expiry
- iii) the lower the exercise price
- iv) the higher the variance of the underlying asset returns
- v) the higher the risk free interest rate.

It can be seen that the varying risk involved in an option over time is accounted for by the inclusion of the time remaining to expiry and the variance of the asset returns. The longer the time to expiry and the greater variance in the underlying asset value the greater the chance that the option will expire “in the money”. This varying risk problem is overcome by using risk-neutral CCA valuation which depends on using knowledge about the value of the underlying asset.

These points are important when it comes to considering the application of OPT to patent valuation. However, the most important statement in Black and Scholes original paper was that option pricing methods could be applied to other financial assets. This resulted in a flood of work

dealing with a wide variety of financial assets and a realization that almost any financial asset could be valued using some form of OPT based method. Cox and Rubinstein for example describe a wide range of financial OPT applications (1985).

4.6.2.2. Real Options

The basic definition of an option (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) can be applied to a number of other situations other than directly financial assets. Such non-financial options have become known as “Real Options” and a substantial literature has built up around the application of OPT methods to their valuation. An example of one, the treatment of a pharmaceutical R&D project as a series of options, was mentioned above whilst discussing discrete time CCA methods (Copeland, Koller et al. 1990). Mitchell and Hamilton also likened the cost of an R&D project to the price of a call option. They identified the cost of an R&D project with the price of a call option on the future commercialization of the project and the future investment needed to capitalize on the R&D programme with the exercise price of the option. The present value of the returns the company will receive from the investment was likened to the value of the share subject to the call option (Mitchell and Hamilton 1988). However they did not discuss in practice how one might go about calculating the value of the options concerned.

For an overview of the subject of real options the most recent and comprehensive works are the books by Trigeorgis (1996) and Dixit and Pindyck (1994). A much less advanced outline of the subject and OPT in general can be found in standard corporate finance textbooks such as that by Brealey & Myers (1984).

The field of real options developed principally from the realization that as outlined above conventional valuation methods do not or cannot cope very well with managerial flexibility. Kester for example highlighted the existence of growth options in many capital budgeting decisions (1984). How valuable growth options are according to Kester depends on (i) the time projects can be deferred, (ii) the project risk

(iii) the level of interest rates, (iv) the exclusivity of the project. On the last point Kester identified both shared and proprietary growth options. Proprietary ones resulting from “patents or the company’s unique knowledge of a market or a technology that competitors cannot duplicate”. Needless to say proprietary options are more valuable than shared options such as the chance to enter a new market or build a new plant which is shared with all other industry members (Kester 1984). There are many later examples of such critiques of conventional DCF techniques. Kulatilaka for example discusses an investment choice between gas and oil fired boilers and

Financial Option on Share

S Current price of the underlying share
 E Exercise price of the option
 t Time to expiry
 .. Standard deviation of underlying share returns
 r Risk free interest rate

Furthermore as shown by Kulatilaka’s example above there are a wide variety of types of real options. Trigeorgis has categorised these based on some of the distinctions noted by Kester (Trigeorgis 1996)(Kester 1984) into options which are either proprietary or shared (as noted above), simple or compound (the latter involving a number of successive options) and expiring or deferrable (the latter being such as to allow an investment or decision to be deferred). On this basis one can identify most patent related options as likely to be proprietary, compound, deferrable real options since they are by definition exclusive to the patentee (or exclusive licensee), involve a number of successive stages and involve decisions which can often be postponed, at least until the next deadline in the application process, renewal fee deadline or sale or licensing decision is due.

4.7. Real Options - Patents, Problems and Solutions

Whilst Black and Scholes pointed out that many other financial assets could be valued using option based methods and other authors have identified a wide range of Real Options the applicability of financial option valuation methods to non-financial assets has raised a

identifies not just conventional NPV value but value due to Investment timing options, Abandonment options, Shutdown options, Growth options, Input and Output Flexibility and Expansion options being involved in the decision (Kulatilaka and Marcus 1992). Dixit and Pindyck also discuss the failings of conventional DCF analysis and the presence of options of various kinds in most investment decisions. (1995) (1994).

There is thus an equivalence between the inputs required to value financial options and those involved in valuing real options:

Real Option

= Present Value of Project Cashflows
 = Investment Cost of Project
 = Time left to invest in
 = Standard deviation of the Project value
 = Risk free interest rate

number of questions which are relevant to any consideration of applying option valuation methods to patents.

An early example of such a debate occurs between Emery and Parr et al. and Rao and Martin. Emery and Parr et al. pointed out differences between traditional capital budgeting methods and option pricing methods in the way the latter treats the probability distribution of returns, the relationship to interest rates and time to exercise date of the option and concluded that using OPT for real investment decisions risked illogical decisions (Emery, Parr et al. 1978). These criticisms were in turn criticised by Rao et al. who argued in favour of the use of the Black and Scholes model for "Real World" capital budgeting decisions (Rao and Martin 1981). However whilst refuting Emery and Parr’s concerns their argument in favour of using the Black and Scholes approach to value real options still involved concern about the requirement for continuous trading in the underlying asset and the option and for the fact that the underlying asset must not produce interim cashflows.

Trigeorgis (1996) and Kester (1993)) identify three main points at which real options may differ

from conventional financial call options on shares.

Firstly with shared real options, unlike proprietary call options on shares, the option holder also has to account for the effects of competition. Patents however are by definition proprietary so this should be of minor concern save for the possible effects of competition due to non-infringing substitute products.

Secondly there is the potential problem that the underlying real asset may not be one which is traded or traded easily. It is now clear though that the fact that an asset is not traded is not a bar to using option pricing methods. However, the Black and Scholes equation depends for its derivation on a no arbitrage equilibrium with a synthetic option comprising a traded security and some debt. CCA in general requires a "spanning" traded asset or portfolio of assets whose stochastic change in value matches exactly that of the underlying asset on which an option is to be valued and from which a volatility can be obtained. For most commodities and manufactured goods this should be possible. Dixit and Pindyck however have pointed out that:

"However, there may be cases in which this assumption will not hold; an example might be a project to develop a new product that is unrelated to any existing ones, or an R&D venture, the results of which may be hard to predict." (Dixit and Pindyck 1994).

Whilst Dixit and Pindyck go on to assume that spanning is possible in an example comprising investment in a project of uncertain outcome the issue perhaps remains one for further discussion. Trigeorgis lists a large number of papers which deal with R&D related options (1996).

A key question must be whether the assumptions of CCA based methods as used in OPT and the use of Brownian Motion type diffusion processes to model the price of the underlying asset are justified when considering Patents.

North has pointed to a distinction between risk and uncertainty, quoting Arrow (1951) and Lucas (Lucas 1981). The latter of these said "in cases of uncertainty, economic reasoning will be of little value". North points out that Frank Knight (1921)

made a fundamental distinction between risk and uncertainty for the former of which it was, given sufficient information possible to derive probability distributions of outcomes and for the latter of which it was not. One might wonder therefore whether if the processes involved in the success of innovations and on which the value of IPRs depends are in fact purely uncertain not merely predictably risky then it may not be possible to derive any forecastable value for IPRs at all. However, this should not deter us since against this view one can say that IPRs all have a value expressed in monetary terms and we have data showing that returns to inventions do form characteristic distributions suggesting particular underlying stochastic processes which we can model. We may not be able to predict whether a particular invention will be a success or not but we should be able to show what the distribution of returns from inventions and IPRs in general are and from this deduce information about their current values.

What remains a subject of discussion is what models should be used. The work of Scherer showing that the returns to Patents are highly skew even in the case of just Patents renewed to their full term (1997) as well as common experience which shows that distribution of returns from Patented inventions must be highly skew at the end of their life with a few highly valuable patents and a lot of worthless and or lapsed ones means that in valuing patents one may need to consider carefully what type of diffusion process and distribution may best be used to model the returns to patents. Is a Brownian type process or some jump diffusion process involving a mixture of Brownian type process with Poisson jump processes more appropriate? Should the distribution of returns be modelled as a form of paretian or lognormal distribution? This area could do with further consideration. Dixit & Pindyck also say:

"Likewise one might model the value of a patent as subject to unpredictable but sizeable drops in response to competitors' success in the market" (Dixit and Pindyck 1994).

Perhaps one needs to distinguish here between what happens after an invention is made and it gradually becomes apparent whether it will be a successful invention or not and what happens

after an inventor is employed and it gradually becomes apparent whether they are going to invent anything. It is perhaps easier to study examples of and model the former. Furthermore the mention of jump processes shows that it is possible to modify the models of the stochastic processes involved to account for other factors.

One such factor concerns the volatility of returns to the underlying asset. There is the possibility that the standard deviation which Black and Scholes assumed to be constant may not be so and the variance of the return on the underlying asset may not be constant over time. In the case of a patent this is very likely the case. The example of a staged pharmaceutical R&D project provided by Copeland (Copeland, Koller et al. 1990) illustrates this. As such a project survives longer continuing with the project becomes less and less risky, the spread of potential outcomes narrower and more certain and the variance less. If one considers patents it is obvious that the distribution of values whilst it might be assumed to be lognormal at the start of a patents life, towards the end it is definitely not, as worthless patents are abandoned and the distribution for a given cohort skews towards the upper end of the original distribution leaving a few highly valuable patents left in force for their maximum life. As Scherer says:

“That skew outcome distributions result with such striking regularity from innovation samples suggests that there must be some underlying stochastic process whose behavioural properties are well worth characterising” (Scherer 1997).

If the volatility of the underlying asset is a known function of time then adjusting the B-S formulae is not difficult with average values being taken over the options remaining life. However work has been done on pricing options on assets which even have stochastic volatilities (Hull and White 1987). As one might expect, one feature is that the longer the life of the option the more significant stochastic volatility becomes compared to the case where it is constant.

The third point at which real options may differ from conventional financial call options on shares according to Trigeorgis is that real options may consist of multiple or *compound* options in a

chain with numerous interdependencies. Option values are not necessarily additive due to these interdependencies and so in general compound options will require more complex analysis.

The application of option pricing methods to real options involving innovation and by implication patents as well is thus by no means a straightforward task. There is also the task of convincing management that the consideration of OPT issues is worthwhile a subject dealt with by Kemna in connection with the consideration of real options in the Oil and Gas industry (Kemna 1993). However, whilst there is the question of keeping the complexity within manageable limits there seems a reasonable possibility that any fundamental reservations about the general applicability of OPT to real option valuation of patents can be overcome. That being the case, valuation is primarily a matter of identifying for a patent the variables described above which are needed for option valuation.

Despite these potential differences between financial and real options in the form of patents, there are several areas where there are definite similarities. Two areas in particular are the issue of limited liability and the establishment of optimal exercise strategies.

Limited liability or rather the ability to escape from financial commitments by going bankrupt and/or defaulting on interest payments is something which is a risk, or benefit, depending in one's view, of some financial arrangements. When evaluating a project using DCF techniques such financing considerations can be accounted for either by adjusting the NPV of the base case in the absence of financing considerations (i.e. all equity finance) or by adjusting the discount rate. However in the case of an options based approach the financing considerations can be considered as an option to default on debt payments which of course has a certain value over and above any option to just abandon a project. In fact as Trigeorgis (1996) points out the combined value of default and abandonment options can be considerably larger than the project abandonment option value alone. In the case of a patent there are obviously abandonment options to let the patent lapse and consequently various options associated with financing the acquisition of the patent quite apart from other options involved in

investment opportunities associated with the patent. Obviously abandonment of a patent is similar to abandonment of a project except that being a pure real option with no obligations attached to abandonment there is no downside to abandonment, save loss of the initial investment costs and a possible upside in the ability to exercise what amount to abandonment put options on the project. One might say that project abandonment options where abandonment involves no costs or penalties involve a form of limited liability.

Just as with analysis of a series of investment project related options there is usually an optimal exercise strategy for the options involved in a patent. For example when to let a patent lapse when to continue with an application, when to license or refuse licences and in many other situations. The more one concentrates on the investment opportunities associated with a patent as opposed to the options inherent in the patent per se the more the options concerned appear the same as any other investment option and the more ordinary investment option triggers become important. However, similar triggers might also be devised for decisions about the options involved in a patent per se.

I will now consider some of the issues which might be involved in attempting an option based method of patent valuation and review some of the other difficulties involved. Before doing so it is worth considering some of the concepts raised by econometric studies of option and renewal fee based patent valuation methods which also reveal the skew distributions referred to above.

5. ECONOMETRIC PATENT VALUATION METHODS

Outside the field of academic economics the work done on the valuation of Patents using econometric methods is probably little known. The work in general deals with aggregate value for particular types or cohorts of patents rather than the individual patents that we are interested with here. However it is nonetheless useful to review this field briefly here not just for the sake of completeness but for the interesting insights it gives into patent values as a whole.

5.1. Stock market based methods

Pakes has investigated the relationship between the stock market value of a firm and the level of inventive activity of the firm as measured by the number of successful US patent applications and R&D expenditures (1985). In this paper Pakes found, not surprisingly, that the stock market did take account of unpredictable changes in R&D levels and levels of patenting by firms. A result which Griliches has also referred to (1981). However, Pakes also commented that the results “may reflect an extremely dispersed distribution of the values of patented ideas”. Whilst this may not be of immediate practical help in valuing patents it is relevant to the idea that patent's values are to a certain extent reflected in stock market valuations.

Kingston discussing Scherer's earlier work points out that one may not be able to assume that value distributions for patents and innovations are the same (1994). However, Scherer has recently compared the distribution of values of High Tech start-up companies over time with the distribution of values of individual patented inventions and found that they have similar highly skewed distributions which may support such an assumption (1997).

There is therefore some factual support for the common sense view that Stock Market values are linked in some way to values of the IPRs held by the company. This however supports at least a possibility of finding shares which might reflect the volatility of patent values which may be helpful in option based valuation methods which require a knowledge of the volatility of the returns to a patent.

5.2. Renewal data based methods

The other main stream of econometric work looks at patent value from the patentees point of view using patent renewal data as a way of measuring the patentees assessment of a patents worth. The advantage of such an approach is that it is aimed at the value of the patent alone. It is thus probably a better valuation of the potential opportunities, for example licensing opportunities, than might be obtained from a stock market valuation, since the patentee usually has better information than the stock market does. The disadvantage is that it

is only useful for valuing patents retrospectively and usually only in aggregation. It may also, due to some of the organizational bias related reasons mentioned above (which will encourage conservative renewal policies) be an overestimate of the true value. On the other hand because the value is merely viewed relative to official renewal fees and excludes other incidental expenses it may also be an underestimate. To what extent these biases may compensate for each other is unclear.

Some of the first steps in this process though, are described in Pakes and Shankerman's paper on the rate of obsolescence of technical knowledge developed or invented by a firm. One of the ways of estimating this was to use patent renewal data to establish a rate of decay (Pakes and Shankerman 1984). This work led in turn to their work on the value of patents in Europe again derived from renewal data (Pakes 1986). Not surprisingly in the study patent quantity was found to be inversely related to patent quality, something those patent agents who have dealt with the output from companies who file everything they can, may agree with. Other critical results include the fact that there is a large number of patents of minimal value and a highly concentrated tail of valuable patents with those few patents kept in force for most of their potential life being highly valuable. A similar study of older patent data using similar methodology has also been carried out by Sullivan (1994b).

However, in Pakes' other paper the concept of viewing Patents as options was expressed more explicitly (1986). In this work the question facing a manager was not just whether the returns in the coming year exceeded the renewal fee as in the deterministic model. It was instead whether the returns for the coming year plus the value of the option of paying the renewal fee and maintaining the patent in the following periods together exceeded the renewal fee. The paper uses the renewal data from English, French and German patents to estimate parameters for the model which is then tested using the parameters against the actual data by calculating the expected drop out or lapsing ratios over time. In the process it calculates the distribution of values for patents and observes how this distribution of returns changes as time progresses. The model of the

process for generating returns to the patents includes a Markov process and assumes that initial returns at least are distributed lognormally both of which are also features of the Option pricing methods described earlier.

The work, whilst producing a model and parameters which fit the actual data very closely, does not of course enable us to calculate the value of any individual patent. The work is nonetheless highly valuable because of some of the concepts it introduces to the field of patent valuation, in particular the consideration of patents as a series of options.

5.3. Patents, Option Pricing and Econometrics

Pakes' view of the options represented by holding a patent is that payment of a renewal fee for a granted patent not only buys the coming years monopoly profits but also buys (in all but the final year) an option on renewing the patent at the end of the year, the exercise price for which is the renewal fee then payable.

Pakes' work elucidated a number of features of the options connected with the renewal fees. In common with normal financial options the value of the options represented by holding a patent or patent application are positive and increase with increasing value of the current returns. In a similar way to normal options their value decreases as the patent ages and the time to expiry of the patent decreases. This is not just because the time to expiry of the individual option considered is nearer its exercise date (for example the patent's renewal date) but because each option's value has built into it the value of future options and the fewer they are the less valuable the current option is.

Some features however differ from more normal financial options. One oddity is that for each option the exercise price increases year on year as the renewal fees which are the price to gain the benefit of next year's returns increase with the age of the patent. A further feature shown by Pakes work is that as the patent ages the distribution of the potential returns skews towards there being a few highly valuable patents and many relatively worthless ones. Options increase in value with increased variance of the potential returns, so this

decrease in variability leads to a decrease in the value of the options which occur later in the life of a patent. Pakes paper also included description of both deterministic (where no option values are included) and stochastic models (where they are). Interestingly they differ most at the beginning of the patents life illustrating that the effect of also considering the option has a much larger effect early in the patent's life. Intuitively this is what one would expect. Also the actual data shows that the dropout rates slow towards the end of a patents life one potential explanation for which is that this will be the case if the option value of the patent drops to zero towards the end of the patent's life.

Previously I outlined how the valuation of a patent needs to be distinguished from the valuation of the underlying invention. The approach adopted by Pakes avoided this problem by working backwards from patent renewal data which reflect patentees valuations of the patents alone. However, Pakes' work only helps assess mean values for groups of patents in the past and not the value of individual patents. Furthermore, the method will not provide a basis for a new valuation process not only because using renewal fees makes it retrospective but because basing an improved objective estimate of patent value, on renewal data which results from the existing and often ad hoc valuation methods one is trying to replace will be unlikely to result in improvement. Despite this it is valuable for the purpose of this review in that it highlights several concepts useful in consideration of individual patents as options.

6. OPTION PRICING AND PATENT VALUATIONS

It should be obvious by now that firstly valuation methods for assets which involve choices and varied potential outcomes may seriously understate the true value of assets if they do not take account of the value of the options involved and secondly that patents and patent applications are just such assets.

We need now to identify what options may be involved in valuing a patent. For example Pakes treated the post-grant phase of a patent as a series of call options on the next years benefits. Hamilton and Newton each treated R&D projects as call options on the eventual project of

commercialising the R&D project results, whilst Copeland et al. viewed an R&D project as a series of abandonment put options. Eldor has treated patent royalty cashflows as a perpetual American option (1982) as does Norris who also points out the option to sell the patent and the option not to license the patent as being two options in addition to the usual collection of real options comprising expansion, deferral, abandonment and switching options (1996).

Norris is mainly interested in the patents value as a means of deferring investment in commercializing the invention. Lambrecht also treats a patent as an element of a deferred investment problem (1997). Takalo and Kanninen also investigate a series of research, patenting and development investment decisions concluding that the value of options to defer investment resulting from holding patents may result in delays in commercialization (Takalo 1997). Interestingly Norris also models a cross-licensing deal using Magrabe's exchange option model (1996). However, neither Norris nor Lambrecht distinguish clearly between the value of the commercialization project as a whole and the value of the patent per se. The distinction drawn is instead between the race to obtain the patent and the commercialization of the invention with the valuation concentrating on the value of the patentees option to invest in commercialization of the invention under the protection of the patent. By separating the research and patenting decisions as well as the commercialization/development decision Takalo and Kanninen do distinguish between the value of the project in the presence and absence of a patent (Takalo 1997).

These examples of the use of option based thinking and valuation methods to situations involving patents however tend to concentrate on patents, on the one hand, as call options on the commercialisation of the underlying invention and on the other hand as options to abandon the Patent, R&D project or Invention in various ways. Firstly, there is a need to distinguish the patent from the underlying invention and secondly, there is a need to see the link between the different ways of looking at patents using options since call and put option valuations are linked. One of the basic equivalencies which lies at the heart of option valuation is that:

$$\text{Call} + (\text{Present Value of the Exercise Price}) = \text{Put} + \text{Underlying Asset}$$

It is this, which holds for European options at least, which enables R&D projects to be considered in terms of both puts and call options. Similarly, whilst Pakes referred to calls, one could also express patents in terms of puts.

A Patent application could thus be valued as the present value of the expected future monopoly profits from the patent less the present value of the cost of the application plus the value of the put option to abandon the application (which has an exercise price of the as yet unspent future application costs). Similarly the granted patent could be valued as the present value of the expected future monopoly profits from the patent less the present value of the future renewal fees plus the value of the put option to let the patent lapse (which has an exercise price of the as yet unspent renewal fee costs).

Alternatively, the application could be considered to be worth the value of a call option on future continuance of the patent application whose exercise price is the cost of moving to the next stage in the application. To value such a call option one would need to know the value of the underlying asset which is the option to continue the application to the next stage, and so on, the final link in the chain This is illustrated in Fig.3. However, this final asset can itself be expressed (as per Pakes) in similar terms as a chain of call options on the next year's benefits (including an option on the following year's benefits) exercisable by payment of the next renewal fee.

It is thus possible to divide up the various stages of a patent or patent applications life into a series of options which it should be possible to value using some of the concepts described earlier. Needless to say this may well be easier said than done and whilst a number of potential problems have already been disposed of in the preceding

discussion there remain some which will need to be overcome being the asset of the present value of the expected future monopoly profits from the patent.

7. PROBLEMS IN APPLYING OPTION PRICING BASED METHODS

7.1. Variance

One problem which has already been mentioned in passing is that at each stage in the application process and at each stage in the life of the patent the variance of future returns will be different as the fact that the patent has survived thus far makes it increasingly likely that it will be successful and profitable. As we have seen single options or DCF valuations which do not take account of this and use the same discount rate and variance at all stages in the life of the patent/application are flawed. Some provision or estimate of the cost in inaccuracy of ignoring this will have to be made.

Newton for example has outlined how one might begin to obtain volatilities for applying Option pricing theory to R&D even if not to patents. The overall approach adopted treats R&D as a call option on the development of the R&D results (1992). It is a straight application of Black and Scholes formula to R&D with the consequent need to derive measures of volatility for what takes the place of the underlying security — the R&D project. Newton discussed how these volatilities of R&D projects might be deduced. However the method proposed did not take account of the fact that as with patents the variability of returns to an R&D project will probably vary throughout its life. Final clinical testing of a proven pharmaceutical is obviously going to be less variable in its possible outcomes than early exploratory research on an unproven discovery. Similar considerations must be dealt with when considering patents alone and perhaps further studies of such variances are needed.

7.2. Compoundedness

The Black and Scholes formula inherently cannot be used to value an option on an option (Black and Scholes 1973), since the variance of return on the option would keep changing and the formula assumes it to be constant. However, there have been a number of studies which address this problem. Trigeorgis discusses this area extensively (1996). Option values are not necessarily additive due to interactions between them but the interaction which can in some cases significantly affect values depends on a range of factors such as the type of options, the overlap of expiry dates, the value of the underlying asset relative to the exercise price (whether the options are in or out of the money). This is a complex area where if the interactions become too complex some solution using numerical analysis or Monte Carlo simulation methods may be needed.

7.3. Interim Payments

A further assumption of the Black and Scholes formula is that no interim dividends are payable. For a patent valuation, cashflows may well occur during the period the options concerned are held. However in general if the schemes of analysis outlined above are followed involving a series of discrete steps the cash inflows concerned will be for a different period than that covered by the option for a given step. For example the value of holding a patent could be stated as being the present value of the current year's cashflows plus an option on the present value of next year's cashflows and benefits. The current cashflows are thus not connected with the option concerned. There are in any event means of adjusting the Black and Scholes equation to account for at least constant dividends (Merton 1973).

7.4. Cashflows

However, despite it being possible to overcome many of the problems outlined above, in practical terms, valuing patents using options whilst attractive theoretically is still a complicated problem. In addition to the standard deviation of the Patents value, obtaining data on the present value of the projected cashflow of the patent is also likely to prove difficult.

One will need a complete predicted cashflow resulting from the patent from its filing date until its lapse together with a complete breakdown of all the costs involved in obtaining and maintaining it including any legal costs incurred after grant in oppositions or litigation. As pointed out the cashflow should be just the extra cashflow resulting from the patent per se. Obviously establishing this requires a highly detailed knowledge of the effect of the patent on demand and on the cashflow the underlying invention generates. The effects of potential competition from rival non-infringing inventions also need to be considered. Quite apart from problems with revenue cashflows one will also need to decide how to treat the costs of the initial application as opposed to the costs of prosecuting any subsequent individual national applications. This will involve making decisions as to how to allocate the common application costs amongst the various national patents which might result.

8. PRACTICAL STEPS

Studies which produce theoretically attractive analyses are sometimes of little practical use. In view of the difficulties of obtaining the data required to carry out a thorough option based analysis of a patent's value it is therefore all the more important to ask what lessons can be learnt from the present analysis pending some conclusions from a more comprehensive study. It is reassuring though that option based patent valuation methods have already been used in practice as shown by Norris whose work was connected with a consultancy project (1996). The key perhaps is not being overwhelmed by the mathematics and trying to reduce the problem to its essentials. However effort is required on two fronts. Firstly and most simply to construct general guidelines which are based on the insights of option based patent valuation. Secondly more work on the detailed issues involved in the application of option based methods of patent valuation. In either case one is in effect applying option pricing theory to establish optimal exercise strategies or rules for the management of the options inherent in a patent or patent application. This again emphasises the similarities with financial and other options where establishing optimal exercise strategies is very often the major aim. Here we shall briefly consider the former issue of general guidelines.

8.1. Options at different stages of a patent's life

Pakes' work has shown that for renewals the later years of a patent's life are dominated by the effects of technical obsolescence rather than the options on future monopoly profits (1986).

As a patent ages therefore the option based part of its value decreases in importance and purely non-option methods of valuation will become more justifiable. The point is that managers need not be so concerned about option values late in a patent's life.

Conversely, early in a patent or application's life the option component comprises the major part of the value and is non-negligible. Added to this, renewal fees early in a patent's life tend to be smaller than those later on and initial application fees are not very large. These facts would indicate that firstly, there is support for the view that one should always file an application on a prima facie patentable invention. This accords with most patent agents' experience and reluctance to decide against filing. Secondly, early in the patent's life the major part of the patent's value will be contained in the options associated with it and these are likely to be considerably more valuable than any initial renewal fees.

An option based view of patent valuation therefore supports giving consideration to renewing patents very early in their lives even in the absence of substantial or even any returns which later in their life should be more likely to indicate that lapsing is required. The presence of valuable options early in a patent's life are what justify Grubb's exhortation "When in doubt, file an application!" (1982).

8.2. Hurdle years for renewal decisions

These considerations reflect part of Pakes' method of analysis which involves the concept of a cutoff value for the present return. This is a hurdle rate for the current returns to the patent which it must exceed to be worthy of renewal. Theoretically the value of the option on the future returns may enable this value to be negative, as with an application. In practice any patent on a product already in production will probably be producing non-negligible returns in comparison

to the renewal fee. However, if the returns or more precisely returns and sales are zero later in a patent's life then there will come a point when with the option value also almost zero, it should be lapsed. The critical decision is as to when the cut-off or hurdle year for non-renewal beyond which lack of any returns is unacceptable will occur. This is something which might be determined but which will very probably depend on the industry and product concerned. A consideration of the decline in value of the options involved in a patent may thus justify setting some form of hurdle year for patents by which they should be generating revenues and repaying their costs.

8.3. Foreign filing decisions

Another critical decision comes about two thirds of the way through the first year of a patent application's life when a decision must be made about foreign filings. It is quite likely that no further information will be available on the commercial prospects other than general market sizes and the only extra information may be early search reports giving some idea of patentability. In general therefore the decision will be driven by the consideration that if the product is being developed further with the aim of putting it on the market foreign applications should be made anyway on the basis that the cost of the options they represent will probably be negligible in relation to the development costs. If the costs are not negligible vis a vis the development costs then more attention must be paid to the likely value of the options involved. At this early stage it is worth remembering that the applications option value is high and related to the potential future, not just current, market size that the patents will protect and future and not just current levels of protection that are available. This is especially important when considering developing markets.

8.4. Sale and licensing decisions

Option based valuation methods can provide justifications for many existing decisions made about patents which depend on what might happen in the future and how the patent or application might be managed. Use of option based valuation methods to calculate precise values as has been shown is rather more complex.

However, whilst more work is needed to show how the methods can be generally and regularly applied in practice the above discussion shows that all valuations including those for the purposes of sale and licensing of patents should ideally be carried out using option pricing based methods outlined above.

9. POTENTIAL FOR FUTURE RESEARCH

The few practical conclusions described above are naturally temporary since they are only using a new theoretical framework to justify existing practice. Further work is needed to apply the methods discussed here to generalised patent valuation problems. The key areas for further research concern assessment of the magnitude of the values of options involved in overall patent values, the establishment of means for estimating the variables used in the valuation methods described above and the assessment of the effects of any simplifying assumptions which will enable them to be used readily by patent managers. This will involve studying the effect of various assumptions about discount rates, volatilities, compoundedness and other factors on a rigorous approach. The aim being to determine when they should be used and to maximise their ease of use and utility when they are used.

Finally there is considerable scope for examining a number of specific current issues in the field of patent management using an option valuation perspective. One example is the case of the high number of Japanese Patent applications. No one reason provides a complete solution to this. However, one usually unconsidered factor is the value conferred by Japan's deferred examination system. Japanese Patent Law, unusually among the world's major patent systems, allows deferral

of a patent application's examination for up to seven years (Art.48.III). However, being able to defer a decision confers a valuable option. The deferred examination system in Japan must therefore act at least as a potential incentive to file patents which in a less flexible system might not be filed because they would be less valuable. No Japanese Patent Manager at present would conduct a full option based valuation before filing an application. However, acting on a feeling that things could change in seven years, is in effect an implicit use of such a valuation. The idea that flexibility confers value is particularly applicable to the patent application process and this may well have more general policy implications.

Option based valuation approaches are undoubtedly a useful and potentially powerful framework in which to consider management of a company's patent portfolio and other IPR assets. Despite the possible difficulties of a rigorous application of the method and the fact that much work remains in developing its practical use the technique is already being used in some specialized situations and should be developed further. Patent valuation is an exercise which is not optional but inherently about options.

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VALUING PATENTS AND PATENT PORTFOLIOS FROM A CORPORATE PERSPECTIVE –THEORETICAL CONSIDERATIONS, APPLIED NEEDS, AND FUTURE CHALLENGES

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This paper seeks to complement Pitkethly's (1999) survey on patent valuation methods. Focusing on two criteria that determine the suitability of a patent valuation method, this article takes up the issue of valuing patents – and patent portfolios in particular – where Pitkethly (1999) left off. This paper first deepens the discussion about the prediction validity of cash-flows and their volatility in existing real option approaches (criterion 1). Secondly, it adds further aspects to the discussion of valuation methods from a strategic management perspective, namely information availability and evaluation costs (criteria 2 and 3). Identifying caveats to existing practice as to the satisfaction of all criteria the paper then reassumes the theoretical discussion of how to assess a patent's value from the scratch. In a next step it proposes alternative considerations for patent valuations. In particular, the article elaborates on the state of the art of valuing patent portfolios with publicly available indicators from the patent system. The paper concludes with a critical analysis of this alternative valuation approach and briefly discusses future challenges in the evaluation of IP.

1. INTRODUCTION

Patent laws (or their legal predecessors) have been in existence for a long time. Introduced in France in 1790 and in the United States in 1791, the German patent law (originally passed in 1877) even belongs to the younger patent jurisdictions.¹⁴ Thus, one should think that patent valuations should be standard issues for practitioners in the field and should offer no further questions to academics. As a matter of fact, this is not the case.

It is true that patent valuation issues are as old as the existence of patents themselves. One of the oldest evaluation purposes is that of damage

award assessments in trials. Since the starting-point for evaluations of this type is a legal one, most of the corresponding literature in this field stems from lawyers.¹⁵ Since the 1960s patents have also attracted the interest of theoretical¹⁶ and empirical economists¹⁷. Accounting scholars write on to the valuation of intangible assets¹⁸, and most recently patents have also gotten increasing attention by management scholars.¹⁹ As Reitzig (2002) shows, however, the different disciplines have substantially different understandings of what the value of a patent is and how it can be assessed.²⁰ This finding very much corresponds to the understanding of Pitkethly (1999, page 3):

The first questions to be asked of any valuation are: who is doing the valuation?, for whom? and for what purpose?

This particular paper takes a strategic management perspective. i.e., valuation considerations in this paper are not bound by any formal legal constraints as eventually imposed upon by patent laws or accounting standards. Instead, this paper will regard a patent as an asset for a corporation whose value is determined by the value of its underlying technology, its technical, legal, and market uncertainty, and the competition scenario as perceived from the perspective of the patent holder. In that sense, this paper largely shares the point of view that from a

¹⁵ For Germany see for example Vollrath (1983), Assmann (1985), Lehmann (1988), Heil and Roos (1994), and Karnell (1996).

¹⁶ See for example Nordhaus (1967), Gilbert and Shapiro (1990), Klemperer (1990), Scotchmer and Green (1990), Gallini (1992), and Green and Scotchmer (1995).

¹⁷ See for example Scherer (1965), Griliches (1981), and Pakes (1986).

¹⁸ See for example Löcke (1998), KPMG (1999), and Schildbach (2000)

¹⁹ See for example Rivette and Kline (2000)

²⁰ See Reitzig (2002), chapter 4.

¹⁴ See Beier (1978)

corporate perspective patents are best viewed and valued as real options.²¹

However, the paper tries to take the discussion one step further by asking the following questions:

- How can we actually assess the input parameters (e.g. expected cash-flows, volatilities, etc.) when valuing patents as real options?
- And more specifically: How can this task actually be carried out at reasonable costs for large portfolios of patents when a few hundred patents or even more must be evaluated quickly?

From the experience of this author, especially the last question still causes most problems in the daily life of analysts and R&D managers.

To address the first question, the paper briefly reassumes the discussion initiated by Pitkethly (1999) on “Real Options – Patents, Problems, and Solutions”. To come up with suggestions as how to meet the second requirement for suitable patent portfolio valuations, the paper will first make a step back and reconsider fundamental issues for the evaluation of patent rights. In a next step it will elaborate on the state of the art and the anticipated future potential of patent portfolio valuation methods using econometrically validated indicators.

1.1. Real option valuation of patents – Existing practice and associated problems

Pitkethly (1999) mentions three major problems when valuing patents as real options.

1. Determining the current price of the underlying by predicting the present value of cash-flows from the patent,
2. Determining the volatility of the underlying, and finally
3. Allowing for an evaluation that views patents as compound options.

In fact, I consider all of the three problems major issues when discussing the practicability of real options for patent valuations. Besides, I figure that for the particular problem of valuing a patent even the assessment of investment costs and the investment time are often complicated parameters to assess. Or in other words: Assessing any of the parameters entering the Black and Scholes formula (Black and Scholes, 1973) or even more complicated models imposes upon problems in the case of patent valuations.²²

Still, interesting approaches to apply the Black and Scholes (1973) formula to patent valuations have been chosen in the past. Intuitively, market benchmarking is certainly an interesting idea to assess the input parameters that are needed to calculate the value of the patent as an option. By doing so, one implicitly assumes that a spanning traded IP asset or portfolio of assets can be found that shows the same volatility as the underlying of the patent or the group of patents subject to valuation. There exists also substantial empirical evidence that the market value of corporations is correlated with their IP stock.²³ In general, these findings render it plausible to apply market benchmarking to patent valuation.

²¹ Note that *strictly speaking* this paper must not claim to view patents as *real options* because the management perspective of the patent holder introduces a *subjective* dimension to the value. At least in theory, however, a real option should have an *objective value* which does not depend on the perspective of the patent holder. Yet, for the purpose of this paper I will stick to the term real option to express that the value of the patent protected invention is subject to a risk and that the patent holder may decide whether he exercises his exclusivity right or not. I will elaborate on the problem of the objectiveness of the underlying's value in more detail at a later point.

²² See Geske (1979) for a model that takes account of the compoundedness of options. As a matter of fact, the compound option character of a patent is striking. One example of the compound character is mentioned in Pakes (1986). The owner of the patent (option) receives an additional option of renewing his patent after a certain period of time. For the purpose of this paper, I will not go into the details of the problems that are associated with the application of the Black and Scholes (1973) formula to patents because of the compound option character of patents. No formalizations will be presented. It should be kept in mind, however, that the real option valuation of patents might even require more complex models than the one presented by Black and Scholes (1973).

²³ See for example Griliches (1981), Conolly, Hirsch et al. (1986), Conolly and Hirsch (1988), Cockburn and Griliches (1988), Megna and Klock (1993), and Hall, Jaffe et al. (2000)

From a scientific standpoint, however, I still wonder what we can actually say about the specific validity of such approaches to assess patent value.²⁴ Even though there may be various cases in which the approach yields scientifically valid results²⁵, I would be afraid that there is still a substantial number of scenarios in which spanning traded IP assets are hard to find: Patents protecting radical inventions, patents protecting inventions that are exploited by multi-product companies, bargaining patents protecting inventions in highly cumulative technologies, etc. In these cases, it may be difficult to find valid proxies for the present value of the cash-flows and their volatility by searching traded spanning assets.

Validity, however, is certainly only one criterion that affects the suitability of a patent valuation from a corporate perspective. Other criteria are information availability (time constraints) and evaluation costs for assessments. They shall be briefly presented in the next part.

1.2. Suitability criteria for patent valuation methods from a corporate perspective

As mentioned before, this paper takes a strategic management perspective. Here, typical questions for the evaluations of patents might likely sound as follows:

- What is the value of our own IP stock within a certain technology sector? (Controlling)
- What should we charge a certain licensee for the use of a specific group of patents? (R&D Strategy/Marketing)
- What is the maximum prize we should pay for the IP portfolio of a competitor that is for sale? (R&D Strategy)

The questions point at a category of applied management tasks where assessments are needed for groups of patents rather than individual patents. Which could in these cases be the caveats

to the application of market benchmarking as described above?

In many of these cases it might be difficult to find a coherent *spanning* bundle of IP assets to apply real option models in the way it was mentioned above. **Validity may become a problem.** But even if the bundle of patents to be evaluated was so coherent that an application of real option models might be feasible from that point, one might still face problems due to the novelty of the technology. The benchmarking application fails if equivalent stocks of IP assets are simply *not traded yet*. **Information availability may become a problem.** Most importantly, however, it appears to be rather costly to apply a detailed real option based evaluation to each individual IP asset or each sub-dividable bundle of IP assets when assessing the aggregate value of an entire portfolio of patents. **Evaluation costs may become a problem.**

Implicitly, the summary of potential obstacles to the use of existing real option evaluations provides a list of criteria for the suitability of patent assessments from a strategic management perspective. No matter whether groups of patents or individual IP assets are evaluated,

1. **Evaluation validity** is an important criterion. In a variety of scenarios that are relevant from a management perspective, however, different criteria appear crucial, too. Particularly when valuing portfolios of patents,
2. **Evaluation costs** per patent start to play an important role. Besides,
3. Necessary **information** for the evaluation should be **available as early as possible** in the life-time of the patents that are to be valued.
4. Optimally, the necessary **information** should be **publicly available** so that it can be applied for the assessment of competitors' patents as well.

Thus, with respect to the evaluation criteria mentioned above there may exist numerous occasions in which market benchmarking evaluations of patents prove inconvenient or fall short. The question rises which potential methods might satisfy those applied management needs at all. This paper does certainly not aim at giving a final answer. It does not uncover the

²⁴ To the best of my knowledge there exists very little empirical evidence from large-scale scientific studies about the validity of market benchmarking based real option evaluations of patents

²⁵ Such cases may be valuations of patents in discrete product technologies held by one-product corporations (e.g. bio-tech patents held by start-ups).

philosopher's stone, either. Rather than that the paper attempts to make some moderate progress by taking a step back first and then move into another direction which has been paid less attention by practitioners so far.

In the following I will, therefore, first reconsider basic questions such as: What is the value of a patent from a management perspective? And which potential ways exist at all to estimate its value? The first two sections in the next chapter will be dedicated to these two issues. In a next step I will then discuss the use of alternative indicators for patent valuations in more detail.

2. PATENT VALUATION FROM A MANAGEMENT PERSPECTIVE

2.1. A definition of patent value

What is the value of a patent from a management perspective? According to the understanding of this paper a patent's value is not observable. The value of a patent from a management perspective is a theoretical term (as will become clearer in the following). Thus, strictly speaking patent values cannot be "measured" at all. They must be assessed or calculated according to their definition.

What is a suitable definition for patent value? As Harhoff, Scherer et al. (1999) can show, for a majority of empirically relevant scenarios a patent's value from a management perspective is defined best as the difference in discounted future profits the patent holder makes during the remaining life-time of the patent vs. if his/her strongest competitor in the field held the patent.²⁶ This value is often referred to as the "asset value" of a patent.

Equation 1 formalizes this definition in a very general fashion.

$$\text{Patent Value}_{\text{anticipated}} = \hat{E}(\Pi_I^I - \Pi_I^C) = \hat{E}(p_I, q_I, c_I, p_C, q_C, c_C - p_I^*, q_I^*, c_I^*, p_C^*, q_C^*, c_C^*) \quad (1)$$

Legend:

- Π_I^I : Profits of the patent holder if he holds the technology
- Π_I^C : Profits of the patent holder if the strongest competitor held the patent
- p_I, q_I, c_I : Prices charged, quantities sold, and costs incurred by the patent holder
- p_C, q_C, c_C : Prices charged, quantities sold, and costs incurred by the competitor
- p_I^*, q_I^*, c_I^* : Counterfactual prices charged, quantities sold, and costs incurred by the patent holder if the competitor held the patent
- p_C^*, q_C^*, c_C^* : Counterfactual prices charged, quantities sold, and costs incurred by the competitor if he/she held the patent

The assessment of a patent's value according to this definition imposes obvious problems. According to the chosen definition it is not sufficient to calculate the (expected) present value of cash-flows for the patent holder if he/she holds the patent, but they also need to be assessed for a scenario in which the strongest competitor hold the patent. The expected cashflows in the second scenario are, however, counterfactual; i.e. they can never be observed. This is why patent value is a theoretical term.

The question therefore is how the patent's value can be proxied.

Assuming that benchmarking the present value of cash-flows (and its risk or distribution) by looking at spanning IP assets is not possible for the reasons mentioned above, one has to think about different ways of estimating future and partly counterfactual cash-flows and their volatility.

A different approach to value patents is to identify their "value drivers" or operationalizations of those value drivers. Despite its obvious

²⁶ See Harhoff, Scherer et al. (1999). The authors compare asset and renewal values for patents in three different empirically relevant scenarios, namely (a) in a standard scenario where inventions do not build upon each other in a cumulative way and no blocking power can be exerted by the use of patents, (b) a scenario in which inventions build upon each other in a cumulative manner and where blocking power can be exerted, and (c) a scenario in which a patent protects a substitution technology.

downsides²⁷ this methodology has been widely accepted in the field of company valuation where the practical assessment of “real options” is maybe equally difficult as in the case of valuing patents.²⁸ Section 2.2.1. will follow such an approach of an alternative real option valuation using value drivers instead of market benchmarking.

2.2. Assessing patent value without market benchmarking

In this section the understanding of what comprises patent value will be deepened first (2.2.1.). Different value drivers as known from the literature are embedded into a real option framework. The discussion of this value concept is not an end in itself but it shall enhance the reader’s understanding as to how the value of patents should consequently become assessable by value proxies that are operationalizations of the latent value drivers. The latter discussion is presented in section 2.2.2. Along the suitability criteria for patent valuations from a management perspective laid out above the existing theoretical and empirical knowledge of the applicability of these proxies is discussed.

2.2.1. A different “real option” framework for patents

Table 1 compares financial options and real options.

As Reitzig (2002) shows, the existing knowledge on value drivers (or value determinants) of patents can be sub-summarized under a real option framework.

Here, three of the parameters show patent specificities, that is the time to invest in, the present value of project cashflows, and the standard deviation of the project value.

- When talking about patents, the *patent’s duration (or life time)* corresponds to the maximum *time to invest in*.
- The *present value of project cash-flows* should be driven by the *patent’s novelty, its inventive activity (non-obviousness), disclosure, breadth, difficulty in (technically) inventing around, its position within a portfolio of other patents, and the complementary assets of the patent holder*.
- The *standard deviation of the patent’s value (volatility)* should be driven by *technical, legal, and market uncertainty*.

In the following, the central terms mentioned above will be presented briefly. I will quote original sources from the economic literature so that the interested reader can go back to them. It would be beyond the scope of this paper to discuss the preliminary empirical evidence of the importance of all those value drivers in detail.²⁹ Thus, the discussion of empirical results is not carried out for all of the value determinants and is kept short where it is raised at all.

2.2.1.1 Patent duration

Various microeconomic models used to help designing patent systems optimally start from the premise that the economic value of a patent for its holder increases with the patent’s duration. Younger models (see for example Matutes, Regibau et al., 1996) differ from their predecessors (see Nordhaus, 1967) mainly in that they make more realistic assumptions as to the distribution of returns-per-period over time.³⁰

²⁷ From a theoretical standpoint, the value of the underlying of a real option is objective (see for example Laux, 1993). If the real option was traded, the objective value could be calculated from arbitrage considerations. From a theoretical point, assessing the value of the underlying of a real option using value drivers breaks with real option theory. From a practical standpoint, there is often no other way to pursue the valuation of a „real option“.

²⁸ See Copeland, Koller et al. (1994), p. 42-44.

²⁹ For a comprehensive overview see Reitzig (2002), chapter 3.

³⁰ Consistent with the literature on technology cycles (see for example Kotler and Bliemel, 1995) the younger models do not assume that returns-per-period are constant but that returns-per-period are subject to the life stage of the underlying technology.

Table 1. Financial Options and Real Options

Financial Option on Share	Real Option
Time to expiry	Time left to invest in
Exercise price of the option	Investment Cost of Project
Current price of the underlying share	Present Value of Project Cash-flows
Standard deviation of underlying share returns	Standard deviation of the Project value (volatility)
Risk free interest rate	Risk free interest rate

Source: Pitkethly (1999) (slightly altered)

2.2.1.2. Novelty and inventive activity (non-obviousness)

Green and Scotchmer (1995) are the first to introduce “novelty” into an economic model of patent value. As a legal term, novelty is a well-known characteristic to legal scholars and practitioners in the field. Novelty describes the technological distance between a patent-protected invention and the state of the art. Similarly, inventive activity (or non-obviousness) has been well-known to lawyers for long but was officially introduced first by Green and Scotchmer (1995) into the economic discussion.

2.2.1.3. Patent breadth

Klemperer (1990) and Gilbert and Shapiro (1990) were the first to assume that the degree to which a patent protects an invention, namely the patent’s breadth, affects the patent’s value. The authors assume that the patent breadth has a positive impact on the patent value.

2.2.1.4. Disclosure

Green and Scotchmer (1995) assume that disclosing technical information confers a positive externality on the patent-holder’s competitors which the patenting firm might want to avoid. Disclosure should reduce a patent’s value for the owner.

2.2.1.5. Difficulty in inventing around

Patents should exert more blocking power the more difficult it becomes to circumnavigate the

protected invention with a new technology. Gallini (1992) introduced this idea into a formal model for the first time.

2.2.1.6. Complementary assets

Patents protect products or processes. Oftentimes, complementary technology and other complementary assets are needed to commercialize the patent protected invention. Teece (1986) analyzes in more detail in what way the commercial success of an invention depends on the availability of complementary assets.

2.2.1.7. Technical, legal, and market uncertainty

The value of patents is subject to three kinds of uncertainty. Technological uncertainty was first acknowledged by Gilbert and Newberry (1982) in the economic literature on patents. The central idea is that patenting usually takes place at a point where the commercial success of the final product still depends on overcoming future technical obstacles. Next to technical uncertainties market uncertainties matter significantly. Again Gilbert and Newberry (1982) were the first to explicit this aspect in the theoretical economic literature on patents.³¹ Finally, legal uncertainty enters the “volatility” of the present cashflows from a patent. Legal uncertainty differs from the technical and market uncertainty in two ways. At first, it is partly determined by the patent owner. This imposes an additional problem to a real option evaluation of patents in that the volatility becomes endogenous. Lanjouw (1998) was the

³¹ See Gilbert and Newberry (1982), p.521.

first to introduce this issue to the economic literature. Expanding on the model by Pakes (1986) she introduces legal uncertainty that is created by the risk of entering and winning infringement suits. Later studies, such as the one by Harhoff and Reitzig (2001) have taken up the idea in a somewhat different fashion. Secondly, legal uncertainty may hardly affect the value of the underlying in an upward fashion but the other way around (validity suits or infringement suits). Thus, it is questionable to what extent legal uncertainty affects the value of the option at all.

2.2.1.8. Empirical evidence – the importance of value drivers depending on the use of the patents

Talking about the empirical evidence a distinction needs to be made between the types of empirical evidence that exist for the time being – studies using expert ratings and studies using alternative measures both to proxy patent value and value drivers. To the best of my knowledge only one empirical study has been published that directly relates expert ratings of various value determinants to patent values. In this study, estimated values of 127 semiconductor patents were regressed on expert ratings of the various value drivers. For this very particular sample it turned out that the novelty and the inventive activity were highly correlated with the patents' values as predicted by the experts. The difficulty in inventing around and the disclosure turned out to be of minor importance. Due to the research design, the impact of other characteristics could not be assessed.³² Interestingly, the results of the study showed, however, that the disclosure of the patents had a positive impact on the patents' values. This particular finding emphasizes the importance to distinguish between different "uses" or modes of exploitation for patents when referring to value drivers for assessments. As well known from the literature, patents may serve various purposes. Until about twenty years ago, it was assumed that patents would dominantly be used to exclude competitors from the use of their technology. As a matter of fact, Harabi (1995) and Cohen, Nelson et al. (2000) do find empirical evidence for this traditional assumption until today. However, in recent years the literature also revealed that patents may serve other purposes.

³² See Reitzig (2001a).

Rahn (1994) underlines the importance of patents as a means to "exchange technology" with competitors. In a survey of the American semiconductor industry, Hall and Ham-Ziedonis (2001) reveal that the main motives for patenting in the field are triggered by negotiation considerations. Thus, the findings by Reitzig (2001a) have to be put into perspective. Disclosure may exert positive externalities for a semiconductor company participating in a patent pool with major players in the field in that disclosing technical know-how conveys the impression of competence to potential negotiation partners. On the other hand, it may have negative externalities for chemical corporations that do not participate in patent pools and are rather interested in hiding as much of their technology from competitors as they can.³³

Indirect empirical evidence for the validity of patent duration as a value driver was provided in two large-scale empirical studies by Schankerman and Pakes (1986) and Lanjouw, Pakes et al. (1996). Schankerman and Pakes (1986) use the observable renewal decision by patent holders from Germany, the United Kingdom, and France between 1955 and 1978 as the dependent variable within a structural estimation model that regards the renewal decision as an investment decision. Their data set comprises 1.7 million renewal decisions. The findings show that the overall value of a patent (from grant to lapse) increases nonlinearly with its age.³⁴ Comparable to the work of Schankerman and Pakes (1986) is the study by Lanjouw, Pakes et al. (1996). The authors analyse renewal decisions for German patent cohorts between 1953 and 1988. The data set consists of more than 20.000 observable renewal decisions. The results by Lanjouw, Pakes et al. (1996) are comparable to the ones by Schankerman and Pakes (1986).³⁵

Indirect empirical evidence for the validity of novelty as a value driver is provided by a study carried out by Carpenter, Cooper et al. (1980). By showing that patent references to the scientific literature made during the examination procedure

³³ See Reitzig (2002) chapter 7 for some preliminary empirical evidence that disclosure may also have negative effects on a patent's value in the chemical industry.

³⁴ See Schankerman and Pakes (1986), p. 1073.

³⁵ See Lanjouw (1998), p. 697.

(see below for more details) are correlated with patent value they do sustain the assumption that novelty is a value driver of a patent.

Some very preliminary empirical evidence exists on the importance of the inventive activity as a value driver for patents. In a study of 613 European chemical patents Reitzig (2002) can show that indicators which plausibly operationalize the inventive activity of a patent are correlated with the patents' values.

Some preliminary empirical evidence also exists on the validity of patent breadth as a value driver of patents. Lerner (1994) showed that the value of American biotechnology firms increases with the 'scope' of the patents they hold. Lerner measured 'scope' by the number of four-digit IPCs assigned to the patents in his sample. Arguing that the number of four-digit IPCs proxies for the breadth of the patent he sustains the theoretical assumption that patent breadth is positively correlated with patent value. Moreover, patent claims (see also below) should theoretically reflect a patent's breadth as well. By showing that patents weighted by their claims correlate with macroeconomic measures of national performance, Tong and Frame (1992) yielded some very first empirical evidence that patent breadth is another patent value driver. Lanjouw and Schankerman's (2000) findings that the likelihood of a patent being litigated increases with its number of claims again sustain that patent breadth may be an important value determinant of the patent.³⁶

Finally, some empirical evidence exists for the importance of technical and market uncertainty. In a study published by the EPO in 1994, European patent applicants mention that in 7% of the cases when they decide against filing for a patent technical uncertainty affects their decision.³⁷ For Japanese applicants this is true in 14% of the cases.³⁸ The study also reveals that in

20% of the cases when European applicants decide against a filing market uncertainty affects their decision-making (for Japanese applicants this figure goes up to 31%).

2.2.1.9. An interim conclusion

Patent value is a theoretical term which is difficult to calculate. Real option assessments of patents are appealing in that they take into account the limited life-time of a patent and the uncertainty about expected cash-flows. Practical problems are imposed upon by the estimation of cashflows and their volatility. Market benchmarking appears to offer an interesting approach to assess patent value in some but not in all cases. An alternative approach is to assess the value determinants of a patent. Since most of these value determinants are latent constructs they must be operationalized for a "measurement". Assessments of patents using value indicators may offer an interesting alternative approach to the valuation of patents.

2.2.2. Indicators of patent value

As mentioned above the discussion of value drivers and embedding them into an option framework was not an end in itself. This paper ultimately addresses the question how the value of patents – and large portfolios of patents in particular – can be assessed to serve applied management needs. Recalling the suitability criteria derived initially, valuations need to be scientifically valid, they should be executable at any time and for any type of patent portfolio (in-house and competitors), and they should not be costly.

One approach is to use indicators of patent value that are generated by the patent system itself. According to the framework developed in 2.2.1. such indicators are either valid if they operationalize one (or more) of the value drivers or if they refer directly to the present value of cash-flows from the patent (expected prizes, quantities, costs). Figure 1 illustrates the different types of validity for value indicators according to the understanding of this paper.

³⁶ Note: As Lanjouw and Schankerman (2000) point out, claims also mark potential points of disputes; thus, their theoretical interpretation is more difficult than suggested above. Claims may refer to both, the *legal robustness* and the *breadth* of a patent simultaneously. Therefore, they may operationalize opposing effects at the same time. Thus, their suitability to empirically buttress breadth as a value determining parameter is limited.

³⁷ See o.V. (1994), p. 109

³⁸ See Ibid., p. 110

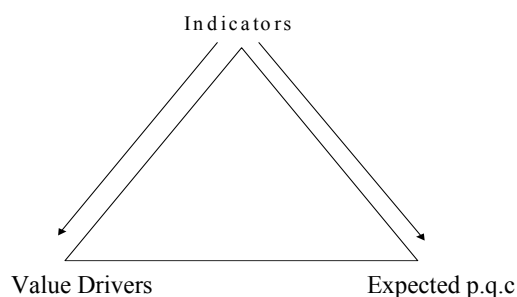


Figure 1: Ways to use indicators for patent valuations

This section will summarize the existing knowledge on the suitability of patent value indicators that are generated by the patent system itself.³⁹ The next section will then discuss issues as to how indicator assessments can actually be carried out, and it will also discuss the challenges of applying indicator valuations for the time being.

2.2.2.1. Empirically tested patent value indicators

Reitzig (2001b) presents a tabulated survey of the existing scientific empirical studies examining the correlation between a patent's value and patent information indicators. Studies are characterized by the underlying sample size, the underlying statistical/econometric model, the latent variable used as a correlate for the patent's value, and the resulting type of validity. The survey shows that many of the studies do not validate indicators of patent value directly. This is due to the fact that in many of the studies the dependent variable of the analysis is not the patent value itself but a value correlate. As a matter of fact, this renders the discussion of the empirical results difficult at times when trying to interpret the correlation between an observable indicator and the patent's value. To a certain extent it appears possible to draw some general conclusions about the validity of the variables tested as indicators of patent value.

In the following I will first very briefly describe what the certain variables mean and refer to the studies in which they were tested as patent value

³⁹ For a comprehensive discussion see Reitzig (2002) chapter 4.

correlates. In the next section I will summarize the findings on their suitability as indicators of patent value. I will report on their validity⁴⁰, their availability, and the costs of computing them.

2.2.2.1.1. Backward citations

US and EP patents are examined before grant. Novelty and inventive activity (non-obviousness) are patenting requirements. In practice, patent examiners judge the fulfilment of these requirements by looking at the state of the art as reflected in existing publications, amongst others former patent documents. Relevant state of the art documents are quoted by patent examiners and are published with the patent application in examination. These documents are called backward citations. Backward citations were tested in the following studies: Carpenter, Cooper et al., 1980; Narin, Noma et al., 1987; Lanjouw and Schankerman, 2000; Lanjouw and Schankerman, 1999; Harhoff, Scherer et al., 1999; Harhoff and Reitzig, 2000.

2.2.2.1.2. Forward citations

The term forward citation refers to the number of times a granted patent is quoted as relevant state of the art during the examination of subsequently examined patents. Forward citations were tested in the following studies: Narin, Noma et al., 1987; Trajtenberg, 1990; Lanjouw and Schankerman, 1999; Albert, Avery et al., 1991; Harhoff, Scherer et al., 1999; Harhoff and Reitzig, 2000.

2.2.2.1.3. Family size

Family size describes some measure for the number of states in which a patent is valid. Family size was tested in the following studies: Lanjouw, Pakes et al., 1996; Lanjouw and Schankerman, 1999; Guellec and van Pottelsberghe de la Potterie, 2000; Harhoff and Reitzig, 2000.

⁴⁰ It needs to be said clearly, however, that none of the studies listed in Reitzig (2001b) actually used a structural econometric model allowing for a test of validity of certain variables as indicators of distinct input parameters of a real option valuation. The empirical evidence existing as of today is not as detailed which is reflected in the state of the art of valuing patents with indicators (see 2.2.3.3.) and brings up future challenges, too (see 3.).

2.2.2.1.4. *Scope*

The scope variable is supposed to capture a patent's breadth. The scope variable was tested in the following studies: Lerner, 1994; Harhoff, Scherer et al., 1999; Harhoff and Reitzig, 2000; Lanjouw and Schankerman, 2000.

2.2.2.1.5. *Patent ownership*

The patent ownership variable describes who holds the property right. In many studies, the variable was used to distinguish between individual and corporate ownership. Ownership was tested in the following studies: Lanjouw and Schankerman, 2000; Harhoff and Reitzig, 2000; Guellec and van Pottelsberghe de la Potterie, 2000.

2.2.2.1.6. *The number of claims*

The number of claims is supposed to capture the breadth of the patent. Either as an absolute number or as a weighting factor it was tested in the following studies: Tong and Frame, 1992; Lanjouw and Schankerman, 1999; Lanjouw and Schankerman, 2000.

2.2.2.1.7. *The patenting strategy (mode of filing)*

Patents can be filed in different ways. On an international level, an application via the so-called PCT route is an alternative mechanism to applying separately in various jurisdictions. Different strategic rationales are associated with the different modes of filing.⁴¹ The mode of filing/patenting strategy variable was tested in the following studies: Guellec and van Pottelsberghe de la Potterie, 2000; Reitzig, 2002.

2.2.2.1.8. *The number of applicants*

Patents can be filed by more than one applicant. The variable was tested in the study by Guellec and van Pottelsberghe de la Potterie (2000).

2.2.2.1.9. *The number of trans-border research cooperations*

Applicants can have different nationalities. From this information a variable can be computed that reflects whether the patent application is the product of a trans-border research cooperation. This variable was tested in the study by Guellec and van Pottelsberghe de la Potterie (2000).

2.2.2.1.10. *Key inventors*

According to Lotka (1926) a small 'elite' of (key) inventors accounts disproportionately much for the scientific output of a corporation. A variable referring to key inventors was tested in a study by Ernst, Leptien et al. (2000).

2.2.2.1.11. *Legal disputes (oppositions against patents)*

EP patents can be legally "attacked" in an opposition procedure up until nine months after their date of grant. This variable was tested in the study by Harhoff, Scherer et al. (1999).

2.2.2.2. Indicators and their suitability for patent valuations – an interim summary

With respect to the validity of the tested variables as indicators of patent value, their availability, and the costs associated with the computation of the indicator I come to the following conclusions⁴²:

Backward Citations have been tested as indicators for patent value in the past. The main distinction needs to be made between patent and non-patent citations. Based on theoretical considerations and results from various empirical studies in the field it seems as if both backward citations to the patent and non-patent literature operationalize novelty and they should therefore be valid correlates of a patent's value. Besides, the attractiveness of a technological field should also be reflected in the number of citations to the patent literature. Nonetheless, the studies also show that correlations between a patent's value and backward citations are not always straightforward which somehow limits their applicability.

⁴¹ See Reitzig (2002) for more details.

⁴² See Reitzig (2002), chapter 4 for a comprehensive discussion.

Backward citations can be compiled for in-house patent portfolios and competitors' portfolios alike. They are available early in the life-time of a patent (after the publication) and are available at low cost (electronically stored in data banks).

Forward Citations belong to the indicators that have been examined most extensively in the literature. Based on theoretical considerations and results from various empirical studies in the field it appears as if forward citations were valid correlates of patent value. Patents that are cited more often in subsequent examinations than others should – on average – have a higher technical and therefore economic value. Forward citations appear to operationalize inventive activity, too. Forward citations can be calculated from publicly available sources and are therefore applicable to in-house evaluations as well as for the evaluations of competitor patents. The downside of forward citations is that they are not available until substantial time after grant. Usually a time window of at least four to five years seems reasonable when computing forward citations. Thus, they are not really suited for the evaluations of patents at a very early stage in their life-time. Computation costs for this type of indicator are low.

Until today, **family size** has been tested as an indicator of patent value in several empirical studies. Based on theoretical considerations and results from various empirical studies in the field it appears as if the family size was a valid correlate of patent value. From a theoretical standpoint it makes sense to assume that patent applicants are only willing to incur the increased application costs (that are associated with the number of states of protection) if they expect corresponding returns from the patent. Regarding the information availability, family size may show certain disadvantages over the other indicators mentioned before. Despite the public availability of the information necessary to compute the indicator I am afraid that little variation may be seen along this indicator within certain corporations that file patents in standard countries only. Finally, the indicator is available early during the lifetime of a patent and is computable at low cost.

Scope has been tested as an indicator for patent value in a series of studies. To me its theoretical

foundation is questionable as the number of four-digit IPCs may well reflect the multi-functionality of a patent but not necessarily its breadth. It has not come out as a significant correlate of patent value in about half the studies mentioned above, either. Regarding its availability, the indicator appears attractive because it can be computed directly after the publication of the granted patent. Since it is electronically available, compilation costs are low.

Patent Ownership is an appealing variable for whose validity preliminary empirical evidence exists. From a theoretical perspective it is plausible to assume that corporate patents may be more valuable (especially in research intense industries), however, the rationale is less convincing than for other indicators (for example forward citations). Since the ownership information is available early in the life-time of the patent and computable at low costs the indicator may be interesting where it shows variation (it might not show enough variation when looking at the portfolio of just one corporation).

The number of claims are interesting as an indicator of patent value for various reasons. From a theoretical standpoint there is good reason to believe that they reflect the present value of the cashflows from the patent by operationalizing its breadth. At the same time the pure number of claims is a measure that is not all convincing. Claims are also difficult to assign to only one input parameter of a Black-and-Scholes based real option valuation of a patent (see below). Preliminary empirical evidence for their validity as a value indicator, however, exists. As far as their availability and computation costs are concerned, they used to be somewhat less attractive than the other indicators because until recently they were not electronically available. This has changed now.

As interesting as the number of claims is **the patenting strategy (mode of filing)** as an indicator of patent value. From theoretical standpoint it makes much sense to believe that the value of cashflows from a patent as anticipated by its owner should be reflected by the owners' choice of the filing mode (different cost

structures, timing issues, etc.).⁴³ Until now, however, there exist only two empirical studies validating patenting strategy variables as indicators of patent value. Depending on the type of variable computed, they may not be available until 29 months after grant (PCT II). The information necessary to compute the indicator is electronically available.

Very little empirical evidence exists on the validity of **the number of applicants, number of trans-boarder research cooperations, and key inventors** as patent value indicators. Thus, I will refrain from a discussion of these indicators at this stage but finally discuss the suitability of **oppositions** as indicators of patent value. Even though they have not been validated in more than one study, either, they appear to have great potential as indicators of patent value. Expanding on a model by Lanjouw and Lerner (1997), Harhoff and Reitzig (2000) can show that also from a theoretical standpoint oppositions should clearly be correlated with the anticipated cashflows from a patent. The major downside of the indicator is that it is not available until 9 months after grant and that it not only proxies the present value of cash-flows but also the legal uncertainty of the patent option.

Summarizing the discussion above the following may be stated. A variety of indicators of patent value have been successfully validated in the past. They differ in their availability in time and – to some lesser extent – in their computation costs.

Thus, at first sight it appears as if patent valuations using indicators from the patent system should be a straightforward task. As a matter of fact, however, the lack of scientific knowledge with respect to the variety of effects that may be reflected by an indicator still imposes problems as will become clearer in the next part.

2.2.3. Assessing the value of patents with indicators

Until this point it was the purpose of this paper to show that alternative measures to a market benchmarking exist that can also be used for the assessment of patents and that might satisfy company's applied needs better when valuing

patents and patent portfolios.

But how can indicators actually be used for patent assessments and why should indicators be particularly suitable for the evaluation of portfolios?

2.2.3.1. A sophisticated patent valuation using indicators – the final goal

Theoretically, a sophisticated patent evaluation using indicators could look like this:

1. Identify relevant indicators for the patent(s) to be valued.
2. Assign the different indicators to the calculation of the present value of cash-flows and their volatility respectively.
3. Choose an algorithm for the calculation of the present value of cash-flows and their volatility through indicators (functional form, weights).
4. Calculate the value of the individual patents using the Black and Scholes (1973) formula.

In the case of a portfolio evaluation:

5. Calculate the portfolio value based on the information about the individual patents⁴⁴

Unfortunately, in practice we are still far away from this. As a matter of fact, a patent valuation using indicators these days is still rather rudimentary with respect to most of the steps.

This is due to lacking scientific knowledge as to how several of the steps mentioned above can be carried out correctly. In the following, I will first briefly show where the obstacles to carrying out a scientifically sophisticated valuation using indicators lie. I will then move on to describing the existing practice and I will explain why

⁴³ For a detailed discussion see Reitzig (2001c).

⁴⁴ Note that this can be a tricky exercise because option values are not always purely additive. Thus, the option value of the portfolio will not necessarily be the aggregate option value of the individual patents. Consider two patent portfolios in which the individual patents have equal absolute option values. In one portfolio, however, the options are interrelated, in the other they are not. Then, the portfolio values of the two different portfolios will differ. The simple addition of the option values of the individual patents would lead to a useless result for the portfolio value in the case of interrelated options.

indicator assessments provide interesting alternatives in various assessment cases already today despite the existing shortcomings.

2.2.3.2. Obstacles to indicator valuations from a theoretical perspective

2.2.3.2.1. Identification of the “right” indicators

How to choose the “right” indicators for the evaluation of a particular patent or group of patents is a difficult task. Even though there is substantial empirical evidence that supports the hypotheses that backward citations, forward citations, family size, and other indicators are correlated with a patent’s value it will be easy to find particular portfolios of patents where this is not the case.⁴⁵ As of today, companies will usually take a representative (historical) test portfolio whose value has been known to validate the significance of certain indicators for their own purposes. Obviously, this imposes various additional problems the most dominant of which may be to assess the value of the test portfolio and to find a representative sample.

2.2.3.2.2. Assigning the different indicators to the input parameters of a real option assessment

Despite the variety of empirical studies that have been carried out (see 2.2.2.1) very little is actually yet known on the multitude of effects that are reflected by certain indicators. None of the studies mentioned in 2.2.2.1 validates indicators of patent value within a structural model that would allow to separate out the correlations between certain indicators and the present value of patent cash flows from those between the indicators and the volatility of the underlying. Nevertheless there is good reason to believe that a substantial amount of indicators is correlated with both, cash-flows and volatility.⁴⁶ Thus as of today

⁴⁵ Reitzig (2001b) describes that for the evaluation of a corporate patent portfolio of 90 semiconductor patents various ‘established’ indicators did not turn out to be significantly correlated with the patents’ values. Forward citations were significant, family size and backward citations were not.

⁴⁶ Take the following as an example: Family size may operationalize the breadth of a patent and it may therefore be positively correlated with the present value of the cash-

it appears scientifically questionable to assign indicators to the different input parameters of the Black and Scholes formula.

2.2.3.2.3. Functional form and weights of indicators

A comparable problem to the assignment of indicators to the different input parameters of the Black and Scholes (1973) formula takes place at a different step of the valuation process, too. As of today little is known whether indicators add up linearly in their explanatory power to predict the present value of the cashflows or not. Most of the studies described in 2.2.2.1 validated indicators in the reduced form. This does not mean, however, that a simple addition of the indicators will be the most convenient way to assess the input parameters for the real option assessment. Besides, weights of indicators may vary substantially across industries and companies. Little is known on what one forward citation, on backward citation or an opposition may reveal about the economic value of a patent. The following extract from the empirical results is incomplete and is meant to convey a general impression only.

The study by Albert, Avery et al. (1991) suggests that the ‘marginal returns’ of an additional forward citation to a patent are increasing more than linearly. On a ordinal scale an increase from 7 to 13 forward citations is associated with an increase in the value of the patent roughly by factor 6. Lanjouw and Schankerman (1999) suggest that weights for indicators have varying importance for the patent quality index across industries. From their factor analysis using United States patents they deduct that forward citations enter the patent quality index with a weight of 39% in chemistry and drugs but only 26% in mechanics. Family size enters with a relative weight of 11% in drugs and chemistry and 18% in electronics and mechanics. Backward citations enter with a relative weight of 35% in drugs, 28% in chemicals, and 18% in electronics and mechanics. In another study, Harhoff, Scherer et al. (1999) find that DE patents of the 1977 cohort that were renewed to full term were on average

flows. At the same time patent breadth may be positively correlated with a patent’s probability to be invalidated or amended (legal volatility)

11.2 times more valuable when they received (and survived) an opposition by a third party.

2.2.3.2.4. Portfolio effects

Finally, when trying to assess a portfolio's value with indicators referring to individual patents it seems hardly possible to model interrelations between the option values of the individual patents at this stage. For example: to the best of my knowledge nothing is known on the impact of the average number of backward citations of the patents in one sample on the value of an additional forward citation of one individual patent in the same sample.

2.2.3.3. Existing practice

To the best of my knowledge, for the time being indicator assessments in practice are carried out in the following way.

- Indicators are compiled for each patent within the portfolio that is subject to valuation.
- A weight is assigned to each indicator.
- The values of the individual patents are calculated by adding up linearly the weighted size of each indicator.

In the case of a portfolio evaluation:

- The portfolio value is calculated as the sum of the individual patents' values.

In practice, indicator assessments differ with respect to the number and types of indicators chosen for the assessment and with respect to the assignment of the weights. In some cases, the weight of certain indicators is determined by calibrating them at a test portfolio of patents whose value is known from other sources. In other cases, a factor analysis of indicators yields the weights of each proxy.

Obviously, assessments of this type show tremendous shortcomings from a scientific standpoint. The obstacles to a proper application of a real option framework as mentioned above made this point very transparent. The existing obstacles do in fact define various future research tasks (see below for a summary).

Still, I argue that there are several scenarios in which even the existing indicator valuation approaches offer an interesting alternative to other methods from a corporate perspective.

Even though indicators of patent value have not yet been validated in structural models that would allow to assign the indicators optimally to profound valuation algorithms, the validity of those indicators as patent value correlates in general can hardly be doubted. Recalling section 2.2.2.2 it becomes clear that many of them can be recommended for the assessments of portfolios comprising "young" property rights (i.e. property rights which were granted only shortly before the evaluation). Finally, the indicators can be compiled at low costs.

Thus, existing indicator assessments can preferably be considered an interesting alternative in cases when:

- Large portfolios of patents need to be valued
 - Here, the cost advantage of an indicator assessment over other types of valuations increases.
 - Besides, the relative evaluation error for the entire portfolio decreases compared to the relative error of each individual patent.
- The evaluated portfolios are not subject to high legal or market uncertainty
- The evaluated portfolios consist of rather interrelated patents
- It is difficult to find comparable traded IP portfolios.

3. SUMMARY AND FUTURE CHALLENGES

This paper started from the premise that from an strategic management perspective valuations of patents using real options should theoretically yield the most suitable assessment results. Consistent with Pitkethly (1999) it argued that in practice real option valuations of patents impose problems because it is especially difficult to assess the present value of cashflows from the patent and the volatility of the cashflows. The paper tried to lay out that according to a series of criteria determining the suitability of patent assessments from a management perspective market benchmarking may not always be a convenient way to assess the input parameters for a real option assessment. It was argued that

problems using market benchmarking might particularly occur in cases where it becomes costly to find spanning traded IP assets. This might especially be the case for portfolio valuations when several different spanning IP assets need to be found for the individual patents within the portfolio. The paper tried to show that alternative approaches to the assessment of the present value of the cashflows and the volatility of the cashflow could offer interesting alternatives in cases where market benchmarking falls short. Reviewing the literature on the determinants of patent value (value drivers) it was shown that a patent's present value of cashflows is driven by the patent's novelty, its inventive activity (non-obviousness), breadth, disclosure, difficulty in inventing around, and the availability of complementary assets. Equally, it was argued that the volatility is determined by technical, market, and legal uncertainty. Reviewing the empirical literature on patent indicators the paper then presented existing knowledge on how the present value of cashflows may become subject to an assessment by indicators (that correlate directly with expected cash-flows or operationalize latent value drivers). An overview over the best-known and scientifically validated indicators was presented in 2.2.2.2. Referring to the actual state of the art in assessing patents using indicators from the patent system the article presented the existing shortcomings of current practice as of today, such as the problem of assigning weights to indicators or assigning indicators correctly to the input parameters of a real option valuation. Despite their shortcomings, however, simplistic indicator evaluation as carried out in practice today already provide a value added to the management in various cases. They are especially appealing in scenarios where large portfolios of patents need to be evaluated quickly on a regular basis.

As mentioned before, several future challenges exist for researchers and practitioners seeking to improve existing valuation approaches from a management perspective. Some of the points had

already been touched in the section 2.2.3. Refining indicator evaluations provides challenges to econometricians working with patent data. From an applied point, I would consider research projects "useful" that address the question of how different indicators from the patent system can be validated either as indicators of the present cash-flows of a patent and/or the volatility of the cash-flows.

Extending our empirical knowledge on the validity of certain indicators across industries and patent uses might be another rewarding task for researchers working in the field.

The use for additional indicators accessible from public data sources would be a third task for researchers trying to enhance the power of prediction tools for patent valuations. Here, special attention should be paid to validating indicators that operationalize latent value drivers. With an eye on related future issues (such as IP accounting) it might be especially rewarding to uncover indicator variables that are not endogenous from the perspective of the patent holder.

A fourth issue to be addressed by researchers is the question of valuing synergies between individual patents within portfolios. To the best of my knowledge, as of today most of the portfolio valuation approaches sum up the values of the inherent individual patents (or subgroups of patents). Obviously, in that way synergistic effects between individual patents that have an impact on the portfolio's value as a whole cannot be illustrated.

Along the same line of thought but on a somewhat higher level it may be a crucial (fifth) task to consider potential synergies between different types of intellectual property rights. The value of an individual patent may be significantly affected by the (lack of) support of a strong brand.

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CAPITAL INTERCONVERTIBILITY IN COMPLEX ORGANIZATIONS

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Identifying various capital species in use and understanding how to convert them into more tradable forms of capital is a complex task. In this paper, we discuss how unique knowledge and relational skills have facilitated capital conversion to nurture innovation and growth in a Scandinavian telecommunication corporation. The core of our discussion is to explore the parts and the process that drives the transformation of capital species, and to show how one organization made sense of their historical knowledge based value creation processes to develop a new integrated business model based on intangible capital forms.

1. INTRODUCTION

It is clear in most research that we know more about the parts than the interaction between the parts. That is true for DNA research, physics and chemistry, and it is true for knowledge based value creation in organizations and communities. In this paper we want to investigate the knowledge based value creation phenomenon from a flow perspective, looking at the connections between and across capital forms and indicators. The goal of this paper is to discuss how intangible capital species convert into new (appropriable) forms of capital. This phenomenon will be described as “capital interconvertibility” and the underlying research question is: *What drives knowledge-based value creation in complex organizations?* We argue that it is the process of capital interconvertibility that everybody is struggling with to release the true value of intellectual capital. A renewed focus on capital species has emerged through the work on intangibles and intellectual capital the last 5 years. The discussion has often been locked up in one field, such as accounting, economics or sociology, but the intellectual capital discussion has moved the discussions across fields. Since we, the authors, have economic backgrounds

(economy, finance and accounting) we have decided to integrate concepts and language from sociology to investigate new inputs to the discussions on knowledge based value creation, intangibles and the notion of the transparent organization.

This paper will introduce the theoretical framework of the French sociologist Pierre Bourdieu, notably his categorization of capital species (Bourdieu, 1983), seen through organizational lenses, and relate these to concepts and recent work on social capital (Adler and Kwon, 2002) and intellectual capital. We have today very limited knowledge on how intangibles are created and developed, and how they contribute to innovation, growth and wealth creation, and how they are used and destroyed. This is mainly due to the lack of available data on intangible investments by public and private organizations. In our view the only way to get such data is to investigate one organization in detail over a long period of time. The case presentation is based on a retrospective case study and a participatory action research project on knowledge based value creation in a Scandinavian telecommunication corporation. Before entering into the case we discuss different capital forms, and how they convert from one form to another. Building on the theoretical constructs from the first part, the notion of capital conversion will be illustrated through case stories centred on value creating periods or moments.

This section is concluded with a presentation of the intellectual capital model that developed in the organization. Before the conclusions, we discuss relational capital, capital interconvertibility and value drivers using constructs from the case and literature.

2. CAPITAL SPECIES AND CONVERSION

The French sociologist Pierre Bourdieu comes close to capturing the complexity embedded in knowledge based value creation since he recognizes multiple species of capital. He recognizes processes in which they develop, and discusses how they convert from one form to another.

Elaborating and extending the idea of the social and relational aspects of capital rooted in Marxian historical materialism, Bourdieu argues that there are species of capital beyond material or economic capital that are of equal, if not greater, significance because they are misrecognized for what they are.

2.1 Capital Species

Depending on the field in which it functions, and at the cost of the more or less expensive transformations which are the precondition for its efficacy in the field in question, Bourdieu holds that capital can present itself in three fundamental guises:

1. Economic capital, which is immediately and directly convertible into money and may be institutionalized in the form of, for example, property rights;
2. Cultural capital, which is convertible, on certain conditions, into economic capital and may be institutionalized in the form of, for example, educational qualifications; and
3. Social capital, made up of social obligations ("connections"), which is convertible, in certain conditions, into economic capital and may be institutionalized in the form of, for example, a title of nobility.
4. Bourdieu's symbolic capital is in a sense his equivalent to intellectual capital. Symbolic capital is capital in whatever form insofar as it is represented, apprehended symbolically, in a relationship of knowledge i.e., unrecognized as capital and recognized as valuable legitimate knowledge resources.

Bourdieu's different forms of capital and their different states. The terms used by Bourdieu to

describe fields and their properties such as 'market', 'capital', 'profit', etc. are terms borrowed from the language of economics, but they are adapted for the analysis of fields which are not 'economic' in the narrow sense. This is a point on which Bourdieu can be easily misunderstood. One may get the impression that, when Bourdieu uses these terms to analyse forms of interaction which are not strictly economic transactions, he is treating these forms of interactions as if they were economic transactions and nothing more. Similarly, one may get the impression that Bourdieu's approach involves a kind of economic reductionism. We understand his view as that the practices we describe today as 'economic' in the narrow sense (e.g. buying and selling commodities) are a sub-category of practices pertaining to a specific field or cluster of fields which have emerged historically, such as the 'knowledge economy', and which displays certain distinctive properties. But there are other sub-categories of practices which pertain to other fields of literature, art, politics and religion; and these other fields are characterized by their own distinctive properties, by distinctive forms of capital, profit, etc. (Bourdieu, 1983)

Bourdieu does not wish to reduce all social fields to the economy in the narrow sense, nor to treat all types of practice as strictly economic transactions. On the contrary, he advocates treating the economy in the narrow sense as one field (or cluster of fields) among a plurality of fields which are not reducible to one another. The different forms of capital included in Bourdieu's work are closely related to similar concepts in knowledge management and intellectual capital fields, but are in many ways more open and including. Where we have traditionally talked about knowledge management and governance systems to gain control over knowledge resources Bourdieu is focused on knowledge sharing and circulation of intangible resources, but at the same time he also holds that non-economic capital forms should be reducible to economic capital.

2.2 Cultural capital and conversion

In Bourdieu's work the notion of cultural capital is presented as a theoretical hypothesis which makes it possible to explain the unequal scholastic achievement of children originating

from different social classes by relating academic success. In his differing scholastic achievement example Bourdieu (1983) accuses economists of neglecting to relate scholastic investment strategies to the whole set of educational strategies and to the system of production strategies.

They let slip the best hidden and socially most determinant educational investment, namely the domestic transmission of cultural capital. The (economic) studies of the relationship between academic ability and academic investment show that they are unaware that ability or talent is itself the product of an investment of time and cultural capital (Becker 1964a, p. 63-66). Not surprisingly, when evaluating the profits of scholastic investment, economists can only consider the profitability of educational expenditure for society as a whole, the "social rate of return," or the "social gain of education as measured by its effects on national productivity" (Becker 1964b, pp. 121, 155).⁴⁷ This suggests that "cultural capital investments" have an aggregate and bundled return and cannot be disaggregated into identifiable and itemized returns on every part that make up the investment. To development an understanding one has to identify the parts, but at the same time be aware of how the parts interact and often "operate" in bundles. Cultural capital is in itself a complex bundle of capital features, and according to Bourdieu (1983) cultural capital can exist in three states:

1. The *embodied* state in the form of long-lasting dispositions of the mind and body. Most of the properties of cultural capital can be deduced from the fact that, in its fundamental state, it is linked to the body and presupposes embodiment.
2. The *objectified* state in the form of cultural goods such as pictures, paintings, monuments, books, dictionaries, instruments, machines,

etc. It has a number of properties which are defined in the relationship with cultural capital in its embodied form. The cultural capital objectified in material objects and media is transmissible in its materiality.

3. The *institutionalized* state, a form of objectification which must be set apart because it confers entirely original properties on the cultural capital which it is presumed to guarantee. It can for example be seen in the case of educational qualifications.

The conversion of cultural capital establishes only the value, in terms of cultural capital, of the holder of a given qualification relative to other qualification holders. The accumulation of cultural capital in the embodied state presupposes a process of embodiment or incorporation. It implies a labour of time which must be invested personally by the investor. Like the training of a muscular physique or to work up a suntan, it cannot be done at second hand.

Cultural capital might be exchanged into monetary value in the labour market, and the uncertainty tied to cultural capital forms and its value depends also on its scarcity. The investments made, in time and effort, may turn out to be less profitable than was anticipated when they were made.

One could argue that there has been a de facto change in the conversion rate between institutionalized cultural capital (e.g. academic qualifications) and economic capital. Academic investments have no meaning unless a minimum degree of reversibility of the conversion it implies is objectively guaranteed. The strategies for converting economic capital into cultural capital, which are among the short-term factors of the schooling explosion and the inflation of qualifications, are governed by changes in the structure of different types of capital. (Bourdieu, 1983)

The initial exchange is related to exploring boundaries, and whether the organization can provide free time to explore is a precondition for capital conversion. The link between economic and cultural capital is established through mediation of relations and the time needed to understand and capitalize on the differences. Differences in cultural capital possessed by an organization imply differences already from the

⁴⁷ Gary S. Becker was one of the first to take explicit account of the types of capital that are usually ignored. We seldom consider anything other than monetary costs and profits, forgetting the non-monetary investments and the material and symbolic profits that for example education provides in an indirect way, such as the added value which the dispositions produce or are reinforced by schooling (bodily or verbal manners, tastes, etc.) or the relationships established with fellow students which can yield results in the matrimonial market (Becker 1964a).

start-up phase where the work of transmission and accumulation begins. The social conditions for cultural capital conversion are more disguised than those of economic capital. The structure of the relations, the scarcity of non-economic capital and unequal distribution is the source of the specific effects of different capital forms. In a sense, the intangible capital investors are competing for the scarce goods and through it value is generated. Identifying and communicating non-economic forms might not have any value unless the organization can objectify some degree of conversion among the capital forms.

2.3 Social capital and conversion

Social capital is the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition. (Bourdieu, 1985) In other words, membership in a group provides each of its members with the backing of a collectivity-owned capital form, a "credential" which entitles them to credit, in the various senses of the word. According to Adler and Kwon (2002) social capital is the resource available to actors as a function of their location in the structure of their social relations. *Are relationships or social resources a capital form?* It is important to note that social relations usually involve several states and forms. Adler and Kwon (2002) distinguish among three dimensions on social structure rooted in different types of relations. Market relations, including product and service exchange for money or barter deals, hierarchical relations in which obedience to authority is exchanged for material and spiritual security, and social relations where favours and gifts are exchanged.

Memberships or social relations may be socially instituted and guaranteed by the application of a common name like the name of a school, a group, a community, an organization, etc. Capital investments made outside organizational boundaries are therefore often underestimated, and the return on such investments is also riskier. Relational webs are the product of essential moments and endless efforts to produce and reproduce lasting, useful relationships that can be converted into new forms of capital.

The network of relationships is the product of investment strategies, individual or collective, consciously or unconsciously aimed at establishing or reproducing social relationships that are directly usable in the short or long term. Like all other forms of capital, social capital is a long lived asset into which other assets can be invested, with the expectation of a future return on investment. Social capital can yield negative effects and benefits for the investor and for others, and it is convertible. (Bourdieu, 1985) Recent research literature on social capital emphasizes its positive consequences, but on the negative side investments in social capital has disutilities, such as possibilities of excluding outsiders, free-rider problems, excess claims on group members, or restricted individual freedom.

The most important competencies in the economy of social exchange is the knowledge of building relationships, understanding and respecting the real connections and having the skill to use them. Social capital can be converted into other forms of capital, for example to economic capital, through the social capital investments made by an actor and the position and advantages these investments create in a given network. Social capital is located between the members and in the relations with other groups. Trust among the members and among the groups is a major driver for moving the value of social capital up or down. Economic capital can also create social capital as it gives the investor an opportunity to create activities where the actors come together.

2.4 Economic capital and conversion

Economic capital is, in Bourdieu's work and in most intellectual capital work, at the root of all the other forms of capital. These transformed disguised forms of economic capital are never entirely reducible to an economic capital definition. They produce their most specific effects only to the extent that they conceal (not least from their possessors) the fact that economic capital is at their root, but at the root of their effects. (Bourdieu, 1983).

The economic view is fundamental on the grounds that every type of capital is reducible, in the last analysis, to economic capital, but only economic lenses ignore what makes the specific efficacy of intangible forms of capital. The view

of sociology reduces social exchanges to phenomena of communication and ignores the brutal fact of universal reducibility to economics.

The different forms of capital can be derived from economic capital, but only at the cost of a more or less great effort of transformation. There are some goods and services to which economic capital gives immediate access without secondary costs while others can be obtained only by virtue of a social capital of relationships (or social obligations). These cannot act instantaneously or at the appropriate moment unless they have been established and maintained for a long time. When looking at the resource concept from an accounting perspective, the tangible versus intangible classification is largely followed. It is in the intangible category, however, that resource viewpoints are diverging. From an accounting perspective, client/customer loyalty and customer base are conventionally addressed under the heading of Goodwill and expressed by either capitalizing or expensing the related monetary value.

Typically, Goodwill value tends to become visible only in moments of ownership transfer, where the acquiring organization tends to pay a negotiated amount over the book value of the acquired firm. (Roberts, 2002). In the conventional accounting taxonomy of intangible assets, the method of acquisition (ownership transfer) of intangible assets is one of two key criteria used.

The first is the method of acquisition, and whether it is internally or externally developed. The other criterion is related to the specificability of the assets and whether it is both identifiable and separable. (Haskins et al., 1993, p. 455)

In accounting, items visualizing uniqueness and competitive advantage tend to be underrepresented and only limitedly captured. Unique non-economic capital forms and their conversion processes are created in organizations and built over time. The value driving factors come in bundles or portfolios instead of discrete packages that can be accounted for. The bundled and time-dependent accumulation of these intangible assets is equally unique; there is no common denominator or standard against which to compare them or by which to aggregate them.

This places the criterion of identification as the most problematic criterion in establishing a resource definition that is acceptable to both accountants and strategists. (Roberts, 2003) If one cannot identify uniqueness because there is no standard for uniqueness, it does not make sense to engage in a subsequent effort of separation because it is unclear what needs to be separated from what. Similarly, the development of uniqueness needs an accumulation basis against which to assess increases or decreases in the development effort. Again, from an accounting perspective, uniqueness and the development of uniqueness by means of internally generated intangible capital is unmanageable because of inadequate identification. Recent developments in the area of performance measurement, however, indicate that non-financial criteria categorized according to competitive dimensions might be an outcome here. Among the several forms of capital identified by Bourdieu, economic capital is most liquid; it is readily convertible into human, cultural, and social capital. As we move into intellectual capital and capital conversion in organizations we will use the term 'financial capital' instead of 'economic capital'. Many researchers and practitioners have worked with ways to identify capital species using economic and accounting related language, and in Scandinavia several organizations have attempted to identify and communicate intangible capital forms in intellectual capital systems and reports.

2.5 Intellectual capital

Even if intellectual capital refers to 'capital,' as in Bourdieu's work, it is not a conventional accounting term. Perhaps the idea of intellectual capital is easiest visualized by using a metaphor, as explained by Edvinsson & Malone (1998, p.21, translation added):

If we imagine a firm as a living organism, for example a tree, one can say organizational plans, annual and quarterly reports, firm brochures, and other documents are the trunk, branches and leaves. An investor might examine the tree to determine if she/he can harvest ripe fruit, but to assume that he has now seen the whole tree, because he has seen what's visible, is a grave mistake. Much of the tree is invisible, below the surface, being

nurtured through its roots. The taste of the fruits and the colour of the leaves make a good presentation of the present health of the tree, but it is much more effective to look at what goes on in the roots if one wants to form an opinion about the health of the tree for the coming years. There may be damage below the surface, which, as time goes by, may kill the tree. This is what makes intellectual capital investigation, the roots of an organization's value, into measurement of dynamic factors.

This presentation talks about intellectual capital in action. It tells a story about the relationship between the past and the future, and it dramatizes the need to look after the roots. Using this metaphor intellectual capital becomes a story of interlinked activities that happen all over the tree at any moment in time.

In Scandinavia there have been attempts to communicate intangible value, where organizations have tried to institutionalize non-economic capital forms in intellectual capital statements as a mechanism to show their real value (Stewart 1997; Sveiby 1997; Edvinsson & Malone 1997; Brooking 1997, Roos et al. 1997). The context of this reporting was typically the huge market-to-book ratios found in some industries during the 1990s and early 2000 which were presented as showing the value of the organization beyond the investments made in physical or tangible assets. The first prototypes of intellectual capital processes and statements were concerned about reporting on 'assets' related to employee knowledge and expertise, customer confidence in the company and its products, company infrastructure, and the sophistication of information technology. Being a little harsh, these early prototypes seem to fall into three categories: those that list their knowledge resources or assets; those that try to visualize knowledge activities, but end up talking about resources; and those that try to visualize knowledge activities but end up talking about resources or output.

The intellectual capital concepts that were developed in 1996-97 were very similar in structure and the language overlapping. The capital species that emerged in intangible capital investigations in organizations in the last half of the 1990s has become the fundamental capital

forms in intellectual capital research and practice. These capital forms are intellectual capital and financial capital presented as the two forms making up market value. The non-financials, or intellectual capital, are in turn defined into human capital, customer capital and structural capital. Innovation and Process perspectives have also appeared as capital forms.

According to Stewart (1997) human capital is that which thinks: money talks, but it does not think; machines perform, often better than any human being can, but do not invent. The primary purpose of human capital is innovation - whether of new products and services, or of improving business processes'. Structural capital is explained as "knowledge" that does not go home at night, and that belongs to the organization as a whole. It can be reproduced and shared such as technologies, inventions, data, and publications. Strategy and culture, structures and systems, organizational routines and procedures are also viewed as structural capital. Like human capital, the organization cannot own customer capital. Yet, it is crucial because it is 'the value of its franchise, its ongoing relationships with the people or organizations to which it sells [like] market share, customer retention and defection rates, and per customer profitability' (Steward, 1997 p.75).

Within the field of strategic resource definitions the internally developed and non-identifiable and non-separable items are the ones addressed. The focus is on the organization's unique competences and capabilities and not on their comparative similarity. This is what intellectual capital is about. Intellectual capital should not be used to compare organizations, but rather to help them discover their uniquenesses and differences and communicate them to compete in the financial market, the talent market, or in the idea market. In effect, an intellectual capital process is not there to explain the market to book ratio - it is there to change it.

2.6 Capital conversion

The logic of the functioning of intangible (non-economic) capital forms is in the conversions from one type to another, and the law of conversion which governs them cannot be understood unless two or more opposing but equally partial views are integrated. It might be

impossible to account for the structure and functioning of organizational systems unless one uses capital in all its forms and not solely in the one form recognized by economic theory. Economic theory has, through a definition of the economy of practices and the historical invention of capitalism, reduced the universe of exchanges and capital species to mercantile exchange oriented toward the maximization of profit. This focus has implicitly defined other forms of capital exchange as non-economic, and disinterested the importance of the process that creates profit. In a sense, we have disinterested those forms of capital exchange that drive the conversion of non-economic capital forms to more tradable forms and visa versa. Intellectual capital research has identified some forms of capital, and brought into the arena knowledge based resources and outputs related to value creation. We have not succeeded in explaining what is in between, the activities or processes that turn resources into results or output/results into resources. It is these movements capital conversion is about.

The capital form depends on its distribution and the relationship of transformation between the bearer and the knowledge resources objectively available. The value they produce is mediated by the relationship between the worker(s) and the objectified capital forms available. Intellectual capital investigations are of value only if they allow new insights to be produced that would change the value of the organization. Returning to the tree metaphor, conversion describes the movement of the parts and the forces that change the nature of interlinked activities and transform them into new states that in turn nurture other facets of a given (knowledge) ecosystem. Intellectual capital is making the intangible more tangible, while capital conversion is explaining interdependence and transformation of different parts and capital forms. Maybe we can better make sense of this through a case study.

3. CAPITAL CONVERSION IN A TELECOMMUNICATION CORPORATION

The research is based on a retrospective case study, a historical study of a company's attempt to convert knowledge into value. Conducting a case study in one organization, rather than several, captures the complexity of human actions in institutional and societal settings. The theoretical

goal is linked to understanding the process of capital interconvertibility, and how intangibles develop into value. A retrospective and reflective method is therefore selected to provide in-depth insight within one organization in order to unravel the fine details and the complexities involved.

The case presented below shows how an organization can take a good look at knowledge-based organizational activities that have driven value in the past, and use these historical critical moments to develop a system that identifies and develops the drivers that create value for the organization. The word 'drivers' refers to knowledge and value drivers representing the parts that make up capital forms. Value drivers are bundles of knowledge drivers, and value drivers connect knowledge drivers across capital forms or organizational boundaries. We have identified several critical historical events that visualize driving forces and how knowledge was used to create value. These value creating periods or moments are difficult to express only in financial terms nor do these moments intuitively fall into a single and straightforward category of explanation. Rather it is the historical alignment of these incidents that provides the accumulation of insight within the organization that allowed them to develop a value driver system. The system has an archeology and the critical events below are as many layers in that reconstruction of our present findings on capital interconvertibility.

3.1 Description of Organization to Be Studied

The organization, a Scandinavian telecommunication corporation, was selected due to its complex operating environments and its attempts to understand knowledge-based value creation. The Telegraph Administration was established on 1 January 1855 when the first telegraph line was opened in Norway. Twenty years later, the telephone was invented and the first telecommunication systems were installed in Oslo, Norway in 1880, just four years after the invention of the telephone. Communication has always been important in Norway with all its fjords and mountains and geographically distributed communities. The organization has historically played an important political role in the socialization of Norway. Based on historical

events and political goals, the organization has developed in a culture that had to consider several forms of development, with only one, the economic development, being related to financial capital. In a sense, the organization navigated their business based upon a variety of non-financial goals (forms of capital) since its very inception.

The case describes a complex, deep historical context that allows national and organizational cultural issues to surface. The case focuses on the many aspects of this organization's struggle to transform and develop its intangible resources into tradable forms of capital. The case data originate from a three-year participatory action research project, initiated early Spring 2000, in order to study knowledge-based value creation and from a retrospective case study. From this organization's own sense-making process a business model that explicitly considers intangible capital forms emerged. The case shows how unique knowledge and expertise, and the relational skills surrounding it, have been important factors in transforming itself from a governmental agency to a publicly listed corporation on the Oslo and New York stock exchanges. In the remaining part of the paper, we will refer to the organization as *Tele-adco*. Today the corporation consists of approximately 22,000 employees organized in four business areas that have been changing over the years, but they have always been organized around wireless networks (satellite, mobile), fixed networks (now fibre optic) and Internet.

The organization differs from many other telecom corporations abroad in that it held on to an integrated business structure, while other telecom businesses segmented and focused on one single area, such as mobile or Internet. We have looked into the history of *Tele-adco* with our (research) question in mind and have selected several critical incidents that visualize the connection of different forms of capital; during this moment of connection, we can observe how intangible capital forms were converted and used to drive value creation in the organization.

Tele-adco was incorporated in 1994 and it started the process of capitalizing on knowledge and relations created in the past, in order to take a position outside Scandinavia. From *Tele-adco*'s

Annual Reports between 1994 and 2001, we observe a marked increase in the minority interests and participations the organization takes in other firms. Already in 1995, the organization held minority ownership interests in 25 companies in 9 countries (including Scandinavia) while 10 of these companies were located outside Scandinavia. By 2001, *Tele-adco* had increased its minority interests to 80 companies in 25 countries (also including Scandinavia) with 50 of these companies being located outside Scandinavia. These output measures indicate that the organization has connected knowledge and relations and that the connections have impacted value.

In the case of *Tele-adco*, the value creating moments emerged as stories – as transportable bundles of meanings and interpretations that have been passed on within the organization or captured in memos and books. We had to extract these stories and use them as magnifying glasses to visualize the complexity and multitude of events and drivers that were dancing together to create value for the organization. We have tried to organize these incidents in a chronological order and will conclude this section by showing how the organization brought all these stories and incidentally learned lessons together in an integrated business model that now mediates intangible capital forms and financial capital in a holistic model.

3.2 Value creating moments

We have included five of these stories that show value creation periods and moments in the past. The first stories describe the start-up phase of *Tele-adco* and how intangible capital forms were created from the very beginning. Following Bourdieu's perspective on capital species, it is considered important to have an early understanding of non-financial values and the time needed to develop them. The last stories are related to more recent events where intangible capital forms have played an important role.

Story 1. Cod and wireless – early non-economical investments in the beginning of the 1900s

Collaboration across the different technology platforms emerged early as the landscape in

Norway forced both technology and business developers to work across organizational systems. One example of cross development and experimenting dates back to 1859 when the director of the post office in Lofoten in the Northern part of Norway wrote a report to the Norwegian Parliament stating that the fishing industry would increase their revenue by more than 25% if they could make the telegraph available in fishing villages in Lofoten. Fishing was and is an important industry in Norway, and every winter fish worth millions were traded in Lofoten.

In 1891 the telegraph administration made a 170 kilometre undersea cable, combined with the land line, outside the main network to nine fishing villages in Lofoten. In 1902, Hermod Petersen, an engineer and a director of the board, visited the area and he was convinced that wireless connections would help the industry grow even further. He initiated the work and a team of technicians took on the challenge. They had to experiment with ways to combine fixed lines and radio technology, and several sectors in the organization were involved. On 1 May 1906 the wireless link between Sørsvågen and Røst in Lofoten was officially opened, one of the first connections between a fixed and wireless network in the world. They made for example contact with German Kaiser Wilhelm's ship "Hohenzollern" on 15 July 1906 on his journey south. The Sørsvågen Radio and Telegraph Company was opened for contact with ships at sea on 1 July 1908 making it the first of its kind in Norway.

Reflections

Many of the experiments embedded in the operations described above created knowledge that was believed to be important to the position the company could later take in the shipping and oil industry. Engineers also saw early on the advantage of equipping people in transportation and medical doctors in remote areas with wireless communication units. The offshore industries soon became important allies in developing wireless (radio and satellite) communication in Norway. Norway, as a nation, developed a strong position in shipping and the oil exploration industry and communication played an important role. *Tele-adco* increased their involvement with

radio stations and the Government decided that they should operate the Coast Radio Service and the Aviation Navigation service. (Telenor, 1975: 40) This created yet another project that brought all these excellent engineers together. In a sense social responsibility blended with integration across sectors, exciting projects and talents (human capital) increased innovation and created both community and organizational value.

Story 2. The telephone venture – another take on the early telephone developments

The Sørsvågen Radio and Telegraph station also became the first of a series of small private telephone companies that were established all over the country over a period of 20 years. When the first phone service was established in Norway in 1880, the Telegraph Administration (*Tele-adco*) did not believe in the telephone. It took them 20 years to discover the beauty of the telephone, and in 1899 the Telegraph Act was passed granting *Tele-adco* the exclusive right to run all telephone services, and the government authorized it to take over the private telephone companies. This took many years because of employment issues in sparsely populated areas, and in 1974 the last private telephone company in Norway, 'Andebu Telefonforening', was taken over by the State-owned *Tele-adco*.

Reflections

They picked strategic telephone companies at first and facilitated relationships and knowledge exchange between key people in the small companies with their own key people. In particular connecting people with good relations in the United States and United Kingdom telecommunication research environments to technicians experimenting with connecting wireless and fixed telephone systems in Norway. (Bastiansen, 2001)

As *tele-adco* took over private phone companies, the economic capital invested was mainly converted into human capital. The value of the human capital available could only be used through facilitating knowledge exchange. The human capital was partly converted into relational capital using the structural or organizational capital previously developed in the Telegraph operations. At the same time challenging projects

brought the bright minds together. Economic and structural capital and a portion of political capital (power) were converted into human and relational capital, creating important value for the Norwegian telegraph operations that was hopelessly behind in the phone industry.

Story 3. TV and oil – the beginning of the Satellite ventures

The organization was operating on multiple technology platforms and saw early possibilities in the satellite arena. The state owned Norwegian Broadcasting Company had been working with *Tele-Adco* to distribute television, and *Tele-Adco* saw satellite as an important technology for television in the future. The political administration was involved in the satellite vision and investment strategies were put on the agenda. From previous ventures the Norwegian shipping and oil industry were important allies in the development and use of the services. The North Sea oil platforms were for example in need of reliable communication technologies. At the time an English organization had decided to sell their satellite. Several nations were interested, but it was the Swedish and the Norwegian Tele-Administrations that had the most interesting purchase strategies.

“I knew that we could pay a higher price than the Swedes. We had more business areas that could utilize the technology and the shipping and oil industry was already working with us on satellite technology projects. When presenting our solution we could show that we had long experience with wireless technology and could visualize several business units where satellite could play an important role in the future. The cheque for 250 million was already signed to show a strong willingness to act, and manifest that we were ready to start capitalizing on the technology immediately. And we knew that the Swedes had a reputation of having slow payment routines.” (Interview with the CEO and President, 2002)

Reflections

Base stations for satellite transmission were established at three oil-platforms in the North Sea in 1980, and an on-shore station was placed at Svalbard in addition to Eik in Rogaland. Twenty-

five Norwegian ships had in 1980 licenses for maritime satellite communication.

The economic capital was undoubtedly important in this transaction, but it was operating together with other forms of capital to win the contract. And they had both projects and relations with big user-groups like oil and shipping companies. In addition to the financial payment *Tele-Adco* could also visualize to the seller how they played a role in helping to develop other forms of capital. *Tele-Adco* had also a clear picture of how the economic capital invested could materialize better and faster because of the intangible capital forms embedded in their operations.

Story 4. Social functions – the non-economic capital focus was not always driving innovation

Telephone automation came to Norway later than in other countries. In 1920 the first automated exchange was put into operation in Skien, and the last automated exchange was completed 65 years later in Balsfjord. Governmental and company records show that the automation was delayed for reasons of employment and regional developments. It is partly explained by the fact that telephone operators in sparsely populated areas of Norway performed an important social function in their local area. In addition, the thousands of employees in the manual exchanges were to large extent women. Telephone automation caused a reduction in the number of jobs for *Tele-Adco*'s employees in areas where job prospects were already scarce.

Reflections

This shows that the organization was managed on different capital forms. It also indicates that social responsibilities did not always drive capital conversion. In this specific period non-financial goals were slowing down innovation.

Story 5. Knowledge exchange – relations to other environments was important

Connecting 1: In 1965 the management of the military research institute (FFI) and the Tele-Administration agreed to establish a committee to elucidate the possibility of establishing a research and development centre for telecommunication close to the military research institute at Kjeller,

just outside Oslo, with the intention of furthering radio technology research. FFI and an electronics company, Simonsen AS, cooperated at the time in developing mobile telephone terminals (Collett et al., 1993: 31).

Connecting 2: A key project that would motivate research came in a meeting in Kabelvåg in Norway 24-27 June 1969, in which governmental representatives from Island, Denmark, Finland, Sweden and Norway participated. From this meeting a proposition to create a Nordic effort in developing the Nordic Mobile Telephone (NMT) emerged.

Reflections

A combination of collaboration and experimentation lead to several generations of mobile systems. The nations involved were used to collaboration and opened up their respective research centres to share ideas. Relations among the national tele-administrations were maintained and as a result *Tele-adco* was included in developing national and global standards.

This was a huge achievement that mainly can be related to their unique knowledge and relations with other significant players. Manual mobile systems lasted more than 20 years, and the first generation automatic analog system, NMT, was launched in 1981. The digital GSM system was introduced in the 1990s, the GPRS system at the turn of the century, and now *Tele-adco* is preparing to launch the third generation UMTS system.

Story 6. Norway in the digital future – competing for recognition

Maybe the lessons from the slow adoption of automated telephone exchanges, see story 4, created organizational value after all. A lesson was learned and they would not be a follower. Parallel to the emergence of the wireless (mobile and satellite) services a strategy to automate and digitalize the manual switchboards throughout Norway was initiated. By taking on the task of digitalizing the Norwegian network, *Tele-adco* started the largest technological effort in Norway since the development of the gas and oil industry. In the 1985 annual report the CEO and President stated that: “1986 is the start of a new era; it is

when we start using the digital switchboards. Within the next 10 years we (*Tele-adco*) will make Norway one of the first countries in Europe to apply this technology to all our services.” (*Tele-Adco* Annual Report, 1985 – My translation). In 1986 this goal was turned into the following vision: “Norway shall become one of the foremost telecom countries in the world by 1995” (*Tele-Adco* Annual Report, 1986: 9). *Tele-Adco* received the first digital telephone exchanges in 1986 from Alcatel STK, which was one of the main suppliers of digital exchanges, chosen in tough competition with others. In 1990 Ericsson became the second supplier of digital exchanges, and *Tele-Adco* developed a good relationship with the two main suppliers of digital exchanges. The new digital system allowed for example the market-side to be more efficient in establishing new subscriptions. The negative side of the high level of knowledge developed in Norway at the time was the decision to develop standards unique to Norway. *Tele-adco* was digitalizing the network faster than the rest of Europe and more than a quarter of the subscribers in 1988 were connected to digital exchanges. By 1992 the rate of digitalization had reached 50% and the digitalization programme for the Norwegian telecommunications network was completed by 1 December 1997.

Reflections

When asking about driving factors behind the digitalizing process, in an interview with the former CEO, the response was human capital. The former CEO put one charismatic engineer as a main driver in this value creating period. “Looking back we can see that we saved billions digitalizing Norway, a very profitable investment,” says the engineer himself. When asking about non-economic capital forms he recalls that the Norwegian digitalization programme was soon well known internationally and delegations from other nations came to study the Norwegian solution, creating important relations internationally. And the suppliers were lining up to deliver equipment. Norway became a display case for new telecommunication technologies, and it was a quality seal to be accepted as a supplier to the Norwegian telecom organization. This gave very low prices internationally and made the digitalization even more profitable. On 1 December 1997 the

digitalization work in Norway was completed as the first country in the world. The digitalization story shows how human capital and unique knowledge created in relations in a given project create both economic and relational capital.

Story 7. Mobile phones for free – knowledge, integration and structural issues

The vice president of *Tele-Adco Mobile* from 1991 to 1995, describes the value creating moment: “When we launched GSM in 1993, we formulated the goal of having 70% of the market, and decided that having a good distribution network would be important to achieve this goal. Our move was to master the distribution network by providing advantages to independent retailers. We knew that it would not be possible to launch GSM before it was a trustworthy alternative for the retailers so we let our competitor, Tele-Com, own the GSM market the first eight months. These moves were a big problem within *Tele-Adco* and especially for the corporate headquarters. We had long experience and unique knowledge within the Tele-Adco group to operate networks, and we analysed Tele-Com’s operations to understand their structure and network, and estimated when they would reach capacity and when they would have to restructure their network. We started building extra capacity into our network in Oslo, and we introduced ‘call as much as you want without paying during the weekends’. Calling for free during the weekends was a good sales argument, and our retailers found it easy to sell mobile phones with a subscription from *Tele-Adco Mobil*. We continued with this offer for a year and a half. We knew that Tele-Com could not follow this move because the traffic volume would cause a breakdown in their network. Every week we analysed how much net capacity we utilized and how much capacity we had at our disposal. Based on these analyses we decided at which exchange to increase capacity.

Customers quickly learned to use the ‘call for free’ service. We made some investments in exchanges earlier than we otherwise would have done to ensure enough capacity. However, this was only a capital cost caused by investing some months earlier. Every time we did something, Tele-Com counteracted with increasing commissions used to subsidize the mobile

terminals. We were the first operator to introduce services such as Privat-200. Engineers tend to investigate the busiest hour during the day and accordingly dimension the network with capacity. A business person sees that the unutilized capacity during other times of the day can be used to offer other services at marginal pricing. That was the background for creating Privat-200. When we launched Privat-200, Tele-Com responded by such high commissions that the mobile terminals were sold for NOK 1-. We met this move, and Summer 1995 was therefore special with an extreme increase in new subscribers. In Fall 1995 we could conclude that we had come through this extreme situation in the best manner, and we had a better organization to handle such extreme situations. This caused the retailers to trust us and we had succeeded in locking in 70% of the distribution network.” (Interview with the vice president of *Tele-Adco Mobile* by Frank Elter)

Reflections

The Privat-200 service was cheap to have but expensive to use, and it had “discounted” prices at times during the day with low utilization of the network. This way investments were utilized better. Analysis of the network also revealed that only 30% of the total traffic went from the mobile network to the fixed network, and 70% of the traffic went from the fixed network to the mobile network.

“We did quite a few things with voice-mail. If you terminate phone calls in the voicemail, you do not strain the radio network, but we still get the higher mobile charges. To develop products and services such as these presuppose a combined good understanding of technology and business. We used knowledge about the operating network combining technology, fixed stations, traffic and stress analysis, pricing and marketing of the service. We integrated our experiences across the organization. Many do not have this insight and do not have the will to gather such knowledge.” (The vice president of *Tele-Adco Mobile*)

The Mobile phone ventures and business movements described above started a rapid growth period for the organization, and at the same time it was putting the nation, Norway, on the map. The company was for example

establishing a mobile network and developing the mobile organization in Greece, and *Tele-Adco Mobile* was selected solely because of their unique knowledge. (From an interview with the former CEO, 2002) The battle with competitors resulted in a huge increase in the number of subscribers, and measured in terms of mobile phones per capita Norway was the world leader. The story illustrates also that management teams need to combine knowledge about technology and business, and that knowledge created across the organization might give competitive solutions. It also shows that local knowledge and strategy decisions are closely related.

Story 8. Wireless in Bangladesh – capitalizing on social responsibilities

The feel for working with different capital form has also opened for new business models. A more recent story visualizes also how organizational, social and economic capital forms were interacting in their telecom work in Bangladesh. In 1998 Grameen Phone, a 50/50 venture between the Norwegian Telecom and a local bank, was established. Five years later the company is by far the largest mobile operator in Bangladesh, with more than 500,000 customers and a market share of more than 70%. During its five years of existence the customer base has grown by 100% per year, making it the fastest growing mobile telephone company in southern Asia.

The company now serves large parts of the country, which has more than 120 million inhabitants. The bank provides small loans to the poor, mainly to women so they can invest in business activities, such as a plot of farm land, a chicken farm or a small fish-farming plant, including mobile telephone for use in business activities. The partnership between Grameen Bank and Grameen Phone is known as the "Village Phone". Women in more than 10,000 villages have been given loans enabling them to become the village's "living call box". As the fixed network in Bangladesh is poorly developed, several million people now have access to telephone services for the first time.

Reflections

The Village Phone attracts international interest, and studies show that the Village Phone has a significant economic and social impact. The villages gain new means of contact with each

other and the outside world, and the women owning the mobile phone earns income and status in the village. At the same time, Grameen Phone is earning profit (economic capital) and international recognition (symbolic capital). The Norwegian telecom's involvement in Grameen Phone shows that their skills to work with different capital forms can open new markets, create organizational value and lead to considerable social improvements.

3.3 The knowledge venture – creating a new business management model

Based on a history of creating unique and valuable knowledge, the organization decided to start a sense-making process based on their history of capitalizing on knowledge and relations – what could be learned and used from all this? A participatory action research project was started when the merger with a Swedish telecom organization broke down in January 2000. An internal group of researchers were organized into a task force, tied to a steering committee, and they have been involved in numerous activities. Having a strong history in research, the task force decided to link up to external researchers rather than to consultants. Given practices of working across the organization, the task force consisted of members from the accounting department, human resources department, and strategy department. This cross-functional character of the task force became one of the major reasons for the continuous innovation and development of the holistic steering model that emerged. Talking about intangibles in the language-of-practice of business and management control was crucial for top management commitment and approval.

As business unit managers entered the process, they claimed the right to adhere to only one management system. This forced staff from finance, strategy and human resources to coordinate different endeavours and align their thinking in order to come up with a flexible system that could accommodate all claims for adherence. The holistic steering model is called the Integrated Management System (IMS) and there are two integrated parts in the model that emerged. Following the specific names that emerged inside the organization, we have labeled the two parts as "The (knowledge based) strategy wheel" and "The House of Drivers".

The “strategy wheel” has its inspiration from the Business Excellence model of the European Foundation of Quality Management (the EFQM model). The strategy wheel is not only about strategy formation as it ties value drivers and performance agreements together into a strategy process. Subsequently, the strategy process is linked to an implementation process of projects and activities, and measured and followed up in business reviews that are part of the Follow-Up process.

The implementation process is located at business area level and decentralized in nature. It is where the projects and activities are located, and it is the knowledge space where the initial relational capital is emerging. The IMS model is sensitive to distributed relational capital and linkages to value drivers and performance agreements are meant to motivate business units and project leaders to make relations and knowledge created visible for others and make it visible to other business areas. A project exchange is developed to strengthen the sharing and visibility of projects even further. The process of value driving system is facilitated by means of value drivers made visible in the “House of Drivers”.

The three elements in the ‘strategy wheel’ derive most of their functional benefit from the fact that they are continuous and brought together into a pattern of action and dialogue. The circle around the strategy wheel shows an ongoing knowledge based strategy process. An intelligent process for developing sound value drivers is developed as a part of the strategy process. The company is well aware of the importance of value drivers as it represents strategy, it is linked to performance agreements, to projects and it is the main point on all business reviews. The business reviews are the arena where the corporate management and business area managers, sometimes accompanied by business unit leaders, come together in an investor/entrepreneur relationship to discuss new investments and status on different capital forms. The value drivers represent how successful the company has been in converting project ideas into organizational value.

The parts in the steering wheel are interrelated, also across the circle creating a multidimensional system of managerial and organizational

behaviour that facilitates knowledge based strategy and operational processes. Various process elements, such as the business reviews and the performance agreements, can be labeled structural capital. The inputs are usually knowledge resources, i.e. human capital is invested, and the knowledge exchange, the relational capital, is located in the different business areas’ projects and activities. The projects and activities tend to be decentralized, located in business areas and units. Knowing the importance of cross-functional work, integration and sharing, the organization decided to link a Project Exchange to the implementation phase in their ‘strategy wheel’. In the Project Exchange projects are being listed across the whole organization and organizational members are bidding on projects with their human capital (availability, competence and experience). The Project Exchange highlights the value of integrated learning practices (job-rotation or on-the-job-training) through the challenges offered in projects. It is in itself a value driver. A division manager in *Tele-adco* offered the following observation: “There is good know how around in our company, but very few people know where to go to get it.”

The House of Drivers serves two functions in the IMS model. It includes the non-economic and economic capital forms represented as knowledge or value drivers in the overall management control system, and it is setting the agenda for corporate business reviews. It also facilitates the process of finding value drivers in business areas and units. The unique needs in business areas resulted in one version of the ‘house of drivers’ for each of them. Through the ‘house of drivers’ movements are monitored and visualizing overall performance and development within each of the four business areas. In the development of systems and models to increase knowledge based value creation the organization is experiencing how important the value drivers are for success. The process of finding the right value drivers is extremely important and they are the fuel of the IMS engine.

4. DISCUSSION

The fundamental assumption made in this study is that knowledge and capital are positively related.

We also assume that all capital forms have their roots in economic capital and that they have to be convertible with economic capital to be defined as a capital category. In order to operationalize and locate conversion processes we adhere to a slightly modified version of earlier intellectual capital models. The main capital species are split into human capital, relational capital, and structural capital (Bontis, 1998; MERITUM, 2002). As before, the human capital form consists of the combined skills, experiences, insights and education of the organizational members. Structural capital, sometimes also referred to as organizational capital, is the procedures, norms, routines and rules that make up the organizational system. The relational capital form - sometimes also called social capital, customer capital or external capital - is the web of relations between people and groups of people associated with the organization. It is made visible through personalized interaction and it is the exchange arena for human capital, and its constituting skills, experiences, education and abilities. In contrast to human capital, parts of the relational capital can be collectively owned. The aggregate exercising of individual skills and competences results in a reputation that is of collective value for the group or organization (Roberts, 2002).

4.1 Relational Capital

Relational capital can be considered the combinatory opportunity that makes interconversion possible where the relations provide the roads on which knowledge drivers can drive. Picture the dynamics present when drivers are approaching a four way intersection in a queue with meeting traffic. The drivers select their direction, get interchanged with new drivers same time there are movements in the opposite direction. The movement between the boxes, represented by the arrows, is the value creating moments, the very moment where a capital form, or part of it, is transforming into a new form - the conversion process. The conversion between human and relational capital is labelled 'creating', it is where people, and people and projects are connected in a knowledge exchange and sense making process. The relational capital is the production arena, and organizations will try to facilitate the creation into structural capital. The

and the dynamics are changed. It is our implicit assumption that the relational capital, placed in the centre of the production process, plays an important role in converting intangible capital forms by means of its 'roadmap' characteristic - it provides connectivity. The use of that connectivity; that in organizations originates from measures and routines such as incentive systems, project organizations, performance measurement systems, internal reporting and communication and other structural capital items. It is structural capital that puts the knowledge drivers (human capital) on the roads of relational capital - no structural capital means no drivers and therefore no movement, just opportunity.

4.2 Capital Interconvertibility

The figure shows how value creating moments, visualized in the figure as the arrows between relational capital and human capital and between relational capital and structural capital, can move capital forms toward economic capital and at the knowledge created has to be represented or codified to strengthen the innovation process and deliver economic output. Through their structural capital, organizations can facilitate human and relational capital conversion. Capital interconvertibility is explaining movements in both directions, different dimensions among multiple capital forms. Interconvertibility refers to a non-linear and non-equilibrium state. In other words, a conversion process can play out in multiple directions, between two or multiple forms of capital.

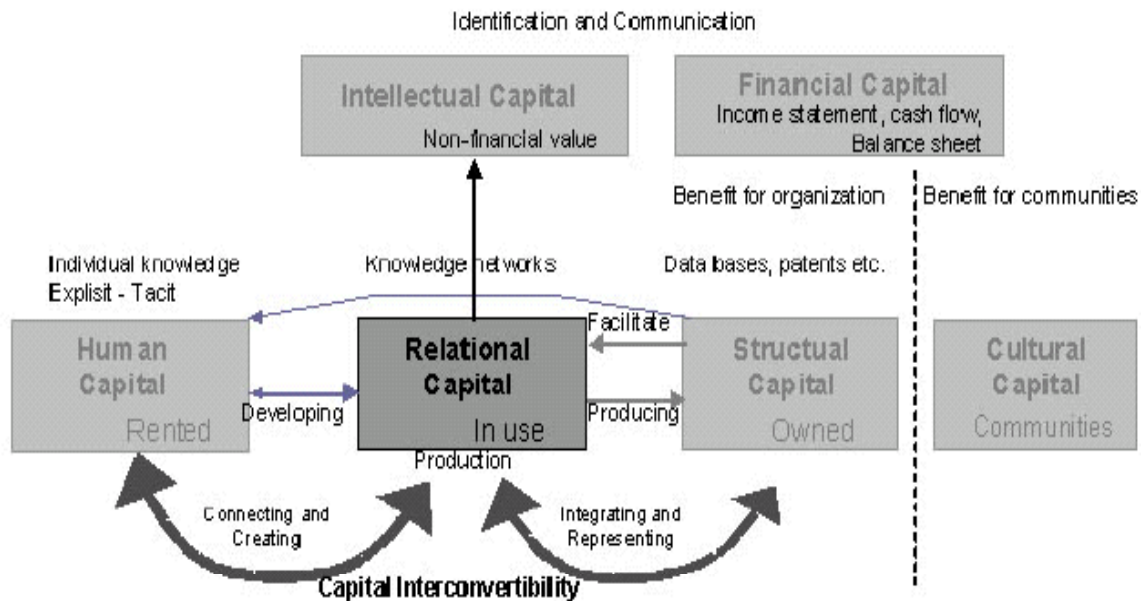


Figure: Capital conversion in the MERITUM model. Social capital as benefits for communities added.

Recollecting how the *Tele-Adco* took over private telephone companies; their economic capital was mainly converted into human capital. The value of the human capital available was turned into relational capital through the structural or organizational capital previously developed in the organization. The relational capital created in turn financial capital/output that was higher than anyone could expect. One can argue that the lead in wireless telephone technology came as a result of non-financial transactions. This simple example shows how different capital forms can convert from one form into another and that the process might work both ways.

The notion of interconvertibility dates back to the emergence of the theories for thermodynamics. In 1829 James Prescott Joule claimed that there was a relationship between mechanical motion and heat and he later said they were interconverted. William Thomson first heard Joule's theory about the interconvertibility of heat and motion at a meeting of the British Association for the Advancement of Science in 1847. Joule's theory went counter to the accepted knowledge of the time, which was that heat was an imponderable

substance (caloric) and could not, as Joule claimed, be a form of motion. Thomson later bridged the theories on interconvertibility over in the telecommunication industry as he got involved in research and development of the first transatlantic fixed telephone line. In accordance with a principle which is the equivalent of the principle of the conservation of energy, the knowledge conversion process could be presented as the conservation of social energy.

Capital interconvertibility should take into account the time accumulated to create intangible forms of capital and the time needed to transform these from one type into another. The work on capital interconvertibility in organizations aims to establish adequate knowledge both of the space of objective relations between the different capital forms and of the necessary relations to convert them. Understand the movement between the parts occupied within a capital form and how these play a part in the reality and the emergence of new capital.

The holders of different capital species have great interest in exploiting the convertibility of the

forms of capital, and to create production strategies capable of ensuring more efficient conversion. Like physical capital, which typically is used for different purposes, relational capital is appropriable in the sense that an actor's network of, say, friendship ties can be used for other purposes, such as information gathering or advice. Relational capital can be "converted" to other kinds of capital; like the advantages conferred by one's position in a social network can be converted to economic or other advantage. The "convertibility rate" of relational capital into economic capital is lower, since it is less liquid and more "sticky" (Adler, 2002). The convertibility rate of intangible capital forms into economic capital is lower since the rate of return is uncertain both in time and size.

4.3 Relational Capital and inter-convertibility

Relational capital can also be described in terms of interdependency and reciprocal relationships. Casual determinations are defined by non-linear relations, but domination in a relational web increases the closer the relations get to economic production. Some relations can be separated out in social spaces or areas, for example for statistical analysis, but the question is if they exist as real groups or if they just explain the probability of individuals constituting themselves as practical groups. The knowledge of an organization lives in a constellation of collectives each taking care of a specific aspect of the competence that the organization needs.

However, the very characteristics that make the relational capital form a good fit for stewarding knowledge and innovation are also characteristics that make it a challenge for traditional hierarchical organizations. The relational arena that exists in our mind is a space of relationships that is as real as a geographical space, in which movements are paid for in work, in efforts and above all, in time. Movements in this space or web of relations mean sharing to acquire new knowledge in interaction with others. Distances within the web can also be measured in time, for example, time taken to rise or to convert capital forms. It is what could be called relational economy of time. One could argue that in the probability of mobilization into organized movements will be an inverse ratio to distance in

this economy of time. The probability of assembling a group of members rises when they are closer in space and that is important as one gets closer to financial production. Production of other forms of capital is easier between those more distant to each other, but an alliance between those distant to each other is never impossible.

4.4 Value drivers and interconvertibility

An important factor in capital conversion is the portfolio of knowledge and value drivers and how it is used to drive knowledge based value creation in both directions. In many ways value drivers are the forces that operate between capital forms and facilitate the conversion process.

Focusing on value drivers and intangible capital forms that convert into economic capital, without considering how interconvertibility might limit the potential non-economic return and creation of capital forms the organizational system can benefit from in the future. Looking at the value moments from case one we have selected two important value drivers: 'Integration through job rotation', how to learn and work together better, rather than work more efficiently; and 'international attractiveness', how to gain international reputation and business. For the sake of the paper we have included a few reflections on the latter.

International attractiveness as a value driver

We know from the case that the home market is a country where it is challenging to build communication services, and it shows how early movements displayed the company to the rest of the world. This surfaces in the digitalization process (story 3) and in the mobile ventures (stories 1, 4 and 5). While operating on the leading edge the company had at the same time a sound development in output measures such as the increase in minority interests, the company managed to hold low prices and they deliver satisfying economic results.

A CEO in the *Tele-adco Mobile* was asked to reflect on the importance of international attractiveness as a value driver: "If I were to say something about value drivers representing the

value of international attractiveness it would have to be to:

1. Compare our skills in coming in position and negotiating good economic terms for investment in international companies to what other telecommunication companies would have to pay for the same or similar ventures.
2. Look at the real use of Norwegian competencies in the companies we have taken a position in, especially for our people that know how to dimension and build networks, but also people that know business development and launches of new products and services.

As a small telecommunication corporation on the edge of Europe we have to ask if we can afford to loose this attractivity. (Interview CEO *Tele-adco Mobile*, 2001)

After this interview we went back and did a small experiment. We looked at value drivers developed for the whole organization for 2001 and asked ‘what are driving international attractiveness?’ We discovered how the knowledge drivers under each of the capital forms in the House of Value were linked across different capital forms and even across business areas within the organization. This little experiment indicated that we have to consider the parts in multiple capital forms located across the organization to understand capital conversion and the activities that drive knowledge based value creation. It is movements on multiple levels.

5. IN CONCLUSION

All together — the awareness and identification, the non-financial steering, and the supporting processes — capital interconvertibility is the movements in a landscape of managerial measures and actions, a landscape of interventions that guides the flow of knowledge from the high lands of expertise to the lowlands of application, making up the hills, river beds, pools and obstacles that create turbulence and resistance to ensure that critical knowledge flows are feeding the creation processes in ways that money can be made from. And, while flowing, it is allowing the organisational landscape to learn from itself. We have now (some of) the

terminology and a first indication on how to create financial capital from other capital forms, and it is in the multidimensional landscape of structural interventions and their integrated visualization that the answer to the how-question can be found.

When the Tele administration took over private telephone companies, their acquired financial capital was mainly converted back into human capital. The value of the human capital available was turned into relational capital through the structural or organizational capital previously developed by the *Tele-adco*. This simple example indicates how different capital forms can convert from one form into another and that the process might work both ways. A value creating moment emerges when connectivity is established between two capital species, and the more or less random chain reaction that this movement creates is the process of capital interconvertibility.

The capital conversion among capital species in organizations is facilitated by the relational capital and its uniqueness and interrelation to other capital forms. Relational capital systematizes the flow (of content) and not the content itself, thus guiding the meaning and interpretation schemes used by people. Knowledge and value drivers, emerging capital forms and the process of capital interconvertibility should help organizations use intellectual capital models to visualize differences and uniqueness. The intellectual capital systems are not there to assist stakeholders or organizations to compare organizations to one another. Instead, starting to recognize what sets organizations apart from each other and subsequently managing and investing in that capital differential, starts a new cycle of capital interconvertibility — from the financial back into the non-financial capital species. Focusing on their differences would help organizations to innovate and grow and to attract financial capital, talents, or ideas. A focus on uniqueness rather than similarities, and putting it to work in diverse webs of relations, would benefit communities and nations in their needs to perform in the global market place.

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PART FOUR

COMMERCIALIZATION OF INTELLECTUAL ASSETS

LEGAL PROTECTION AND COMMERCIALIZATION OF INTELLECTUAL PROPERTY IN RUSSIA

by Natalia N. Karpova, Professor of the Academy of National Economy of the Russian Government

INTRODUCTION

Today with the development of the worldwide economy the exchange of scientific and engineering achievements, of various intellectual property subject matters has become an independent sphere of economic relationships. The formation and development of a patent system has created prerequisites for the distribution of state-of-the-art scientific and engineering knowledge in trade form, in particular by trade in patents and licenses.

A condition for the integration of Russia into the international system of economic relations, including patent-license exchange, is the improvement of the national system of legal protection and transfer of intellectual property. The transition of Russia to market relations sharply raised the interests of international business in all the spheres of activity but mainly in the field of high technology transfer.

For a better understanding of the problems which foreign and national companies are facing in Russia it is necessary to look back to history, since the problems existing today have their roots in the administrative-law system of the former Soviet Union.

I. HISTORICAL REVIEW

To begin with, the former Soviet Union had an enormous scientific and engineering potential.

About one-third of all the inventions in the world were created in the USSR. Every year in the USSR more than 80,000 inventions were registered and the majority of these, 64%, were created in the Russian Federation. In respect of other industrial property, Russia held more than 80% of total assets. For this reason the data relating to the USSR can with a sufficient degree of accuracy be considered as relating to Russia. (see Fig.1).

It is very difficult to speak about each separate republic. An invention was very often created in one republic, applied in another, and improved in a third. And the old country's legislation helped this process.

The number of Soviet inventions prior to 1991 exceeded 1.5 million. As can be seen, this is a powerful intellectual resource from which technology for international and domestic exchange, ideas for new developments and for wide use in the national economy are being taken at the present time.

1.1 Organization of Legal Protection of Intellectual Property in the USSR

The first Patent law in Russia was adopted in 1812 but this law was annulled in 1919. In accordance with legislation in force prior to 1991, almost all inventions were protected by Inventor's Certificates and belonged to the State.

What is an Inventor's Certificate? First of all it provides State protection of a right to an invention. If you have an Inventor's Certificate you are the only author. The exclusive right to use the invention belongs to the State. Anybody in the USSR, now in Russia, may use an invention which has received an Inventor's Certificate, without a patentee's consent. The certificate is free of charge but the certificate cannot be sold nor can a license to use the idea since it has become State property.

The patent as a form of exclusive right for an invention was available in the USSR. However, only foreigners could avail themselves of that form of protection. Russian subjects had to be satisfied with the inventor's certificates which only confirmed their authorship and allowed them a modest remuneration from the enterprise they worked in.

As a result, State property in general and inventors' certificates in particular contributed to the notion that new technical solutions were not regarded as anyone's property. Inventions protected by inventor's certificates could be used free of charge without the inventor's permission.

This knowledge is essential as herein lies one of the main problems of Russian technology transfer. The reason lies in our past when property belonged to the State and then it passed into the hands of entrepreneurs unaccustomed to private property. Some of them are still inclined to think that they may use the results of other people's work without the owner's authorization. It is not always a case of ill will. Sometimes it is lack of education.

It should be noted that inventors' certificates issued in 1992 are valid up to 2012. Inventors offering their technologies often do not think about who is the holder of intellectual property rights. *That is why the first thing that has to be done during negotiations concerning Russian technology licensing is to find out who actually owns the rights of IP: the State, a company or the inventor himself* Analysis of statistical data for 1985-1991 confirms the aforesaid.

Inventions

From 1985 onwards the number of annually registered inventions has been constant, equal to about 82,000, almost all protected by Inventor's Certificates. Patents formed only an insignificant portion — about 8% — of the whole number of protective documents and were granted to foreign applicants.

In this time the dynamics of the inventive activity of national and foreign applicants reflects rather precisely the political and economic situation of the country. It is known that the main purpose of a patent is to protect a product in which the patented invention is used. Foreign companies could not realize their patents for commercial purposes in Russia, as all import operations were centralized and carried out through different branches of the Ministry of Foreign Economic Relations of the USSR and it was prohibited to involve foreign investments to arrange production in the former USSR. This fact quite naturally influenced the level of activity of foreign applicants who treated a Soviet patent simply as a way of setting their priority and blocking Soviet inventions from being used in the most progressive fields of science and technology.

This is proved by an analysis of the fields to which the registered inventions relate. The largest number of inventions created by Russian inventors are in the fields of machine building, mechanical processing of materials (Class B), chemistry (Class C), energy (Class H), aerospace research (Class G), and arms (Class F). With regard to foreign applicants, protection has been obtained in chemistry (Class C), technological processes (Class B), consumer goods (Class A), and arms (Class F).

An analysis of the geographical structure of the flow of foreign patent applications shows that in 1991, 52 countries throughout the world protected their achievements in the former Soviet Union: 79.8% of the patents belonged to firms of leading industrial countries, 19.8% to Eastern European countries, and 0.6% to developing countries. Firms of 11 countries exhibited the greatest activity in this respect. Among the 6,956 patents valid in the USSR at the end of 1991, the following numbers belonged to firms from:

Germany	1,647
USA	1,080
Japan	803
France	782
Switzerland	540
Italy	433
United Kingdom	293
Finland	298
Sweden	298
Netherlands	221
Austria	193

Industrial designs

The dynamics of legal protection of industrial design was similar. The total number of designs registered annually constantly rose. However, the share of foreign designs did not exceed 1%. At the end of 1991, firms from 28 countries had obtained protection for 281 industrial designs. There were firms from the United States of America, Denmark, Germany, France, Great Britain, Italy, Austria and others.

Trademarks

The situation with trademarks is entirely different. The period from 1989 to 1991 was marked by the transition of Russia to a new economic course, and a large number of enterprises came to realize how important it was to protect their trademarks. During that period, a sharp increase in the number of applications for and registrations of trademarks was observed. The activity of national and foreign applicants increased.

In contrast to the legal protection of inventions and industrial designs, 60% of all valid trademarks belonged to foreign firms. Sixty-four countries from around the world actively protected their trademarks and service marks in the former Soviet Union. In 1991 alone, 7,794 trademarks of foreign firms were registered, among them:

Germany	1,796
France	1,357
USA	917
Italy	885
Switzerland	701
Netherlands	468
Spain	336

Austria	268
Belgium	174
Japan	117

There were 99,989 valid trademarks in the USSR by the end of 1991.

1.2. Commercialization of IP

As was already said above, all scientific and technical achievements in the former Soviet Union belonged to the state and any firm could freely use any of them in its production without signing a license agreement. That is why in the USSR there was no system of internal licensing, and licensing existed only in connection with foreign economic operations.

As is known, a permitting order under conditions of the State monopoly on foreign trade was in force in the USSR up to the end of 1991. Since the exclusive right of use of inventions and other industrial property rights belonged to the State, all procedures for patenting abroad and for trading in licenses was carried out under State control with all expenses associated with the filing of applications in foreign offices being borne by the State budget.

No enterprise had the right to enter the international market by itself. If it wanted to patent its invention abroad or to sell a license on it to foreign companies, it had to apply to higher organizations. The only Soviet organization engaged in foreign patenting was the Chamber of Commerce of the USSR. All activities related to commercial realization of Soviet technologies and purchase of foreign technologies were carried out by the specialized international economic organization "Licensintorg".

The former Soviet Union had adequate experience of participating in international license trade. The beginning of the USSR's active participation in the international license trade may be dated back to 1962.

Exports

From 1976 onwards the USSR became an active exporter of technologies in the international market. More than one million inventions were registered over that period. In all about 5,000

licenses on new Soviet technologies had been sold by 1992.

The geographical extent of Soviet exports in 1976-1990 included 69 countries around the world. The largest share of exports (68%) concerned the former socialist countries. Bulgaria, Czechoslovakia, German Democratic Republic and Hungary were the main importers of Soviet technologies. Yugoslavia was a permanent partner of the Soviet Union in the license trade. Strong contacts were established with China which first bought two licenses in 1986, then six in 1988, and eight in 1989.

The share of capitalist countries in the total volume of USSR license exports represented 21%. The dynamics of Soviet license exports to Western countries constantly increased. Their main importers were leading industrial countries: Finland, Japan, Federal Republic of Germany, Italy, USA, France, Great Britain, Switzerland, and Sweden. In all 23 capitalist countries imported Russian technologies.

Among the licensees of Soviet technologies were such well known companies as: Nippon Steel, Kawasaki Steel, Tsukisima Kakai (Japan); Krupp, Mannesmann, Ferroschtal, Zaltsgitter, Schlemann Zimag, Aizenbaum Essen, Assig (Federal Republic of Germany), American Home Products, Diverseafide, McDermott, Ethyl Corp., Allied Steel and Tractor Cop., Kaiser Aluminum, Ciber Geigy, etc. (USA); Monvisoimpianty, Snamprodgetty (Italy); Nokia Electronic, Vyartsilya, Kemira Oy (Finland).

The USSR license contacts with developing countries grew stronger. Although their share of total export volume was about 11%, it increased fourfold. The main importers of Soviet technologies were companies from India, Iraq, Yemen, Syria, Turkey, and Afghanistan. Exports to countries of Latin America grew: companies from Brazil, Venezuela, Argentina, Bolivia were active importers of Soviet technologies.

What technologies did Russia export? The industrial structure of Soviet exports showed that the export of technologies of machinery construction made up 27%, military industries 11%, metallurgy 9%, chemical/timber complex 4.5%, other industries 2.3%. The largest license

suppliers in the world market were metallurgy, gas industry, power engineering, instrument-making, heavy machinery construction, oil-extraction, geological prospecting and medicine.

Imports

The geographical extent of imports of technologies shows that those imported from the former socialist countries made up only 6% of the total number of contracts. Among active USSR partners were the German Democratic Republic, Czechoslovakia, Hungary, and Yugoslavia.

The main license exporters to Russia were leading industrial countries, which supplied 94% of Soviet technology imports. The dynamics of Soviet license imports show that in general the volume of foreign technologies imports was unstable, and since 1988 it has been decreasing sharply.

The majority of contracts (70%) were concluded with companies from the Federal Republic of Germany, Italy, Japan, Switzerland, and France. In total 20 capitalist countries sold their licenses during the period 1976-1990. Active licensors were the following companies: Krupp, Hereus, Porsche, Almatic, Walter Scheid (Federal Republic of Germany); Raketto, Manky (Italy), LASS, Renault (France); OMC (Great Britain); Yamaha, Dzhuky (Japan).

An analysis of the industrial aspect of foreign technologies shows that 47% of them were imported for machinery construction, 27% for military industries, 6% for chemical/timber complex, 5% for metallurgy, 7% for consumer goods production. The majority of licenses, 47%, were imported for automobile production, radio and electronic equipment, aerospace industry, agriculture.

Research on the industrial structure of imports shows that at first the USSR purchased licenses for coal and chemical industries, then it imported technologies for, first of all, science-intensive industries: machinery construction, auto- and airtransport, radioelectronics, etc.

Such was the system of legal protection and commercial realization of new technologies in

Russia. Today, as already mentioned, the situation has changed very suddenly.

2. IP IN RUSSIA IN MODERN CONDITIONS

The disintegration of the USSR and the establishment of new economic relations in Russia completely changed the situation described above:

- First of all, Russia is an independent state in the Commonwealth of other states of the former Soviet Union;
- Russia is changing to a market economy;
- new kinds of property, including private, have appeared;
- instead of one political party there are more than 40;
- the country's new legislative basis is being founded;
- Russia's cooperation with other countries has expanded considerably; it has now become possible to set up companies with foreign investments in Russia.

Certainly, businessmen are interested in what laws can protect their investments in the Russian economy and what changes have taken place now in the Russian Federation.

The Law "On Foreign Investments in the RSFSR" of 4 July 1991 permitted the use of foreign investments in the national economy of the Russian Federation. According to Article 2 of that law "foreign investments shall be all types of material and intellectual values invested by foreign investors in objects of business and other kinds of activities for the purpose of gaining profit (income)." According to Article 31 "...Protection and realization of rights to intellectual enterprises with foreign investments shall be secured in compliance with the legislation currently in force in the territory of Russia.

Improvement of the national system of legal protection and commercialization of the use of intellectual property is one of the major conditions for the successful economic development of Russia and its integration into the system of international economic relations.

2.1. New system of Legal Protection of IP

In 1992 after the adoption of a whole series of laws, the new Russian system of legal protection of intellectual property was established. First of all the Russian Agency for Patents and Trademarks (Rospatent) was set up to replace the State Committee for inventions and discoveries of the USSR.

Rospatent

The Russian Agency for Patents and Trademarks (Rospatent) is a federal executive body duly authorized to grant, register, and maintain rights to inventions, utility models, industrial design, trademarks, service marks, appellation of origin, as well as to effect registration of computer programmes, databases, and topographies of integrated circuits in the Russian Federation. It performs the functions of the State Patent Office of Russia and those of the Agency for the legal protection of computer programmes, databases, and topographies of integrated circuits.

Rospatent is empowered to implement uniform state policies on the legal protection of industrial property rights, computer programmes, databases, and topographies of integrated circuits, improve the legislative and statutory basis in the sphere of intellectual property, provide conditions for bringing industrial property rights into commercial circulation, realize tasks of international cooperation in the aforementioned sphere and develop its inner structure and forms of activity. In addition, in April 1999 Rospatent was empowered to improve legislation on international cooperation and interaction with public organizations in the field of copyright and related rights.

The functional structure of Rospatent is an aggregate of several structural elements. The functions of the State Patent Office are as follows:

The Central Body (functions of the federal executive agency: working out of proposals, in cooperation with ministries and offices, on the formulation of state policies in a given field, international cooperation, financial support for the system, registration of licenses and contacts, professional certification and registration of

patent attorneys, coordination of activities of all structural elements, general questions).

The Federal Institute of Industrial Property (FIPS) (acceptance and examination of applications, registration of titles of protection, publication of official data on the above titles, acquisition of patent collections, provision of patent information services, participation in Rospatent's activity to up-date legislation in the field of industrial property protection, improvement of the normative base of examination, solving specific legal and methodological problems, etc.).

The Board of Appeals (examination of appeals against the Examiner's decisions and objections to the granting of titles of protection of registration of industrial property rights).

The Higher Patent Chamber (a collegiate body within Rospatent; established in order to examine appeals, statements, and requests of applicants, holders of titles of protection, and third parties).

The State Anti-Monopoly Committee

Apart from the Patent Office dealing with the registration of trademarks there is a State Anti-Monopoly Committee which monitors the activities of business entities from the point of view of their allegiance to the existing legislation. It bases its activities on the Law on Competition and Limitation of Monopoly Activities on the Markets. Specifically, Article 10 of the Law relates to unfair competition and bans the sale of goods violating intellectual property rights. The Anti-Monopoly Committee may also forbid activities which mislead the consumer in respect of the source of goods and the manufacturer.

In 1999 the Rospatent Website was developed — www.rupto.ru — for a wide range of user access.

2.2. Legislative Basis

As said above a whole series of new laws was adopted in 1992-1993. The results of scientific and engineering activity are now the object of private ownership and are protected by patents or certificates of equal jurisdiction. New subject matters such as utility models, appellations of origin, computer programmes, databases and the

topographies of integrated circuits are given protection. The most important of the laws is the Patent Law.

1. "Patent Law of Russian Federation No. 3517-1 of 23 September.1992".

In accordance with the Patent Law of the Russian Federation, the structure of legal protection of industrial property subject matter was redefined. In particular, "postponed examination of inventions" was introduced. In compliance with the Patent Law the results of scientific and engineering activity are the object of private ownership and are protected by patents or certificates of equal jurisdiction. The Patent Law regulates the relations occurred in compliance with the development, legal protection and use of the inventions, utility models (UM) and industrial design (ID).

According to the Patent Law an invention may be protected if it is new, is characterized by inventive level and is applicable in industry. An invention is new if it is not known from prior art. An invention is characterized by inventive level if for an expert it does not follow obviously from prior art. Prior art includes any information generally available in the world before the priority date of the invention.

While establishing the novelty of an invention, prior art includes all applications for inventions and utility models (except for those withdrawn) filed by other persons in the Russian Federation if they have an earlier priority, and also inventions and utility models patented in the Russian Federation.

An invention is considered to be applicable in industry if it can be used in industry, agriculture, the public health service and in other fields of activity. The law also contains an exception to novelty which is six months after disclosure of the invention. The subject matter of an invention may be: a device, a method, a substance, a strain of microorganism, cultures of cells of plants and animals as well new application of a previously known device, method, substance, strain.

There are solutions which are not regarded as patentable inventions. These are mainly scientific theories and mathematical methods; methods of

organization and management of economy; methods of performing mental operations and some others. The Patent Law incorporates provisions for utility models and designs. A utility model (UM) is a structural embodiment of a means of production and of consumer goods. The design (industrial design – ID) concerns the outer appearance of an object determined by its artistic/structural embodiment.

The right to an invention, and ID, or a UM shall be protected by the State and certified by the grant of a patent or a certificate:

- the patent for an invention shall be effective for 20 years
- the patent for an ID shall be effective for 10 years
- the certificate for a UM shall be protected for 5 years

Inventorship

A national whose creative work has resulted in an invention, industrial design (ID), or utility model (UM), is recognized as the inventor. The right of inventorship shall belong to the inventor as it is an inalienable personal right. Inventorship is protected permanently.

The Patentee

A patent for an invention, UM, or ID shall be granted:

- to the inventor;
- to a national or legal entity (under an agreement) who is indicated by the inventor in the application;
- to the heir of the inventor;
- to the employer, if the appropriate agreement has been concluded between an employee and an employer.

According to Russian Civil legislation, a legal entity is an organization which possesses separate property in the process of economic, proprietary and management activities and which incurs liability for its obligations by said property and can act on behalf of its name, when acquiring and exercising its personal rights of property and non-property rights, and presents itself before the court as the plaintiff or defendant.

Application for a Patent

The application for a patent for an invention, ID, or UM shall be filed with the Russian Patent Office (PRO). National and stateless persons domiciled outside the Russian territory or foreign legal entities shall conduct actions in Russia concerning obtaining patents and keeping them in force through the intermediary of Russian patent attorneys registered by PRO.

Priority of invention, ID, or UM

The priority of an invention, ID, or UM, shall be established by the date of filing an application with PRO. The priority may be established by the application filing date in a foreign state (member of Paris Convention for the Protection of Industrial Property - convention priority) if the application for the invention or UM is filed with the PRO within 12 months and the application for the ID is filed within 6 months from the foreign filing date.

Appeal of Decision on Application for Invention, ID, or UM

In the case of disagreements with the decision of the substantive examination, the applicant has the right to submit a motivated appeal to the Appellate Board of the PRO. In the case of disagreement with the decision of the Appellate Board, the applicant has the right to submit an appeal to the Patent Court of the PRO.

Figure 1 below represents the new system of organization of legal protection of industrial property in Russia. In accordance with the new law any inventor or national or legal entity may file an application with the PRO. Foreigners have equal rights with Russian citizens.

Today in Russia provisional legal protection of inventions has been introduced. Provisional legal protection of inventions shall be effective for three years from the date of publication of an application. If within three years a petition is not filed with PRO to carry out substantive examination, an application for an invention is cancelled. After substantive examination a patent can be granted. A patent for an invention shall be effective for 20 years, 10 years for an industrial

design, and 6 years for a useful model, from the date of filing an application with the PRO.

The exclusive right to use an invention (ID; UM) belongs to a patentee. No one may use an invention for which a patent has been granted without the patentee's consent.

2. "The Law of the Russian Federation on trademarks, service marks and appellations of origin" No. 3520-1 of 23 September 1992".

According to this Law, the Trademark is a sign whereby goods manufactured and services rendered by a natural person or legal entity may be distinguished from goods or services of the same type manufactured or offered by another natural person or legal entity. The trademark can be registered on the juridical person or private owner. The registered trademark is proved by a certificate. The right to a trademark shall be protected by the State and certified by the granting of a certificate. The trademark certificate shall be effective for 10 years, and can be prolonged every 10 years. The certificate of appellation of origin is granted only once and is valid for life.

In 2000, the **"Rules on Recognition of Trademark as Well-Known Mark in the Russian Federation"** entered into effect. The provisions of the above-mentioned document are harmonized with the provisions of the Joint Recommendations Concerning Protection of Well-Known Marks adopted in September 1999 by the General Assembly of the Paris Union on Protection of Industrial Property and the General Assembly of the World Intellectual Property Organization.

The Rules determine the features of well-known marks as follows (1) intensive use; (2) reputation (notoriety) in the Russian Federation among the relevant groups of population; (3) reputation of trademark as a sign marking the goods of a specific manufacturer. The Rules define the list and content of the documents which can be attached to an application.

3. Legal protection of trade names. "Civil Code of the Russian Federation" part I No.51-FL as of 30 November 1994, part 2 No.15-FL of 26 November 1996.

Basically, the legal regulation of trade names is implemented by the provisions of the Civil Code of the Russian Federation. Federal Laws also include certain provisions related to this issue. However, said Laws are not special Laws devoted to the practice of legal protection of trade names.

Namely, according to Article 51 of the Civil Code of the Russian Federation, legal protection of a trade name begins after registration of the right holder — the legal entity — by the Ministry of Justice. The trade name is a piece of information for the official registration of the legal entity, which is included in the Common State Register of legal entities i.e., it is not an independent registration but an "accompanying" registration; the trade name itself is not under registration.

4. The Law of Russian Federation on "Legal protection of computer programmes and data protection" № 3523-1 of 23 September 1992.

The Law regulates the relations connected with development, legal protection and use of computer programmes and data bases. According to this Law:

- "computer programme" means the objective form of presenting a totality of data and commands which are intended for the operation of computers and other computer devices for the purpose of obtaining a certain result. By a computer programme is also understood the preparatory materials.
- "data base" means the objective form of presenting and organizing a totality of data (e.g., articles, calculations) systematized in such a way that this data may be found and processed by a computer.

Relations Governed

Computer programmes and data bases are referred by this Law to the subject matters protected by copyright. Computer programmes shall be legally protected as literary works, and data bases shall be legally protected as compilations.

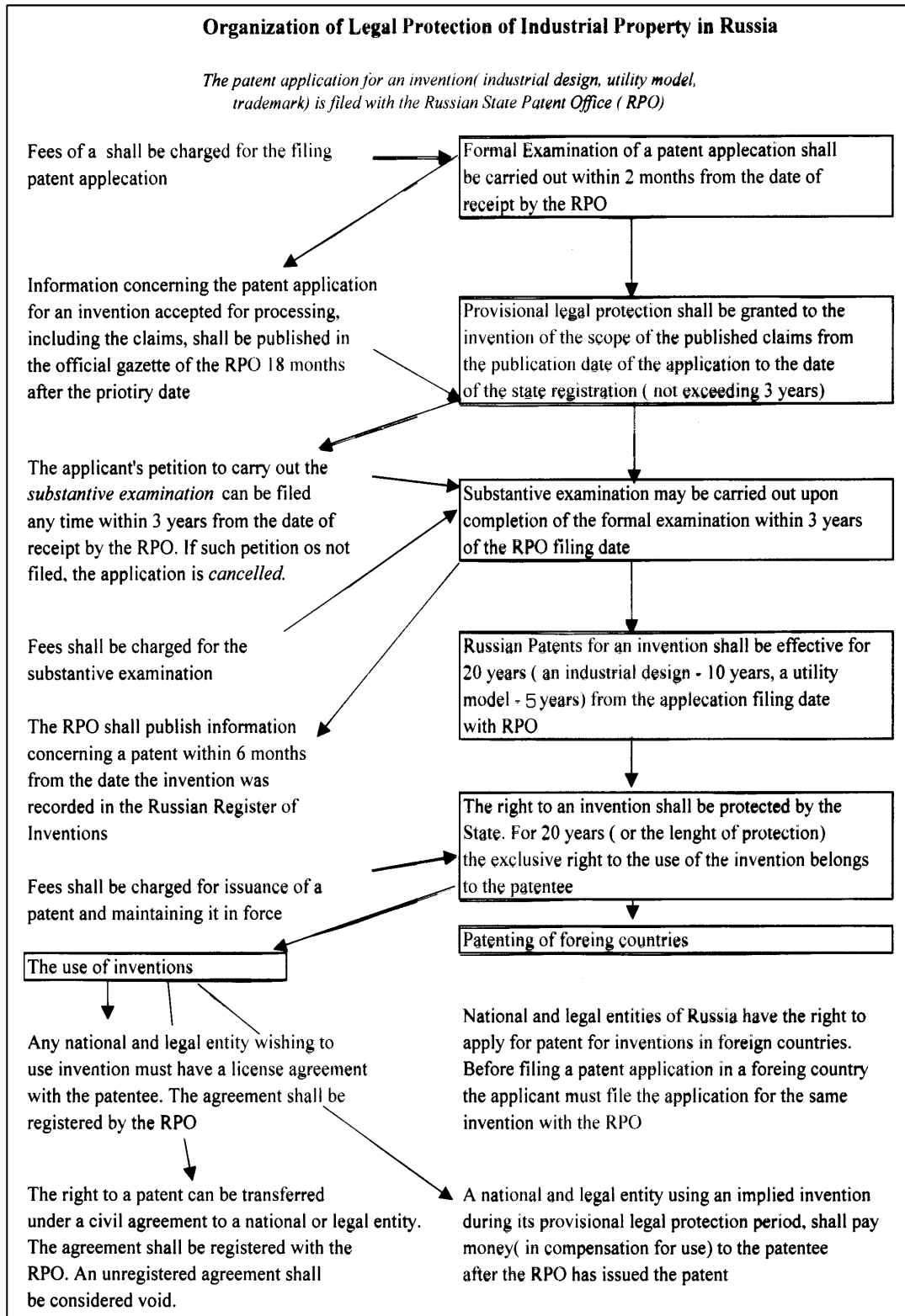


Figure 1

Subject Matter of Legal Protection

The legal protection granted by this Law shall cover all kinds of computer programmes (including those for operational systems and software complexes) which may be expressed in any language and in any form, including the initial text and the objective code.

The legal protection granted by this Law shall cover data bases that are the results of creative work on selection and organization of data. Data bases shall be protected regardless of whether or not the data on which they are based or which they include are protectable by copyright.

Conditions for Recognizing Author's Rights

The holder of the right, in order to announce his rights, may, from the first issuance of a computer programme or a data base, use the symbol of copyright consisting of three elements:

- the letter C in a circle or in parenthesis;
- the designation (name) of the holder of the right;
- the year of the first issuance of the computer programme or data base.

Copyright for Data Base

Copyright for a data base consisting of materials not protectable by copyright shall be vested in the persons that have created that data base.

5. The Law of the Russian Federation on "Legal protection of topographies of integrated microcircuits" № 3526-1 of 23 September 1992.

The Law regulates the relations connected with the development, legal protection, use of topographies and defines as follows: "topography of an integrated microcircuit" (hereinafter "topography") means a three-dimensional disposition, as fixed on a material carrier, of a totality of the elements of an integrated microcircuit and the interconnections therebetween..

Subject Matter and Conditions of Legal Protection

The legal protection provided by this Law shall cover original topographies only. The original

topography is a topography made as a result of the creative activity of the author. The topography shall be regarded as original provided and until there is no proof to the contrary.

Authorship of a Topography

By the author of a topography is recognized the natural person whose creative activity has resulted in the creation of the topography.

Property Rights

The author or other holder of the right shall enjoy the exclusive right to use the topography at his own discretion, in particular by manufacturing and distributing IMCs having this topography, including the right to prevent other persons from using this topography without a corresponding authorization, except for the cases provided for in Article 8 of this Law.

Registration and Notice

In order to announce his rights, the author of a topography or his successor in title shall have the right to make, on the protected topography as well as on the products containing this topography, a notice to that effect in the form of an upper-case letter T ("T", [T] (T), T* or T, date of the beginning of the exclusive right to use the topography, and information allowing the holder of the right to be identified.

6. The Law of the Russian Federation on "Copyrights and allied rights" № 5351-1 of 9 July 1993.

The Law regulates the relations connected with development, legal protection and use of research works, literature and art (copyright), phonograms of the performances, programmes (allied rights). There is no need to be officially registered in order to obtain copyright in Russia. The copyright occurs after the development of the work and is effected and protected during the author's life and for 50 years after the author's death.

7. The Law of Russian Federation on "Legal protection of achievements in Selection № 5605-1 of 6 August 1993.

The Law regulates the relations with development, legal protection and use of

achievements in Selection. Achievement in Selection means new plant varieties and animal breeds. The right to an achievement shall be protected by the State and certified by the grant of a patent. The patent shall be effective for 30 years.

The above-mentioned laws are basic and provide effective functioning of the legal protection of IP System in Russia.

8. International cooperation in IPR

Russia is a member of many international conventions in the field of intellectual property. The basic one is the Paris Convention. It allows the applicant to file a patent application in his home country after which he has twelve months to decide on filing corresponding patent applications in other countries. This helps the applicant to search for potential consumers of his product before he files in other countries. The applicant may also file a so-called PCT patent application. There is a Receiving Office in Russia for this purpose.

If the applicant limits his claims to Europe he may file a European patent application. Russia is not a member of the European Patent Convention, however since the Convention is open to third countries the Russian applicants use it.

Recently another regional patent has become available, i.e. a Eurasian patent. The members of the Eurasian Patent Convention are most of the former USSR republics, now independent States. A Eurasian patent application shall be filed in the Eurasian Patent Office in Moscow which is a multinational office. After an examination procedure a Eurasian patent is granted. Unlike the European patent it does not break into the national patents but remains as such and is maintained undivided. After the grant of a Eurasian patent the applicant shall pay a combined maintenance fee which is a sum of national maintenance fees. The Eurasian patent system is open for the filing of patent applications

from other, non-member countries and is open for other countries to join.

2.3. Statistical review

The new Russian system of legal protection of intellectual property has been in force for seven years, and some tendencies can be detected.

Inventions

A reduction of inventive activity was observed after implementation of the Patent Law of the Russian Federation in 1992. There was a sharp drop in the number of invention applications submitted by Russian applicants (from 200,000 in 1989 to 28,000 in 1993). There are a number of reasons for such a situation:

- 1) The unstable economic situation in Russia and sharp drop in production;
- 2) The legal status of a patent, according to which the exclusive right of using an invention belongs not to the State but to the patent owner, who is interested in the protection of a commercialized invention. Due to all this there was an abrupt rise in the requirements for selection of inventions to be patented;
- 3) The necessity of paying for substantive examination and for maintenance of a patent, while Inventor's Certificates were granted free of charge, etc. This tendency towards a reduction of the number of applications was observed up to 1998, when there appeared an increase in the inventive activity (Table 1).

The decrease in foreign applicants' activity was insignificant while the share of the foreign applications increased from 1.2 % in 1989 up to 20 % in 1999.

Speaking about the formation of market relations in Russia, attention should be directed to the specific features of the patent policy carried out by foreign firms of the leading countries throughout the world. Beginning in 1985, a

Table 1. Intensity of Inventive Activity

Number of applications for a patent submitted to ROSPATENT	1993	1994	1995	1996	1997	1998	1999
Total number	32 216	23 081	22 202	23 211	19 992	21 362	24 659
Russian applicants	28 478	19 482	17 551	18 014	15 106	21 362	19 900
Foreign applicants	3 738	3 599	4 651	5 197	4 886	4 908	4 759

substantial increase in the flow of applications from leading industrial countries abroad was noted on the international market of patents and licenses. Today the USA is the country with the highest degree of involvement in patenting inventions abroad. The proportion of American applications in the worldwide flow is 28%. The degree of activity of Japanese and German firms has also increased, to 14.3% and 19% respectively. Great Britain and France are next in line in respect of foreign patenting.

At present the volume of mutual foreign patenting of leading industrially developed countries is tens of thousands of patents. An analysis of the legal protection of foreign inventions in Russia shows that there is a growth in the interest of foreign firms in the protection of their inventive developments in our country. However, the general policy of the leading countries in the world toward Russia has not substantially changed. And even though the share of applications filed by foreign applicants has increased, these numbers do not in any way compare with the volume of mutual foreign patenting between the leading industrial countries. For example, firms of the USA, which are the most active foreign applicants at the Russian market, sent 1186 applications to ROSPATENT in 1999, then comes those of Germany – 812, France – 385.

Among the CIS countries the most active country is Ukraine, which is fourth after the USA, Germany and France as to the number of patent applications submitted to Russia. Formation of the intellectual property market is characterised by the growth of the total number of valid patents and certificates.

During the period under consideration the number of valid patents on the territory of Russia constantly increased and there were 191,129 of them by 1 January 2000 (Table 2), 38,143 of them belonging to firms from 85 countries of the world.

It is important to emphasize the following tendency. The majority of the annually registered inventions belong to juridical entities. Along with it the number of patents given to juridical entities from Russia is on average twice that of patents received by the physical persons from Russia. For foreign applicants this ratio is much higher (about six times as many). For example, 14,138 patents out of 19,508 were given to juridical entities in 1999:

- 10,378 patents to Russian representatives;
- 3,760 to foreign firms.

Analysis of the structure of flow of the patents for inventions proves that the leading countries of the world still carry out the same policy concerning Russia as described above. Foreign firms protect their priorities in the same fields in which they used to before the new laws were adopted. These fields are as follows – “Chemistry and Metallurgy”(C), “Technological Processes”(B), “Armaments”(F), “Necessities of Life”(A).

On the contrary, Russian applicants have absolutely changed their priorities. Previously the number of national applications under A-category were the smallest, but now in this category one can observe the greatest level of activity. Russian enterprises are trying to gain the priorities and markets in the area of meeting the necessities of life, first of all, but not in the area of armaments and explosives, as was previously the case.

Table 2. Dynamics of Legal Protection of Intellectual Property in Russian

Items valid by the end of the year	1994	1995	1996	1997	1998	1999
Patents for inventions	60 321	76 186	109 467	155 247	173 081	191 129
Patents for production prototype		4 700	5 560	6 400	7 234	8 651
Certificates for useful model	186	2 971	3 361	5 700	8 185	11 591
Certificates for trademarks and service marks	81 675	92 915	102 241	109 993	107 561	117 920
Registrations of -computer programmes	534	1 018	1 601	2 322	3 071	4 087
-databases	43	84	133	224	302	463
-microchip topologies	8	16	20	23	31	43

Table 3. Dynamics of Applications for Industrial Design Patenting

Number of applications	1994	1995	1996	1997	1998	1999
Total number	1 423	1 370	1 266	1 302	1 509	1 585
Russian Participants	1 225	1 165	994	929	1 076	1 274
Foreign Participants	198	205	272	373	433	311

Utility models

The analysis of data given in Table 2 proves that a system of legal protection of utility models is now being established in Russia. This fact is confirmed by the considerable increase both in the number of national applications for utility models (from 14 applications in 1992 up to 3444 in 1999), and in the number of their registrations.

Foreign applicants still show slight interest in protecting this kind of property in Russia. In 1993-1999 only 202 applications were submitted by foreign applicants, mainly from Ukraine and Belarus.

Analysis of the branch structure of the registered utility models proves that the leading position is occupied by the Russian applicants in section B – "Different Technological Processes", and section A – "Necessities of Life", then comes section F – "Mechanics, light, weapons, ammunition", section G – "Physics". For foreign applicants the picture is quite different: first comes section B, then section D – "Textiles, paper", then sections A and F, etc. All in all there were 11,591 valid certificates for utility models in force on the territory of Russia by 1 January 2000.

Industrial design

Under conditions of an operating market, one of the main objects of industrial property is industrial design. At present firms abroad pay special attention to the protection of this subject matter, since in the long run the appearance of goods ensures their successful sale. Unfortunately industrial design has not yet attained an independent economic value in Russia, this being confirmed by the reduction in the number of applications for the registration of national industrial designs (Table 3).

And on the contrary, the volume of applications for registration of foreign industrial design permanently increases. However their total is not comparable with the number of applications given by the corporations to other countries. Thus in 1999 there were 36 applications for registration of industrial designs submitted from the USA to Russia, 30 from Germany, 44 from France, 10 from Great Britain, 31 from the Netherlands. In 1999 Japan, which is most active in protecting its industrial designs abroad, submitted 17 applications to Russia. It is necessary to note that foreign corporations submit to Russia applications for consumer goods, sporting goods

and items of light industry, and practically do not protect products of mechanical engineering. The reason for this is the condition of the Russian market and the low level of domestic design.

Trademarks and service marks

In Russia one of the intensively growing intellectual property subject matters is the trademark, servicing mark together with the name of the place of origin or geographical names, or the so-called means of individualization of the products and services.

It is a well-established fact that world practice acknowledges the acquisition of exclusive rights through registration or through use. In Russia, the right to a trademark is acquired by registration. Analysis of the dynamics of trademark protection reveals the following tendency (Table 4). Analysis of changes in trademark legal protection shows a different tendency. First of all, the number of annually registered trademarks permanently increases. A steady tendency of increase in the number of applications from domestic applicants should be noted. They obtained 63% of all the trademark applications in 1999. The ratio of registered national and foreign trademarks merits special attention. If earlier more than 60% of all registered and operational

trademarks belonged to foreign corporations, the transition of Russia to a new economic structure showed many Russian companies how important it is to protect trademarks in time. In 1999 the registered trademarks of the Russian companies was about 50%.

Foreign firms also show a steady concern about protection of their goods on the Russian market. Sixty-four countries of the world register their trademarks in Russia. Corporations from Germany, France, USA, Switzerland, Netherlands, Great Britain and Spain take the leading position. Among countries of the former socialist commonwealth there are firms from the Czech Republic and Poland. There are also applications from CIS countries — first of all from Belarus and Ukraine (Table 4).

It is also necessary to note changes in the structure of registrations as to branch. Earlier there were mainly trademarks that were protected, but in 1994-1999 about 23% of the national applications were submitted for the registration of service marks, that is first of all due to the development of Russian services market. Among foreign applications the share of service marks is less than 10 %.

Table 4. Changes in Submission of Applications for Registration of Trademarks (TM) and Service Marks (SM)

Years	1993	1994	1995	1996	1997	1998	1999
Total number of applications for registration TM and SM in Russia:	25 920	23 875	21 403	24 127	28 157	28 581	28 995
- Russian applicants	18 028	14 419	11 829	13 513	15 998	15 583	18 254
- Foreign applicants	7 892	9 456	9 574	10 614	12 159	12 993	10 741
Total number of new registrations:	11 246	12 805	12 647	20 313	17 401	17 701	19 507
- Russian applicants	3 996	5 780	10 256	10 108	8 249	7 791	9 181
- Foreign applicants	7 250	7 025	2 391	10 205	9 152	9 910	10 326
By the end of the year of registration	74 676	81 675	92 915	102 241	109 993	107 561	117 920

In total 117,920 registered trademarks and service marks were effective in Russia by 1 January 2000.

Appellations of origin

Specifying the appellation of origin is for Russian applicants principally a new object of legal protection and they still insufficiently use the advantages of such registration. For the whole period that the Law protecting this object of intellectual property has been in force, 129 applications from Russian applicants have been submitted to ROSPATENT and 104 certificates granting the right to use the name of appellations of origin were given.

Mostly granting rights to use appellations of origin are signs associated with traditional goods, like "Gzhel", "Khokhloma", "Fedoskino", "Vologodskoye maslo", mineral waters. There were no such applications from foreign applicants.

Computer programmes, data base and topology of integrated circuits

In 1993 the official registration of computer programmes, databases (DB) and topology of integrated circuits (TIC) began. Data presented in Table 5 prove that a legal protection of these objects is being formed in Russia. In 1997-99 a considerable increase in the number of appeals for official registration of computer programmes was noted and this is also true for Russian applicants. The activity of foreign applicants increased, which proves that foreign firms are interested in defending their positions on the Russian software market. Such foreign companies as IBM, Microsoft and Unigraphics are the most active in registration of their programmes.

3. RUSSIAN SYSTEM OF LICENSING

The commercial realization of intellectual property is a constituent part of its legal protection. A characteristic of modern-day development of economic relations is the constant expansion of the volume of transfer of intellectual property such as technology, which is accomplished on a commercial basis in the form of license trades.

For the majority of countries, license trade is carried out on both a national and an international level, i.e. firms carry out an exchange of technologies within a country and actively use license trade in their foreign trade practice.

3.1. Technology transfer regulation

As already said above, all scientific and technical achievements in the former Soviet Union belonged to the state. That is why in the USSR there was no system of internal licensing, and licensing existed only as a way of foreign economic operations. License trade within the country is a completely new phenomenon for Russia. For the moment Russia does not have special laws governing the transfer of technology

Legislative acts and regulations adopted in Russia in 1991-1999 laid the foundation for the domestic legal system in the field of technology licensing. It comprised: the Civil Code of the RF,, Patent Law of the RF, Laws "On Legal Protection of Computer Programmes and Data Bases", "On Legal Protection of Integrated Micro-Circuits Topologies", "On Legal Protection of Achievements in Selection", "On Copyrights and Allied Rights", "On Export Control", "On

Table 5. Changes in Registration of Computer Programmes, DB and TIC

Object of Protection	1994	1995	1996	1997	1998	1999	Total
Computer Programmes	534	484	583	721	749	1016	4087
Databases	43	41	49	91	78	161	463
Integrated Circuits Topology	8	8	4	3	8	12	43

Competition and Limitation of Monopoly Activities on the Market”.

The domestic system of technology transfer

With a variety of ways for technological exchange, a patent assignment contract, a license agreement on granting the right to use the protectable industrial property subject matter, a contract for granting know-how and a commercial concession contract to provide the user with a set of exclusive rights, including a trade name or a business name, are the basic legal means of transferring and acquiring technology in the Russian Federation. The patent assignment contract as an independent contract type is designated in Article 10(6) of the Patent Law of the Russian Federation. In this case rights to a patent can be transferred to a national or legal entity under a civil agreement which shall be registered in Rospatent.

Article 13 of the RU Patent Law states that a license agreement between the Party which expressed a desire to use the industrial property object, and the Patentee should be obligatorily signed and registered in the Russian Patent Office (ROSPATENT).

State registration is obligatory only for the internal operations connected with protected industrial property objects: agreements on providing a patent and agreements on patent license transfer. Agreements, the subject of which is the transfer of technological activity products not protected by a patent ("know-how" agreements), are not subject to registration, neither are international treaties on export of Russian technologies or import of foreign ones, except for military and dual-purpose technologies, for which there exists a special state control .

Article 13 of the RU Patent Law defines four types of license:

Simple license - the licensor, giving to the licensee a right to use the invention, keeps all rights arising from a patent including the right to grant a license to a third party.

Compulsory license - in the case where the invention and ID fails to work or performs

insufficiently within 4 years from the date of publication (UM is 3 years) a person willing and prepared to use the invention may lodge a suit before the Patent Court of Russia to grant him a compulsory, simple license fixing the Units of the use of the invention, amounts, time limits, and terms of payment.

The amount of payment must be comparable with market price of the license. This license is granted if it is not possible to conclude a license agreement with the patentee, and the latter cannot justify the failure to work or insufficient performance of the invention, UM ID with legitimate reason.

Exclusive license - the exclusive right to use the invention within the scope specified by an agreement is assigned to the licensee. The licensor retains the right to use the invention in part — not transferred to the licensee.

Open license - a patentee may submit an application to the RPO offering any person the right to use his invention, in which case the maintenance fee shall be reduced by 50% starting from the date of publications of the application.

The registration of a license agreement is carried out in accordance with “**Regulations on Consideration and Registration of the Contract for the Assignment of a Patent and Granting of the rights to exploit the invention, utility model, industrial design**”. The registration procedure aims to provide for legality of contracts for the assignment and exploitation of intellectual property rights, namely to preventing the assignment of intellectual property rights by unauthorized persons, the inclusion of contracts of clauses contradicting current legislation, the revocation of rights under the contracts concluded.

The list of documents accompanying the application for registration of a contract is enumerated in Para. 2 of the Regulations. Presence of the protective document (patent for invention, utility model, industrial design) and the possibility of access to State Registers Data bases allows the authority of person transferring the rights of the patent to be confirmed and the patent validity on the date of registration to be controlled.

The amendments and additions to the registered contract relating to the determination of the contracting parties, the object of the contract, the scope of rights transferred, the territory and term of contract validity, including premature expiration of contract validity, shall also be registered (Para. 6 of the Regulations).

Particularities of licensing of trademarks and trade names.

According to Article 26 of the Law of the Russian Federation "On Trademarks, Service Marks and Appellations of Origin", a national and legal entity wishing to use a trademark any license agreement with the patentee. Above all - it is subject-matter of licensing.

According to Russian legislation usually only the signs registered by the Patent Office are protected as trademarks. In other words, in Russia the signs used for marking of goods, but not registered in due form, are not protected as trademarks. And, respectively, they cannot be the object of license contract. (Note: this presentation does not cover well-known trademarks which are protected without any registration.)

Legal protection of ***trade names*** is regulated in a different way. Russia, as a contracting party to the Paris Convention for the Protection of Industrial Property, shall provide legal protection to trade names without the mandatory filing of an application or special registration, notwithstanding whether or not it is part of a trademark. The above international obligation is applied in Russian legislation.

Thus, the trade name of the Russian right holder can be the object of licensing if the said right holder is registered as a legal entity. In the case where the right holder is foreign (not Russian) subject of law, the trade name can be the object of licensing in Russia if the said trade name is protectable in accordance with the national legislation of the right holder.

Secondly, the success of trademark and trade name licensing depends greatly on the correct determination of the legal status of the person granting the right to make use of the trademark or trade name.

In accordance with Article 2 of the RU Law "On Trademarks, Service Marks and Appellations of Origin", the trademark owner may be a legal entity or natural person engaged in entrepreneurial activity. Both commercial and non-commercial organizations can be regarded as a legal entity. It should be noted that daughter companies and affiliates are not regarded as legal entities. Legal entities shall be registered by the Ministry of Justice.

As the second subject of the law, which can be the trademark owner, Laws determine the natural person engaged in entrepreneurial activity. In accordance with Russian legislation a citizen has the right to be engaged in entrepreneurial activity without establishing legal entity from the time of registration as an individual entrepreneur.

There are legal requirements as to status of trade name owner. Only a legal entity which is a commercial organization can be regarded as a trade name owner. "Commercial organization" means an organization whose main goal is to derive a profit as a result of its activity.

Non-respect of the above requirements can lead to annulment of the registration of a license contract. The license contract registration procedure and terms are governed in detail by the "***Rules for registration of the Trademark Assignment Contracts and License Contracts for the Granting of the Right to Exploit the Trademark***" which is a Departmental normative (by-laws).

In Russia, the agreement on ***commercial concession*** is widely used. In particular, according to Article 1027 ("Franchising arrangement") of the RU Civil Code," under a franchising arrangement, one party to an agreement (the franchiser) shall be obliged, in exchange for consideration, to allow another party to an agreement (the franchisee) for a certain period of time or without indication of time limits to use in the franchisee's commercial activity the system of exclusive rights belonging to the franchiser, including the right to a trade name and/or business name of the franchiser, right to undisclosed information as well as the other objects of exclusive rights provided for in the agreement - a trademark, service mark, etc."

Licensing of Computer Programmes, Databases and Topographies of Integrated Circuits

In accordance with Art 13 of the RU Law "On Legal Protection of Computer Programmes and Databases" a holder of all the economic rights in the computer programme or database may, with the term of the copyright protection, register it at his discretion by filing an application in accordance with established procedures. The application for registration of the topographies of integrated circuits should be filed within a two-year period from the date of the first use.

The contracts for the complete assignment of all property rights and contracts for the transfer (licensing) of property rights for these computer programmes, databases, and topographies shall be registered with Rospatent. In contract registration the procedure is governed by the ***“Rules on registration of Contracts for the complete assignment of rights and Contracts for the transfer of rights. for computer programmes, databases, and topographies”***.

In particular, according to the said regulations the contract (or copying) of any kind of intellectual property, the application for registration of a contract and the proof of payment of the prescribed fee shall be filed within the Patent Office for registration of the license contract. All said documents, in accordance with the regulations, shall be written in Russian. If the documents are written in a language other than Russian, the said documents shall be accompanied by a Russian translation certified in due manner. Application for registration of the contract shall be considered within two months following the filing date.

Information relating to licenses granted is recorded in the Official Register of the Russian Federation. In addition the information shall be published in the Official Gazette by the Patent Office.

Know-how transfer

There is at present no specialized legal act combining all rules relating to know-how in Russia. As the same time, a contract for granting know-how is the popular way for technological exchange. Also, conditions on know-how transfer

for optimal use of the protectable industrial property subject matter are included in the majority of license agreements and commercial concession contracts.

The protection and putting in economic turnover of know-how became possible following the adoption of the revised Civil Code of the Russian Federation. According to Article 139, “Commercial secrets” are “the various valuable commercial knowledge connected with manufacturing, management, financial activities etc., recognized as know-how”, for example, knowledge of a technological character such as scientific reports, design drawings, methods of carrying out experiments, methods of calculation, specifications, principles of prescription-writing, records of tests. Economic and management confidential information are also protected as know-how or commercial secrets, for example clients’ and providers’ cards, financial operations, business plans, analytical information. It is necessary to consider the RU Government Resolution of 5 December 1991, No. 35 “On the list of data which cannot be regarded as commercial secrets”.

Defining the term “know-how” requires special care to take into account some peculiarities of the RF legal system. Often some “generic notion” is understood as know-how including all commercially valuable information, and that which is not kept secret. However in the RF this term has a more narrow construction and essentially is equivalent to the notion of a trade secret. To avoid possible misunderstandings, parties to an international license agreement should strictly define what is meant by licensed information; otherwise a license agreement can be recognized as invalid. A contract on assignment rights for know-how does not require official registration.

Russian market of licenses

So, what are the specific features of the Russian license market? The dynamics of registration of license transactions presented in fig. 7 provide evidence of the presence in Russia of conditions for converting intellectual property into goods.

***Licensing of inventions, utility models,
industrial design.***

Formation of the intellectual property market began with the invention license trade. From 1992 to 1999 9,643 license agreements were registered in Russia, among which there were:

- 3,512 agreements for patents concession;
- 860 agreements for granting an exclusive license;
- 5,271 agreements for granting a non-exclusive license.

As to the volume of transferred rights, the majority of the signed agreements consist of non-exclusive licenses (57.6%) and agreements for patent cession (33.8%). Changes in the licensed invention trade show a reduction in non-exclusive licenses' share (from 72% in 1994 to 40% in 1999) and a simultaneous increase in the share of agreements on patent cession (Table 6).

The share of exclusive licenses is insignificant and forms only 8.6% of the total number of agreements.

Table 6. Registration of the license agreements and agreements for patent session

	1992	1993	1994	1995	1996	1997	1998	1999
Agreements on patent cession	98	97	214	292	422	757	851	781
Agreements on exclusive license	98	80	101	101	82	115	115	168
Agreements on non-exclusive license	433	579	820	702	809	649	650	629
Total number of the registered agreements	629	756	1 135	1 095	1 313	1 521	1 616	1 578

All over the globe there is keen competition and licensees, aiming to protect their rights, purchase an exclusive license. In Russia the predominance of the non-exclusive license is explained by a high market capacity and complexity of guaranteeing exclusive rights, furthermore the non-exclusive license is much cheaper.

At the cession of rights the territory of their validity is stipulated. The geography of the license trade in Russia has the following structure:

- Agreements, according to which a license is valid
- on all the territory of Russia, make up 78%;
 - on the territory of CIS countries – 10%;
 - in some regions, districts, cities – 5.7%
 - in some firms – 6.3%

There exist license agreements which stipulate usage of the licensed object in a concrete branch only, for example in aircraft manufacturing.

One more thing that makes license trade in Russia differ from global practice is that distant foreign countries do not take part in this process and agreements have limited validity on the territory of Russia and CIS countries.

As to industrial property objects there is a tendency of growth in the number of agreements on the use of utility models and industrial design. However, if until 1996 these agreements on license inventions were practically 100 %, since 1996 there has been an increase in the number of agreements on using industrial designs (from 60 in 1996 up to 161 in 1999) and utility models (from 37 in 1996 up to 159 in 1999). An almost fivefold times increase in the number of agreements on using utility models proves that demand for "small inventions" is increasing.

During the considered period there were also considerable changes in the activity of the subjects of the license bargains. Thus, if up to 1995 most active licensors were physical persons

(57% of the total number of agreements) and state firms (26%), today their activity has considerably decreased, but the activity of non-state structures, on the contrary, has increased (from 17% to 58%). Till (62 %) of all patents and rights for using inventions, then come state structures (22%) and physical persons (16%). In 1998 the number of agreements in which state structures (firms, research institutes, design bureaus and higher educational establishments) acted as receiving party, decreased to 7 %. Simultaneously, the share of physical persons decreased (12%) but the share of non-state structures sharply increased (81%).

An important tendency for the Russian market of licenses is the increase in the number of agreements with foreign firms. Thus, in 1996 the share of agreements in which foreign firms acted as a receiving or transferring party was less than 4% and in 1999 it was 12%. 1995 most active licensees were state firms and organizations. They gained the main share

Analysis of the concluded agreements by branch of industry proves that there were also considerable changes. In the period from 1992 to 1995 most of the agreements were concluded in the field of medicine — 20%; light and food-processing industry 14.5%; chemistry, petrochemistry 15%; engineering, machine-tool construction and manufacturing of tools 11.3%; house construction and building materials 11.2%.

Agreements in the field of power engineering and electrical engineering made up 8.3%, electronics engineering and computer facilities 5.7%, metallurgy 3.6%, other 4.1%.

By 1999 the quantity of agreements in the field of oil and gas had increased 2.4 times, in engineering they doubled, and in the field of medicine they were halved. The share of the agreements in the field of house construction and building materials, light and food-processing industry, power engineering and electrical engineering first decreased and since then has remained stable. The share of the agreements in the field of chemistry, petrochemistry, electronics engineering and computer facilities, instrument making is quite stable.

Licensing of trademarks and service marks

In modern conditions a trademark becomes a very important object on the intellectual property market. Now more than 80% of all items produced and exported by firms from the leading industrial countries are labelled with trademarks. In the global market there is a competition not so much among goods, but much more among trademarks. The share of the agreements on acquisition of a trademark or of the rights for using it in the total amount of license trade permanently increases.

Table 7. Registration of the agreements on trademark (TM) concession and licensing

	1993	1994	1995	1996	1997	1998	1999
Total number of registered agreements, among which:	450	1 256	1 125	1 893	2 214	3 101	4 638
On trademark concession	403	656	1 014	1 202	1 285	1 645	2 608
On trademark licensing	47	600	111	691	929	1 456	2 030

In Russia this process is also under development. Analysis of the data presented in Table 7 reveals a steady tendency of growth in the total amount of registrations of both license agreements, and agreements for cession of a trademark. Thus, in 1999 the number of registrations increased to 4,638 as compared to 450 in 1993. And although,

as already said above, the formation of the intellectual property market in Russia began from the invention license trade, the rate of growth in the number of registrations of the agreements on trademarks is considerably greater than those on invention license, which proves that the Russian trademark market is quickly developing.

There were 14,677 agreements registered in Russia by 1 January 1999: 8,813 agreements for trademark concession and 5,864 license agreements. It is necessary to note the reduction in the share of the agreements on trademark concession from 85 % to 56 %. Along with it there were considerable changes in the ratio of national and foreign subjects of agreement. As distinguished from the invention market, at the initial stage of the Russian trademarks market most of the agreements (~75 %) were made between foreign firms. By the end of 1999 their share had decreased to 20 %.

Such changes in the activity of Russian businessmen correspond to the changes which are taking place in our country. The second stage of privatization is now underway in Russia, a great number of new firms with different ownership have appeared, to which the old firms are transferring their trademarks. Companies disintegrate, join, detach affiliates, etc.

As distinguished from the agreements on trademark concession, the situation with license bargains is quite different. Along with a general increase in the total number of registrations the share of license agreements with foreign participants is rather stable and makes up approximately 25% of the total number of registered licenses. Such a situation proves to be of great interest to foreign corporations in promoting their goods and services onto the Russian market. And practically all corporations conclude license agreements with their own representatives in Russia.

This shows that foreign companies, especially TNK, carry out the usual strategy of market development by creating their affiliates and representative offices, which significantly reduces the risks they are taking, especially in conditions of economic instability.

The USA corporations are most widely represented on the Russian trademark market, their share in the total amount of agreements exceeding 13%, then come firms from Germany, Canada, Netherlands, Great Britain and Finland. But most license bargains in the Russian market (~75%) are made between home firms and organizations.

Analysis of the branch structure of the license bargains proves that the greatest quantity of agreements relate to food-processing, drinks and cigarettes manufacturing (~20 %), then follow petroleum production (17%), electrical industry and instrument making (11%), light industry (8%), services (including finance) (7%), chemistry and pharmaceuticals (5%), publishing (5%), etc.

The increase in the volume of license bargains is due to the fact that in Russia there appear new forms, such as "franchising" and "merchandising", when cession of rights for using a trademark is just a part of the general agreement.

In Russian legislation the term "franchise" is replaced by "commercial concession". This type of commercial relations (namely the agreement on commercial concession) was introduced in Russia in 1997 together with the adoption of the second part of the Civil Code of RF. Now the largest share of franchise market in Russia belongs to foreign companies like McDonalds, Coca Cola, PepsiCo, Pizza Hut, Buskin Robbins, Beeline and others.

As far as merchandising is concerned, for the present time there is no appropriate legislative base regulating such type of trademarks licensing. In practice merchandising is widely used for goods promotion on the Russia market.

Licensing of computer programmes, data base and topology of integrated circuits

From 1993 the formation of the market of computer programmes, databases and integrated circuit topologies began in Russia. During six years 471 agreements were registered, 120 of which were agreements for full concession of rights and 351 agreements for property rights transfer (Table 8)

From the data presented in Table 8 it follows that agreements on property rights transfer make up the main part of all registered agreements. Their share, however, decreased from 80 % to 57 %. The number of agreements on full concession of rights increased and was 43 % in 1999, which corresponds to the growth in the number of agreements on cession of invention patent. The

above analysis concerned only registered objects of intellectual property. However, the license trade also includes transfer of "know-how", results of research and development, such services as "engineering", etc.

In international practice the volume of these operations considerably exceeds that of the protected objects trade. The absence in Russia of a legal base and registration of the agreements on transfer of such objects slows down the process of formation of the national market of licenses.

3.2. Particularization of international technology transfer

A permitting order under the State monopoly on foreign trade was in force in the USSR up to the end of 1991.

Under the Russian Federation Presidential Decree "On Liberalization of Foreign Economic

Activities in the RSFSR Territory" on 15 November 1991, the right to perform export-import commercial operations, including purchase-sale of licenses, was afforded to all domestic legal and natural persons engaged in entrepreneurial business. In particular, the Law of the Russian Federation, No. 2551-1 "On Conversion in the War Industry" of 20 March 1992 provided enterprises of the military industrial complex with the capacity to independently transfer (exchange and sell) technology and know-how. In addition, under the USSR Council of Ministers Ordinance "On Licensing and Quoting of Export and Import of Goods (Works, Services)" of 1 January 1992 inventions, know-how, achievements on scientific and technological activities, except for those which may be used in the creation of military equipment, were excluded from a list of goods and services sale and purchase of which could be effected with the authorization of the competent bodies.

Table 8. Dynamics of registration of agreements on concession of rights for computer programmes, databases and integrated circuit topologies

	1994	1995	1996	1997	1998	1999	Total
Total number of agreements	90	50	62	131	75	63	471
Agreements on concession	17	9	8	39	32	15	120
Agreements on rights transfer	73	41	54	92	43	48	351

The permitting order to purchase-sale licenses was therefore abolished. Legal and natural persons obtained the right to carry out license activities independently and enter into license agreements with foreign partners, without a specific system for registering license transactions provided for.

At present, the foreign economic activity in our country is regulated by the Russian Federation Law "*On the State Regulation of Foreign Trade Activities*" No. 157-F.L., dated 13 October 1995. The Law determines the basis of State regulation of foreign trade activities, a procedure for carrying out thereof by the Russian and foreign persons, rights, obligations and responsibility of government agencies in the field of foreign trade activities. The Law applies to entrepreneurial

business in the area of international exchange of goods, works, services, information, achievements of intellectual activity, including the exclusive rights thereof. Special attention is paid to the issues of strict regulation of the processes for transferring technology having military, special and dual purposes.

Thus, at present Russia has a paradoxical situation. The national system of technology transfer regulates only license trade inside the country and there is practically no unified mechanism for state regulation of selling licenses abroad:

1. A system for State regulation of the process for transferring technology which has a civil purpose is absent.

2. All reforms carried out in the field of foreign economic activities have brought about a quite strict control over the transfer abroad of technologies of military and dual purpose as well as so-called “sensitive” technologies:

- In accordance with Russian Federation Presidential Decree **“On Measures to Establish the Export Control System in Russia” No. 11, dated 11 April 1992**. Under this Decree, a Commission for the export control of the Russian Federation was formed.
- Specific regulating lists of goods of strategic significance, including military and dual-purpose technologies, not to be exported without authorization of the Department for export control of the Russian Ministry of Economy, were worked out and adopted.
- Pursuant to the Russian Federation Presidential Decree No.556, dated 14 March 1998 “On Legal Protection of Achievements of the Research, Development and Technological Works Having Military, Special and Dual Purpose”, Russian Federation Government Ordinance No. 1132, dated 29 September 29 was issued. To control the process for transferring such works, a special structure – Federal Agency for the Legal Protection of Intellectual Property Achievements Having Military, Special and Dual Purposes– was established. The objectives of this Agency are, in particular, to hold a single Register, control and account for the use of intellectual property achievements having military, special and dual purposes to be put into economic and civil circulation.

At present, however, it is impossible to appraise the scope or intellectual property transactions on the external market, since in Russia there are no official statistics on the sale of licenses abroad. However, one may judge by indirect means the active character of the sale and transfer abroad of technologies developed by Russian manufacturers.

The tendency of Soviet license export development seems to be very interesting. Over the last years the centre of gravity has moved towards science-intensive industries: instrument-making, radio-electronics, medical biology. New

license objects have appeared – RF, relating, in particular, to employee’s inventions, export control procedures, legal protection of intellectual property, created in the RF territory, contract relations, and, in particular, the norms about invalidity of agreements; do not take into account the requirements of the Russian administrative proceedings and court proceedings.

As a result of errors made by the parties, license agreements concluded by them can be recognized as invalid. This situation can in practice result in essential economic losses for cooperation participants, which undoubtedly affect the results of international integration interaction.

3. When Russian firms now independently execute export-import transactions, independently introduce their scientific and technological products onto the external market and create joint ventures with foreign firms, important problems now arise: a poor professional level of the specialists in this activity, which is rather new to the majority of firms.

In order to make licensing a profitable economic operation, it is necessary to know the state, tendencies and specific features of the world license trade. It is especially important to make use of the license trade experience already available in our country. In the USSR there was a powerful state system represented by “Licenzintorg”, in which professionals of the highest class were available. Almost 30 years experience demonstrated that the largest quantity of Soviet licenses were sold to the former socialist countries (about 66%), the share of the advanced industrial countries being about 24%. But today Russian firms try to find buyers or investors for their technologies first of all in the advanced industrial countries, not having the necessary finance and business ties.

Russian firms try to transfer abroad the latest knowledge of a purely scientific character without providing any manufacturing technologies, secrets and such services as “engineering”. And here appears a whole series of problems, which complicate the commercial implementation of Russian technologies both inside the country and on the foreign market. Buyers are first and foremost interested not in the technology itself, but in the products which can

be manufactured by this technology, in those advantages which these products can give them to enable them to compete successfully with similar goods. Unfortunately, when Russian firms speak about technology they forget about the final product.

One more reason for the low efficiency of the license trade is the level of industrial development of a license subject. The majority of technologies offered by Russian firms cannot be implemented in industry.

Implementation in industry of the developed technologies is now, perhaps, the most acute problem for Russian firms. The next problem is novelty protection. Most firms have no unified policy in the field of intellectual property protection, nor in the field of promoting their products and technologies on the market.

4. Speaking about problems of license trade, special attention should be paid to the import of foreign technologies into Russia.

A common mistake of Russian firms is that when concluding a license agreement they do not take into account such problems as legal protection for the subject of the license and patent purity of the manufactured goods, conditions for continuation of production of goods after the license agreement has expired, etc.

An important problem of imports is price. Unfortunately, not all Russian firms obtaining licenses realize that the royalties form only part of the payment; quite often the cost of the production equipment which is necessary for developing the technology is 2-3 times the cost of the license. Delays in launching the product reduce the novelty and competitiveness of plants, strains, computers' programmes, space technic achievements.

The most promising technological fields are the following:

- vacuum and plasma technologies;
- informatics;
- optical instrument manufacture, optical spectrometers;
- laser technology, advanced optical means for information transmission;

- technologies of production of special materials (synthetic diamonds, crystals, nanoparticles);
- biotechnological equipment (environmental protection technology) etc.

TAX issues in relation with licensing

According to "*The TAX Code of the Russian Federation*" part 1 No. 147-FL as of 31 July 1998, part 2 No. 118-FL as of 5 August 2000 there are no privileges for patent-license operations with Russia.

In is only in international operations in the technology transfer that direct privileges exist. Article 148 of the RU TAX Code states that payments for export licenses and patents (when the license contracts and patent assignment contracts are attached) are exempt from value added tax (VAT).

The legal mechanism for the regulating processes of technology transfer in Russia has not yet been fully established. A new system of regulations will be issued with due regard for the positive experience of the State regulation of license operations in developed countries.

4. OPPORTUNITIES AND PROBLEMS OF IP LICENSING

4.1. Common problems

In spite of the substantial progress reached in the sphere of creative law in the Russian Federation, the activation of international operations in technology transfer and intensification of information exchange, have revealed a whole range of problems relating to the legal conditions of licensing, both at the macro- and micro-levels.

This is first of all related to the legislative vagueness which still exists in respect of:

- rights of ownership, disposal and use of the results of intellectual activity, created full or partially at the expense of the Federal budget resources;
- legal basis of the transfer of confidential business information and production secrets (know-how);

- unfair competition and restricting monopolistic activity in licensing.

One of the causes is the lack of adequate understanding on the part of participants in the technology licensing process of the key definitions and legal procedures related to the international transfer of technologies. Practice shows that many foreign partners entering into license relations with Russian organizations, as a rule:

- Do not take into account the specifics of the Russian scientific research organizations, which as a rule represent the state scientific-research structures of organizations with state financing;
- Do not take into account the provisions of all the legislative acts covering the license product.
- One more problem of importing is the quality of the foreign technologies. Quite often they are out-of-date and more modern technologies are available at a reasonable price. An important problem when organizing the export of Russian technologies is the absence of information and license autarchy.

Despite the problems listed above, the process of improving the system of legal protection and intellectual property licensing is under way in Russia. A number of measures carried out by the State during the period under consideration also facilitate the development of this process.

4.2. Opportunities

In spite of the above problems, the license market in Russia is developing successfully. A whole set of positive circumstances support this process.

Information and organization opportunities

It is becoming significantly easier to find partners and the necessary information:

- LES Russia has been created and is actively functioning. LES members can assist practically in seeking and realizing the desired technology both in Russia and member States of the CIS. All information can be found at: www.LES-Russia.org.

- In Russia there is already a system of science and technology parks, business incubators and innovation-technological Centres (several scores of such Centres have been organized based on the Ministry of Science and are working successfully).
- Technology exchange is easily done in the framework of international cooperation.

There are many international centres in Russia, such as: Russian-German space technology centre; International Science & Technology Centre (parties are – EU, Japan, USA, Norway and Republic of Korea), etc.

Law enforcement practice in the field of IPR and technology transfer in Russia.

Protective documents obtained for inventions are actively used by the patent holders. They make it part of the business. According to the data published by “Patents and Licenses” magazine, roughly one hundred assignments and licenses are registered every month in Russia.

The opportunities connected with the effective protection of intellectual property rights are more and more important in the national economy.

IP rights

There are a number of administrative ways to fight infringement of IP owners’ rights. These are administrative actions under the auspices of the Patent Office and administrative actions by other government authorities. First and foremost is the State Anti-Monopoly Committee, specifically, Article 10 of the “**Law on Competition and Limitation of Monopoly Activities on the Market**” relates to unfair competition and bans the sale of goods which violate intellectual property rights. This provision of the law is frequently used by trademark owners.

It is advisable to resort to this provision to stop the use of a trademark which closely resembles a registered trademark. As an example, one can cite a “Coca-Cola” case. In the south of Russia the defendant labelled his product with a “Coca-Cola” trademark. The Coca-Cola company lodged a complaint in the Anti-Monopoly

Committee and forced the local producer to cease use of the similar trademark.

A very convenient side to this approach is that the interested party may initiate the case in Moscow regardless of the location of the infringer, unlike civil cases in which the plaintiff has to sue the defendant at his location.

Civil action is also possible in case of infringement of rights of IP owners. Suits shall be brought at the location of the infringer and this creates certain inconvenience for the plaintiff. The route to follow in each particular case depends on the nature of the infringement and on the specifics of the case. When the courts examine trademark cases they also take into account international agreements to which Russia is a party, the Paris Convention in the first place.

Criminal action may also be brought in IP infringement cases. The protection of rights in the sphere of intellectual property has gained considerable encouragement through the adoption of the new RU Criminal Code of 1996, a year in which considerably more attention was paid to the protection of intellectual property:

- In the existing Code a distinction is made between crimes committed in the sphere of protectable patents and authors' rights (with neighbouring rights). As the infringement of authors' rights and neighbouring rights involving criminal responsibility is recognized as illegal exploitation (i.e. in the case of unauthorised use or in cases referred to the Law) of the objects of the authors' rights or of the neighbouring rights as well as the misappropriation of authorship if these crimes caused large damage. A qualifying indication covers the repetition of crime, committed by a criminal group of persons and conspiratorial crime (Art. 146 of the Criminal Code).
- The new legislation pays particular attention to computer software protection.

The Criminal Code has introduced Chapter 28 based on principles concerning operations that are considered criminal offences in the sphere of computer information. These articles of the Criminal Code (272-274) lay the basis for

prosecuting illegal actions in the sphere of computer information.

Technology transfer

Analysis of court and arbitration practice shows that the RU Civil Code and the RU Patent Law are the main legal Acts governing contractual relationships in regard to transferring the right to industrial property title and granting the right to its exploitation.

The relationships between a patent owner and a person exploiting industrial property rights are based on the license contract which shall be registered by the Patent Office in accordance with Article 13 of the Patent Law of the Russian Federation. Rospatent has no competence to supervise the execution of obligations under the contract, including the obligations concerning the patent and legal guaranties.

The administrative settlement of disputes in the field of assignment of rights to protected industrial property titles is not provided for by current legislation. According to Article 31 of the Patent Law the competence of the courts shall extend to settlement of disputes arising from the conclusion and execution of license contracts for the use of the protected industrial property title.

Analysis of court and arbitration practice on dispute settlement allows us to determine the type of disputes as follows: disputes on the concluding of contracts; disputes on amendment to contract and premature expiration of the validity of the contract; disputes on invalidation of the contract. (Table 9).

1. *In disputes on the conclusion of contracts* the main grounds for nullity actions are:

- The lack of registration of the contract by Rospatent.
- The coercion of one party of the contract into registration of said contract by Rospatent is widespread grounds for action. According to Article 165 (Par. 3) of the RU Civil code "if a deal which shall be officially registered is concluded in the form prescribed, but one of the parties is avoiding registration, the court has a power of judgement on registration of a deal at the request of the other party. In such a

case a deal is registered on the basis of the court ruling.” It should be noted that this provision provides for the possibility of court judgement on registration of a deal only when meeting the following two requirements: a deal is concluded in the form prescribed (Article 160 of the RU Civil code) and one of the parties is avoiding registration of such a deal. It seems that neither said Article nor Article 13 of the RU Patent Law are grounds for coercion to conclusion of the contract on the terms demanded by one party.

2. *Dispute proceedings relating to execution and premature expiration of the validity of the license contracts* testify that:

- Only a small number of license contracts contain well-drafted parts devoted to technical guaranties that will presumably lead to conflicts and disputes;
- Unfair trade practice implemented by the patent owner – where the licensor imposes burdensome clauses of the contract on the licensee in the absence of legal regulations in this field – is a barrier to the development of licensing. At present besides compulsory licensing according to article 10 (Par. 4) of the RU Patent Law, the only legal grounds for prohibition of any monopoly abuse in the

Table 9. The most popular grounds for disputes:

Types of disputes	The most popular grounds for actions
Disputes on conclusion of contracts	<ul style="list-style-type: none"> • absence of registration by Rospatent • legality of requirements of registration body • coercion of patent holders to contracts registration
Disputes on amendment to contract and premature expiration of the validity of contracts	<ul style="list-style-type: none"> • non-execution of contractual obligations (payment, technical warranties, patent and legal guaranties)
Disputes on invalidity of contracts	<ul style="list-style-type: none"> • non-fulfilment of law provisions • absence of registration by Rospatent, non-fulfilment of patent and legal guaranties

field of industrial property is Article 2 (Par. 2) of the RU Law “On Competition and Restriction of Monopoly Activity on Commodities Markets” which provides that the said Law is not applicable to relationships dealing with exclusive rights excluding the situation where contracts covering its exploitation lead to restriction of said rights. Settlement of the said problem is made in the framework of the RU Civil Code where Chapter 54, “Commercial concession”, provides for legal governing of unfair trade practices upon conclusion of one type of technology transfer contract – commercial concession contract (franchising agreement).

3. “Classical” grounds for disputes on invalidation of license contracts, and patent assignment contracts are the infringement of patent and legal guarantees including guarantees of patent validity and its maintenance in force, guarantees of absence (at the time of conclusion of the contract) of claims from third parties, whose exclusive rights are infringed by use of the technology transferred under contract.

- Court practice and especially arbitrage practice tend to increase the number of disputes relating to recognition of transactions as null and void with utilization of circumstances of invalid transactions.
- Special attention should be paid to meeting formalities dealing with the conclusion of

license contracts and patent assignment contracts in accordance with current legislation as well as conformity of contract clauses with current law.

- All requirements provided for by Rules on Examination and Registration of the Contract on Assignment of Rights of Use Inventions, Utility Models, Industrial Design, Trademarks and Trade names, should be met.

4.3 State policy in the field of IP

The effective use of Russian scientific and technological potential and the introduction of intellectual property rights are now considered to be the basis for the growth of the economy.

Recently a number of documents on State regulation in the sphere of using intellectual property rights have been adopted.

1. The Russian Government has established an ***Interdepartmental Commission on Intellectual Property Protection***. The Commission is organized to coordinate the activity of state bodies carrying out the Laws of the Russian Federation on intellectual property protection and obligations of Russia under international treaties in this area.

2. ***The Eurasian Patent Convention***, which entered into force on 12 August 1995, should play an important role in forming the national system of protection and transfer of intellectual property and in intensifying innovative activity. It aims at creating a unified patent space on the territory of 11 member States of the CIS and is one of the important factors enabling recovery of economic connections with the nearby foreign countries.

3. The Russian Federation Government Ordinance adopted the ***Conception of innovation policy for 1998-2000***, one of whose orientations is enforcement of intellectual property in the area of innovation and its introduction into civilian circulation.

4. The issue of affording rights in technology created at the expense of means provided from the Federal budget is of particular importance. ***The Russian Federation Presidential Decree No. 863, dated 22 July 1998*** defines the problem of

well balanced rights and legal interests of all subjects of legal relationships, including the State, as one of the major priorities in the implementation of State policies in the process of economic circulation of the achievements of scientific and technological activities and intellectual property rights in the sphere of science and technology.

5. An important task is cooperation with those persons investing means in high technology production, including on the basis of different forms of sharing and joint participation, with the State, in the financing of scientific and technology and innovation activities.

The possibility of cooperating with investors for participation in financing industrial development of the latest technology is directly dependent on the rights of use of the achievements of scientific and technology activities created at the expense of funds provided from the Federal budget.

At present, in accordance with ***Russian Federation Governmental Ordinances No. 982 dated 2 September 1999 and No. 1132, dated 29 September 1998***, all rights in the achievements of scientific and technology activities earlier obtained at the expense of funds provided from the state budgets of all levels shall belong to the Russian Federation in the person of authorized federal executive bodies. The use of the results of works not related to the provision of federal governmental needs may be carried out by third persons under license agreements, in accordance with the legislation of the Russian Federation. So, persons wishing to participate in the realization of federal technology may only rely upon a non-exclusive license, and accordingly, they are not protected against competition.

6. A separate system is now being developed for State control and regulation of the export of Russian technologies having a civil purpose, including those created using federal budgetary funds.

7. To effectively realize intellectual property rights it is necessary to establish an improved system to evaluate exclusive rights to the results of intellectual activities.

The Federal Law “On Evaluation Activities in the Russian Federation” No. 135-FL of 29 June 1998, provides standards on evaluation, as well as procedures for developing and drafting standards by the representatives of State bodies, and approval by the Government of the Russian Federation.

At present the State standard of intellectual property and intangible assets is developed in accordance with current international valuation standards.

All these measures prove that Russia has now undertaken a qualitatively new approach to the

system of economic relations, where intellectual property should take its proper place, and the policy of firms working in the intellectual property market should become an integral part of their general development strategy, which would take into account both the concerns of each separate firm and of the country as a whole.

In conclusion, it would be useful to point out that improvements in the legislation and mechanisms for protecting and licensing intellectual property rights are of paramount importance for the growth in the scientific and technological potential of Russia, for international technological exchange, expansion of international trade and business.

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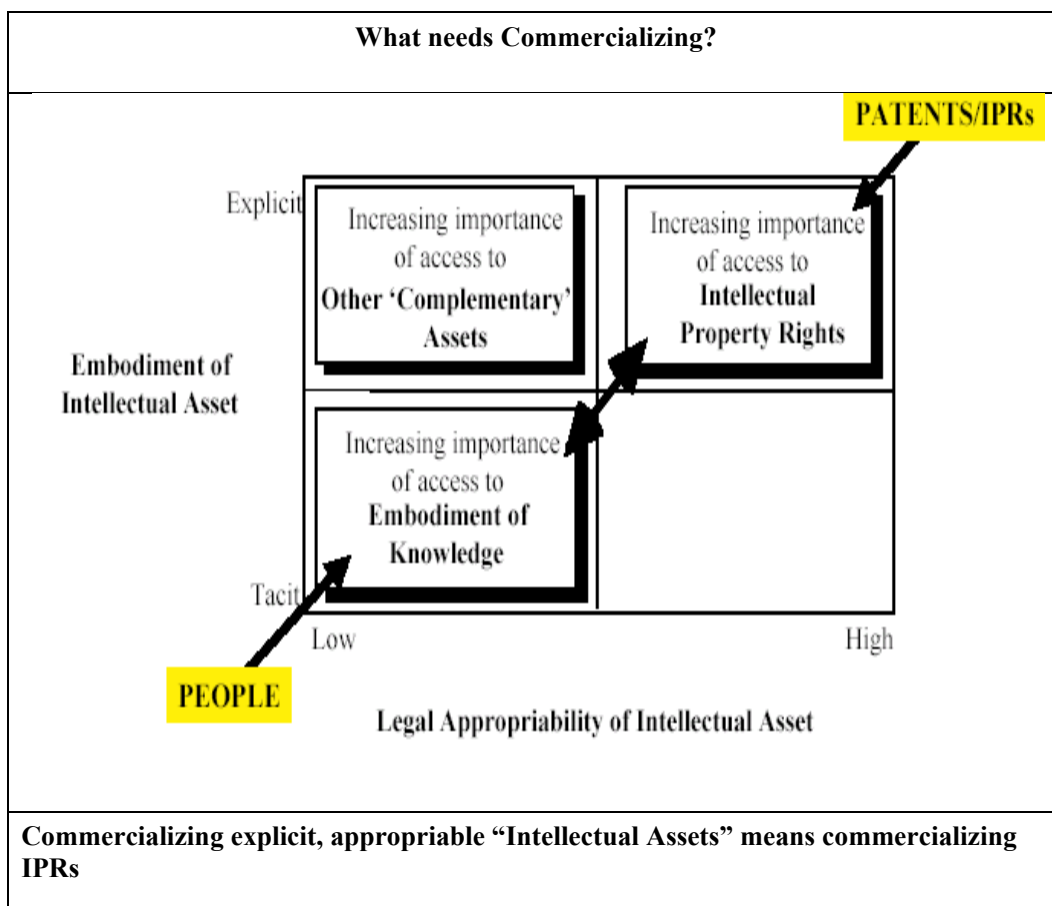
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COMMERCIALIZATION OF INTELLECTUAL ASSETS

by Robert Pitkethly, The Said Business School, University of Oxford, and Oxford Intellectual Property Research Centre, St.Peter's College, United Kingdom

Commercialization of Intellectual Assets
<ul style="list-style-type: none"> • Valuation / Management / Transfer of Intellectual / Intangible Assets requires the Assets to be defined. • Definition of Intellectual Assets requires their location and/or specification in tacit or explicit form. • Ownership / Management but especially Commercialization of Intellectual / Intangible Assets require the Assets concerned to be subject to some legal form of appropriation in effect packaging.



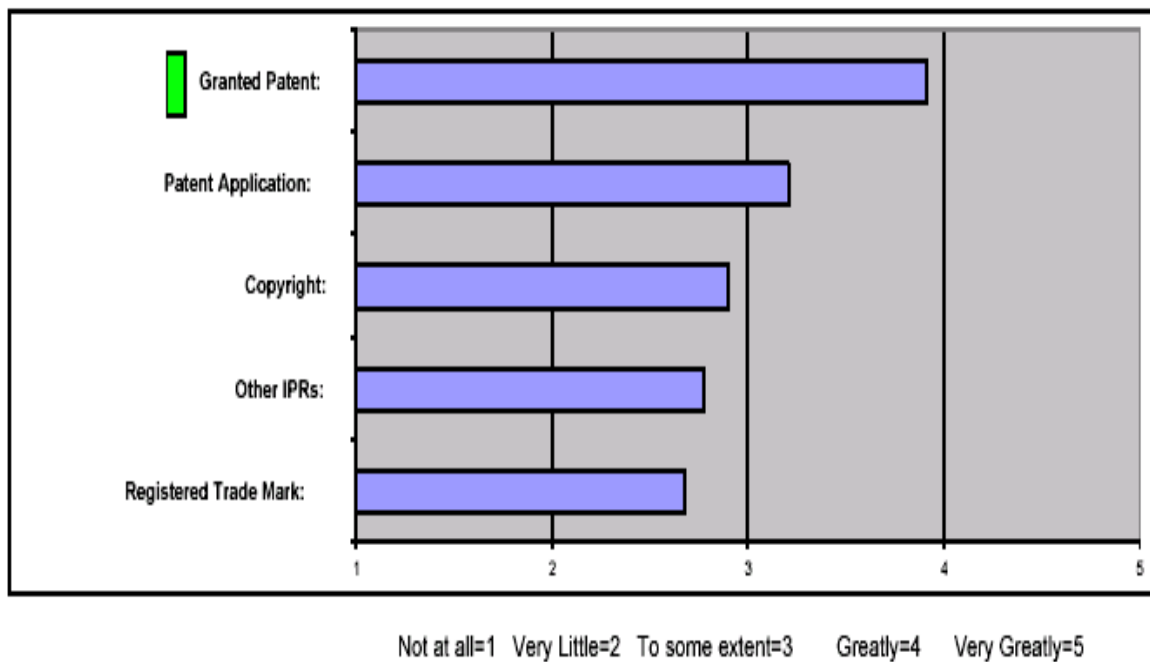
Roles of IPRs (especially Patents) in Commercializing Intellectual Assets

- Public Policy level
 - An **Incentive to Invest** in Innovation
 - balancing private and public benefits
 - A Right to Benefit and an **Incentive to Invent**
- Firm level
 - Identification of invention
 - Patent Law requires naming inventors - **Internal IP Management**
 - Packaging of invention
 - Patent Law necessitates defining inventions - **External IP Management**
(Licensing / Litigation)

An Incentive to Invest (Survey of UK Venture Capitalists 2002)

Granted Patents are the most attractive IPR for venture Capitalists

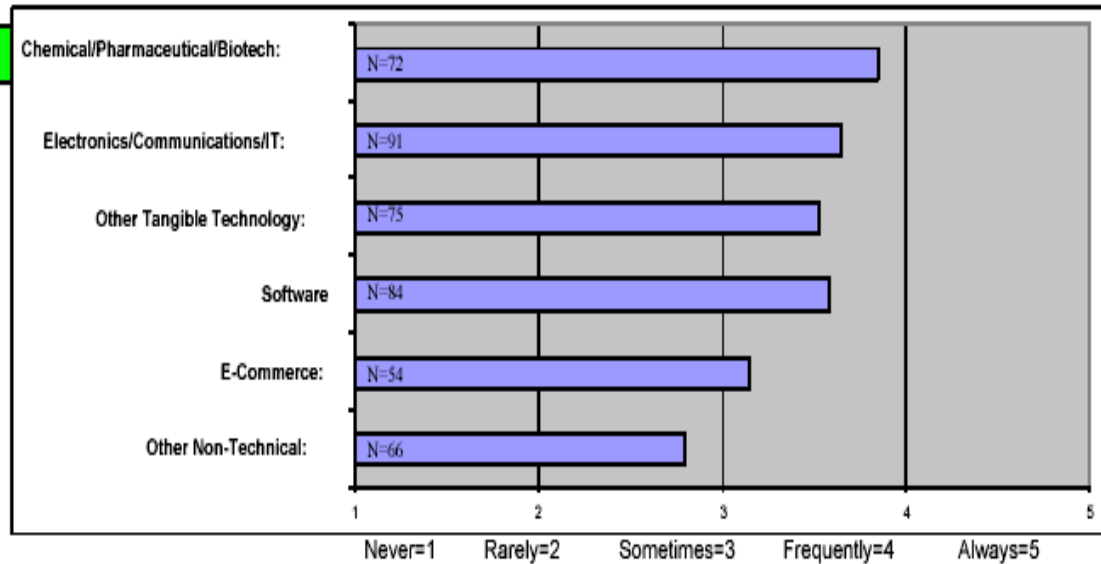
To what extent would ownership of any of the following IPRs by a business increase its attractiveness as an investment opportunity? (choose 1-5 on the following scale).



Kendall's W Test p=0.000

The importance of IPRs varies slightly by Industry Sector

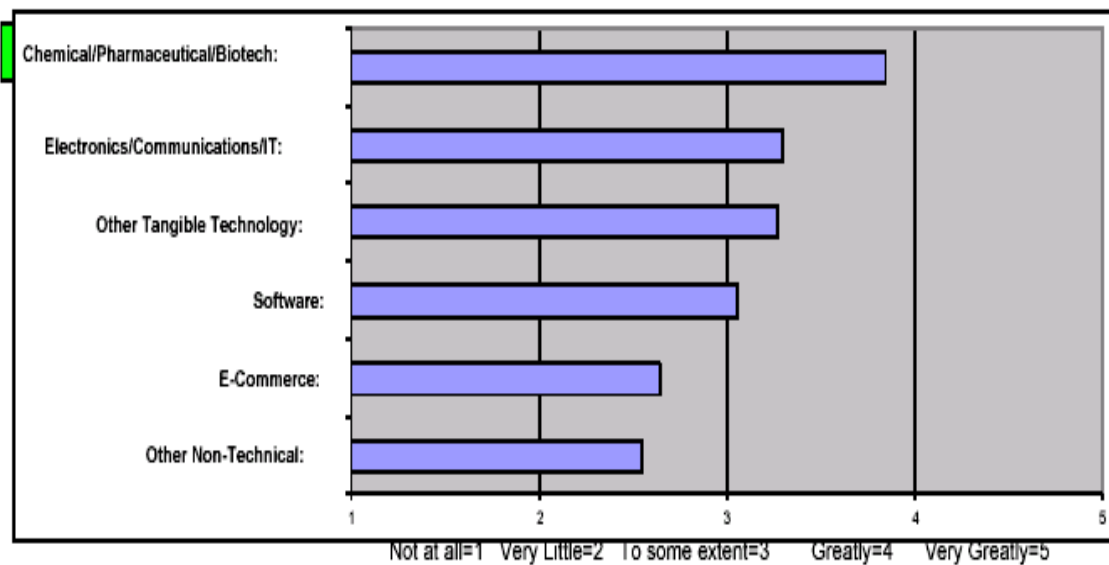
How often are Intellectual Property Rights (IPR) a significant factor in whether or not to invest in a company in the following sectors? (choose 1-5 on the following scale).



Kendall's W Test p=0.000

Equally *lack* of IP is more serious in some sectors than others

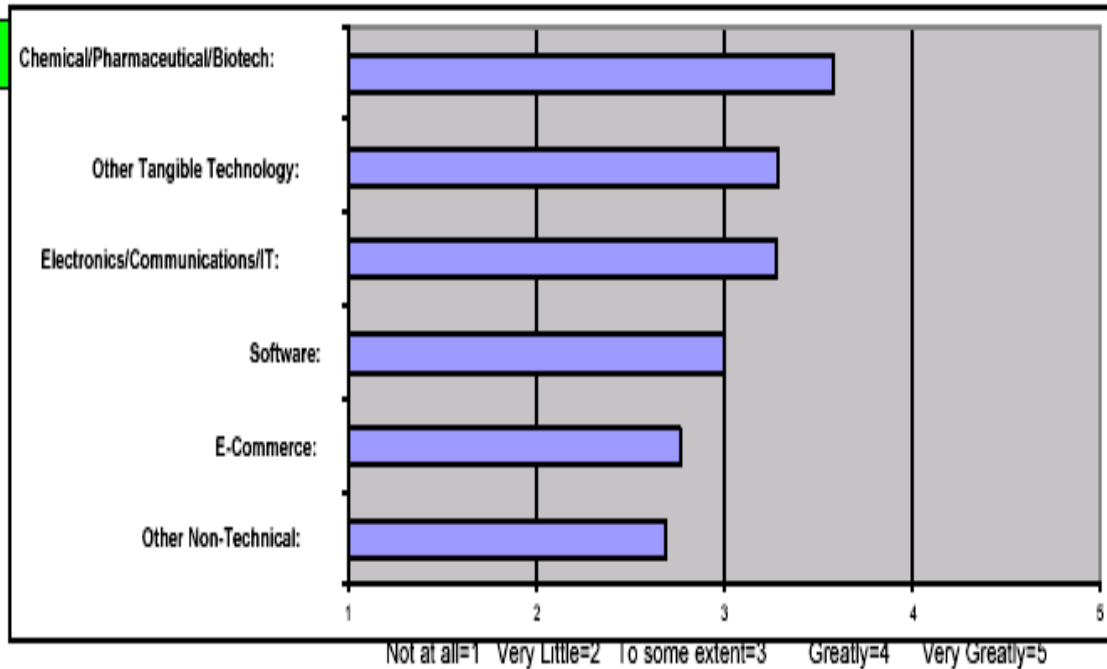
To what extent would *lack* of Patent Protection prevent venture capital funding for a company in the following sectors? (choose 1-5 on the following scale).



Kendall's W Test p=0.000

But Patent Applications can still help attract VC funding

To what extent would ownership of Patent Applications by a business increase its attractiveness as an investment opportunity in the following sectors? (choose 1-5 on the following scale).



Kendall's W Test $p=0.000$

Commercialization of Intellectual Assets

- Managing explicit, appropriable “Intellectual Assets” means managing IPRs and especially patents
- IPRs and especially patents have a significant role to play in:
- Defining and packaging “Intellectual Assets”
- Encouraging investment in commercializing “Intellectual Assets”
- The effectiveness of IPRs as an incentive to invest varies by industry sector

Recommendation: Commercialization of Intellectual Assets needs to include management of Both IPRs and People & Processes.

CANADIAN PERSPECTIVE OF IP MANAGEMENT: INTERACTION BETWEEN THE PUBLIC SECTOR & INDUSTRY

*by Karin Keyes Endemann, Director International Relations Office,
National Research Council of Canada*

Canada is a very large country with a multiplicity of organizations involved in knowledge development – over 360 federally funded ones and many more if the private sector organizations are included.

To complicate things even more, the Canadians are a very de-centralized industrial nation – with the funds and the decision-making power resting with individual organizations and universities. As a result, they have learned to work quite well together to achieve our ends. Public-private partnerships are the fabric from which Canada is woven for without them none would be able to survive alone.

With all these players the Canadian system of innovation is complex and involves many bodies such as:

- Governments – both federal and provincial
- Universities
- Industry
- Research networks

Federal Government is a founder of R&D and a performer of R&D. The federal government support for R&D involves:

- Direct grants to Universities
- Procurement contracts
- In-house basic and applied research
- Contribution agreements to industry (see Figure 1)

The management of intellectual property in Canada involves all these participants in our system of innovation. Canada recognizes that effective management and ease of its transfer of intellectual property (IP) to private industry and other client organizations are critical factors in the pursuit of its mission to rapidly exploit the results of its research. As a result, Canada has

recently launched Innovation Strategy, which is designed to foster the expansion of knowledge-based industries. Notably this includes a drive to facilitate and optimize the management of IP, the rapid transfer of knowledge and technology and to foster strong linkages between technology sources and the Canadian industry

Canada has 48 federal organizations, which perform and/or fund R&D. There are over 120 federal research institutions/laboratories all of which produce technology and transfer it to industry. In 2001-2002, the total Canadian federal R&D expenditure was \$4.6 billion, which equates to 18% of all the R&D. Of this \$ 1.7 billion was transferred to the Universities and industry and \$2 billion of it was spent on research conducted by federal labs (see Figure 2).

One of the reasons that the management of the knowledge assets and the transfer of knowledge and technology to industry is an integral part of Canada's Innovation Strategy is that its SMEs represent 95% of all the companies and provide 6 out of 10 jobs in the country (see Figure 3). Hence significant federal effort is being made to support their development, especially those which are technology based.

As a result, all science-based departments and agencies are required to develop strategies for promoting partnerships and collaborative S&T arrangements with industry and academia. They must also take measures to improve access to their facilities and encourage an open-door approach to all the other players in scientific research. And finally, they must ensure that the transfer of knowledge and the sharing of scientific information and data with Canadian researchers in universities and industry is a key function of their Ministries.

Figure 1

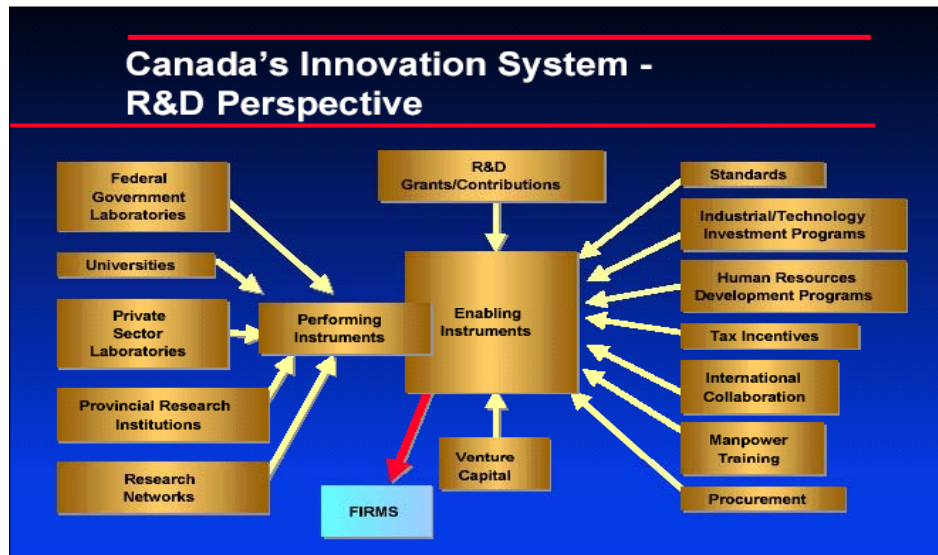


Figure 2

CANADIAN GOVERNMENT

Canadian expenditures on R&D 1.83% of GDP

48 federal organizations perform and/or fund R&D

Over 120 federal research institutions/laboratories

2001-2 Canadian federal R&D expenditures were \$4.6 billion (18% of total R&D)

\$2 billion on intramural R&D (58% on extramural)

Active participant with industry



Figure 3

THE TRANSFER OF KNOWLEDGE AND TECHNOLOGY IS AN EXPLICIT OBJECTIVE OF CANADIAN FEDERAL S&T

Federal government departments must:

- Develop strategies for promoting partnerships and collaborative S&T
- Improve access to facilities
- Encourage an open-door approach
- Make knowledge transfer, the sharing of scientific information and data a key function



Canada

Figure 4



Figure 5



With respect to IP management the federal government is bound by two guiding principles:

- All federally generated IP must be managed as a tool to help federal departments fulfil their mandates and
- All federal agencies must have programmes to transfer IP to the private sector in order to maximize socio-economic benefits for the Canadians (see Figures 4-5).

The implementation of these broad directions has led us to 6 main guiding principles listed below:

- The Canadian Government is committed to the development of mechanisms and linkages to improve the diffusion and application of technology among all users, especially Canadian industry. This includes the provision of necessary related services to its clients and partners and, as such, it is dedicated to being responsive to partner needs.
- The Canadian Government is committed to recognizing the contributions of its employees in the generation of intellectual property.
- The Government of Canada has designed its IP policies and procedures to be sufficiently flexible to enable effective and timely exploitation and to minimize any administrative burden.
- Canada approaches IP management in a transparent, straightforward way so that all aspects are clear to its employees, clients and partners. Penultimately, the Canadian Government is committed to dealing with all

external organizations in a manner which is fair and consistent.

- Finally, the Government of Canada requires that its departments exhibit uniformity in the manner in which they conduct business and manage assets with respect to intellectual property

Any IP created by federal employees in their work is owned by the government department. Ownership of any IP developed through collaborative research activities with other parties is subject to arrangements negotiated by the parties. Regardless of the ownership of the IP the Canadian Ministries must attempt to retain a right to use the technology for their own internal R&D use and where feasible, seek to transfer the technology to as many Canadian firms as possible in order to create optimal wealth for Canadians.

Furthermore, the governmental institutions of Canada are required to review the anticipated commercial exploitation of our IP and they must prepare commercialization and protection strategies for each. In order to ensure benefits to the economy at large, licensing preference is normally given to Canadian firms or multinationals with a Canadian presence, followed by companies which will exploit technology to the greatest degree in Canada (e.g. Canadian based R&D, manufacturing, etc.)

While exclusive licenses can be considered, the mandate of the federal government is to endeavour to help as broad a range of Canadian

firms as possible and hence to seek the industrial partners which are best positioned to exploit the technology. As it stems from the above, Canada is committed to public private partnerships and nowhere is this more profoundly seen than in the Industrial Research Assistance Program – or IRAP (see Figures 6-7).

IRAP connects Canadian innovative firms with the information, resources and financial assistance they need to turn ideas into commercial products and services. It has been doing so for over 60 years and is very successful. It consists of a national network of advisors – 260 Industrial Technology Advisors in more than 90 communities. In 2001, over 3,900 industry-led projects received support, worth \$68 million. In

the last year, IRAP and its parent organization, NRC, have provided technical assistance to over 12,000 firms, generated 268 patents and over 300 licenses, developed over 70 spin-off companies, are incubating 75 tenant companies and have signed over 3,000 collaborative agreements. Quite an impressive record.

To complement IRAP in the support of SMEs, Canada has also implemented a network of advisors to offer all the essential business services to Canada's fledgling companies. The Canadian Technology Network consists of a network of 360 advisors – from 1,000 institutions – and they offer over 11,000 services to our businesses to support innovation. They offer such services as advice on:



Figure 6

- market information
- business planning
- legal, management and marketing advice
- financing and venture capital
- licensing and patent rules
- standards and environmental information

In addition, all of Canada's science institutions have developed or are in the process of developing incubators located on their sites to foster the sharing of information, technology transfer and the development of spin-offs and new companies.



Figure 7

Extrapolating from these previous successes, Canada now believes that it has found the right formula to nurture public private partnerships – clusters. The significant success which Canada has had with clusters has demonstrated that a concentration of public and private organizations provides the right environment to foster, not only the creation of technology based companies but also to stimulate regional economic growth. As a result, Canada is highly focused now on creating 10 regional clusters, which respond directly to the needs of the particular region. These clusters involve all layers of the innovation system and are designed to support innovative firms. They offer access to:

- Research and development
- Technology transfer tools
- Policy instruments and regulations
- Incubation and mentoring
- Financing and risk capital
- Human resources and skills

There is one more national organization which has to be mentioned. It has evolved from grass roots and is focused on helping the Canadian federal agencies to manage their IP more effectively. The Federal Partners in Technology Transfer is a network of 15 science-based departments and agencies working in collaboration to identify and share their challenges in IP management both within their agencies and with the private sector. It also is a forum for discussing the main issues of the day, developing cohesion in approach and generally sharing tips on effective technology transfer. This organization represents over 110 research labs, which conduct over \$2 billion in R&D each year. FTTP has done a lot to develop national consensus, resolve national IP issues and improve the federal links with industry.

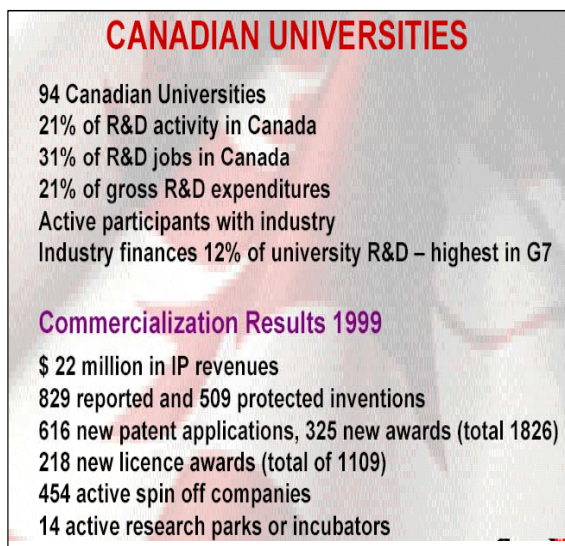


Figure 8

As is seen from Figure 8, the Canadian universities contribute significantly to the national innovation system. They are the source of 21% of all R&D activity across the country;

31% of R&D jobs in Canada; and 21% of gross R&D expenditures. With respect to the management of their IP however, there is considerable variation in the methods of commercialization and in the levels of activity. There is no consistent approach across the university scene. The policies governing ownership of IP and the sharing of potential benefits also vary from one Canadian university to the next. In some, it is vested solely with the university (Laval, BC) while in others it rests with the inventor (Waterloo, Simon Fraser). With respect to exploitation, many universities take equity in companies to contribute to the financing of IP exploitation – but some do not.

Many of our universities contend that the diversity of approaches adopted by Canadian universities regarding commercialization initiatives and ownership of intellectual property is not only warranted but also an inherent strength. They feel that this diversity is crucial to ensure that universities' commercialization services can fully address the wide-range of programmes of study and institutional realities. Moreover, they believe that the standardization of the rules for intellectual property ownership does not appear to be a determining factor in the success of commercialization. Rather, they contend that the presence of world-class researchers and graduate students innovating in a vibrant and internationally competitive research environment with access both to well-resourced and well-staffed commercialization offices and to industry receptor capacity, appear to be determining factors of sustained success.

Canadian universities believe that their institutions' intellectual property policies must be internally consistent; clearly communicated to faculty and research staff; and fully transparent to external partners engaged in the commercialization of university research, in order to facilitate and accelerate the commercialization process for internal and external stakeholders. In keeping with this emphasis on transparency, they also believe that when a researcher chooses to commercialize a federally funded innovation, this innovation should be divulged to the university's commercialization service.

It is thought that this compulsory disclosure will give universities' commercialization services the

opportunity to engage in the commercialization process, in a timely and appropriate manner, establish an exhaustive profile of intellectual property produced in their institutions and to more fully integrate these findings in their annual strategic research plans. And that the end result will be to increase the transparency of the commercialization process for public, private and university sector partners whose joint commitment is a prerequisite for success.

In addition, many of the universities insist on a right of first refusal to commercialize innovations resulting from research conducted on their campuses. They believe that the combination of compulsory disclosure and the right of first refusal will reinforce the role of their commercialization services as the primary point of access for industry seeking to participate in the commercialization process

Canadian Universities are also interested in developing better accountability mechanisms to provide a better evaluation of the costs of commercialization (in terms of human resources, material and funds).

And finally, the Universities concur with the federal government that, where feasible, Canada should be the first beneficiary of federally sponsored research conducted in Canadian universities. However, in emphasizing the need for benefits to accrue to Canada, they fully recognize that certain commercialization opportunities are more limited or indeed unavailable in Canada, given our lack of receptor capacity.

Canada recently conducted a survey of federal scientists and some of the results are the following. In responding to the question of what the major barriers were to technology transfer from the government to industry, the following was quoted: red tape, lack of resources, lack of commitment, lack of awareness of industry interests and difficulty in finding a receptor company (see Figures 9-10).

When the same people were asked what they thought were the barriers to working with industry, the results were quite interesting. Three of these were the same:

- Lack of resources
- Lack of champions, and
- Lack of awareness of what was going on in the government labs

They also mentioned:

- Mistrust of the value of government technology
- Conservative attitudes to acquiring technology
- Expectations that government should do it for free
- Industry interest in owning all rights to the IP, and
- Restrictive confidentiality agreements

It seems there is a long way to go to ensure that our IP assets can be effectively turned into economic returns.

When the respondents were asked for solutions, the following were proffered. Most of them are predictable and respond directly to the issues raised. So what is the Government of Canada doing to remedy the situation? It is making concerted efforts to more effectively manage the Canadian IP assets – and is starting inside its own organizations. These are what is called the proven practices – the goals towards which Canada is striving. While it has managed to implement many of these – it still has a ways to go to achieve perfection - largely in IP identification, training, performance measurement and receptor identification.

The results of the above-mentioned survey imply that Canada has seven main barriers to IP management, some of which are internal to its organizations and some of which are external. Canada suffers from a dearth of SMEs, which are capable of, or interested in, acquiring IP from the public sector. This unfortunate situation may stem less from a paucity of Canadian businesses or venture capitalists, than from these players' greater aversion to financial risk. In contrast with many of their American counterparts, Canadian businesses and venture capitalists often appear considerably more hesitant to invest in the early stages of the commercialization process. There is a need to find ways to create more companies and to have them recognized by venture capitalists as a valued resource.

More effort is needed in Canada to add technological capacity to existing firms and to encourage the development of new companies in order to increase industrial receptor capacity. Without this capacity it is very difficult to move ideas stemming from basic research to existing companies – the trade off is often between a vulnerable spin-off based on a single technology or offshore licensing.

The Canadian Government has only recently begun to once again invest appropriately in infrastructure. The past 10 years have had a significant impact on our federal agencies’ capability to support and incubate new companies – without this capability we are unable to effectively support these essential parts of our innovation system. Canada will need to do more to ensure that the receptor capacity is present if it wants to ensure its continued ability to foster public private partnerships (see Figures 11-12).

GOVERNMENT BARRIERS

- Stifling government bureaucracy (red-tape);
- Lack of adequate human and financial resources assigned to technology transfer;
- Lack of commitment to technology transfer by senior management and some scientists;
- Disincentives to become involved in technology transfer
- Government scientists being unaware of industry standards, regulations, codes and accepted practice;
- Difficulty in identifying a receiving firm with adequate capabilities and resources

Figure 9

BARRIERS IN CLIENT COMPANIES

- Industrial mistrust of the value and merit of government technology;
- Relatively small size and limited resources of Canadian firms;
- Lack of R&D, IP and technology transfer champions in the companies;
- Canadian firms are very conservative when it comes to buying/adopting new technology;
- Client perception that the output from a government lab should be cheap or free;
- Lack of awareness by industry of what is going on in the government labs;
- Industry wanting exclusive rights to any resulting IP;
- Industry’s confidentiality agreements sometimes being too restrictive.

Figure 10

FEDERAL RESEARCHERS’ SOLUTIONS

- Greater commitment by senior management
- Specific funds set aside for patent costs
- Expanded library services to facilitate patent searches
- Availability of IP mentors to assist researchers
- More training in IP management
- More resources assigned to TT activities
- Government to defend its patents
- Hiring additional, dedicated TT staff
- Training for government scientists in TT
- More effective mechanisms to identify appropriate licensees and R&D partners
- Increase and improve the monitoring of licences and follow-up action.

Figure 11

PROVEN PRACTICES in IP MANAGEMENT

- Strengthen alignment between IP strategy and corporate strategy
- Structure the organization to enable value extraction
- Take stock of all relevant IP owned
- Establish a formal process and criteria for screening IP disclosures and patents
- Conduct competitive assessments
- Become a pro-active licensing organization
- Focus on strategic value extraction
- Regularly and systematically review and prune the IP portfolio
- Gain a reputation of enforcing patents
- Institute a performance measurement and reporting system




Figure 12

Many SMEs feel that it is essential that they own any IP – when in fact, in many cases, it might be preferable for them to only have exclusive rights to exploitation. This often means that they do not pick up valuable and profitable IP from the public sector. Canada will need to ensure that this fallacy is addressed. To be more successful in the public private IP transfers Canada will need to become better at leveraging the resources, knowledge and skills of its partners....and, as mentioned at the beginning, it has many of them. This will require better coordination and more sharing of best practices across the Canadian system of innovation. Furthermore, all the Canadian organizations will need to become more strategic in the management of their intellectual property in order to reap the largest returns on investment. In addition, there is a need for much more inclusive – and much more complex-metrics than the amount of royalty and licensing returns to the organization or the sales revenues or cost savings to industry or the number of spin off companies. To be successful, Canada will need to find a way to assess the benefits to society of knowledge transfer. It will need to include other measures such as the amount of industrial research funding attracted, financial investments made in companies which use the IP, technology transfer from movement of human capital, impacts on the local economy etc.

Much remains to be done in Canada (and elsewhere) in the development of appropriate indicators to measure successful knowledge flows. And finally Canada will need to ensure that its employees and partners have more appropriate training in IP management and business skills – not only for the scientific staff but also for those involved in commercialization in order to effect more efficient public private partnerships.

As a final note, the National Research Council (NRC) is currently conducting consultations across the country, which, it is hoped, will

provide it with the ingredients for more strategic management of the Canada's IP, at least within the NRC itself. While this is a work in progress, it shows how the NRC is attempting to identify broader metrics for the evaluation of the IP assets (see Figure 13).

In closing, it is important to note that there is a perception, in some quarters, that Canada is a country whose economy is based mostly upon natural resources. Indeed, its vast geography, scenic vistas and rich natural environment have helped to perpetuate the notion that its economy is overwhelmingly based on resource and commodity production. But don't be fooled. Canada was rated in 2002, for the third time, as the leading cost-competitive industrial country. Canada's fiscal and economic fundamentals are among the strongest in the world – with surplus budgets, sharply falling public debt and low interest rates and inflation.

Canada also ranks first in the world in developing knowledge workers. Nearly half of Canadians over 25 have completed post-secondary studies, graduating from schools which have been independently ranked among the world's finest. As a result of its government's commitment to innovation, its new knowledge based industries – those based on science and technology – are powering Canada's strong economic performance.

Since 1995 they have expanded the growth rate of Canada's economy, as a whole, by almost four times and contributed to about 40% of Canada's growth last year. Canada's position as the lowest-cost destination for business, its vibrant research community, highly-qualified workforce, tax incentives and competitive labour costs – combined with the United Nations designation as one of the best countries in the world to live in – all add up to a welcoming scientific and economic climate.

FUTURE CHALLENGES

External:

- Foster more companies
- More access to venture capital
- More investment in infrastructure
- Educate SMEs in IP management

Internal:

- Leverage resources, knowledge and skills from partners
- Strategic management of intellectual property
- Increase metrics for the creation of value



Figure 13

PART FIVE

SUSTAINING INNOVATION PROCESS

TECHNOLOGY, INNOVATION AND COMMERCIALIZATION – INTELLECTUAL ASSETS – OPPORTUNITIES FOR SELECTIVE INTERVENTION

by Peter Rouse, Geodesia, United Kingdom

INTRODUCTION

Innovation and commercialization in the field of technology are not as prevalent as they could be. We know this because there are conspicuous pockets of success that promote as much envy as they do praise. These examples provide valuable clues as to what is needed, though of course no single formula. What is clear is that these successes are not brought about by innovation alone but have as much to do with prevailing business conditions and the way in which business is done.

Not surprisingly, it is the strategies adopted by leading corporations, Universities and small business organisations in the United States and United Kingdom that have been reviewed most extensively, invariably presented in the context of what is or will be the “New Economy”. Whatever the origins of the term New Economy, it is commonly used to describe a number of new dynamics that together allow for a new way of looking at what is possible for the economy and what is desirable for humanity. Happily, the dynamic that is now recognised to be of paramount importance to business is that of human intelligence and ingenuity.

A Bank of Boston report of 1997 found that Massachusetts Institute of Technology-related companies employed 1.1 million people and produced annual sales of USD 232 billion.
Financial Times, 25 April 2002

Just as companies are discovering the importance of “human capital” so also is the importance of the individual being recognised as citizen, as employee, as consumer. The importance of values and their observance has come to the fore. These values are central to the development of citizen-centric government, observance of corporate social responsibilities, and the building of successful brands; they all involve building trust relationships that promote participation, inclusion and choice.

James D Wolfensohn, President of the World Bank, has said this of the New Economy:

“The New Economy has the potential to unleash extraordinary development benefits and real social and environmental gains, but to achieve such gains requires participation and intervention at the local, national and global level. The New Economy will most effectively deliver a positive balance of benefits and costs if we ensure that societies are fully able to take advantage of the arising opportunities by encouraging socially and environmentally responsible business conduct. This can often be best achieved through partnerships that bring together, and create synergies in, the competencies of civil society and labour organisations, businesses, governments and international bodies.”

This paper will look at a number of areas in which there exist opportunities for selective intervention that have the potential to promote

greater participation in technology innovation and commercialization. The ideas put forward here are to promote debate. That said, and in order to provide context for these ideas, practical suggestions are made which of course each present their own challenges.

The key drivers for business success are now commonly recognised to be knowledge, innovation, collaboration and investment; all of which thrive best in conditions of trust, confidence, and mutual respect. Whereas technology can be reduced to precise formula and definition, business is an organic activity involving human aspiration, need, fear and will; it is as complex and diverse an activity as are the relationships that make it possible.

The urge to discover and improve and the willingness to bring about change for individual and collective benefit are the natural predispositions of inventors and entrepreneurs and those who work to support them. This natural human activity takes place within the framework of legal, regulatory and fiscal structures that Governments put in place to provide some commercial order and discipline, but which can as easily prove to hinder as encourage business development. While Government should resist the temptation to interfere in the commercial application of innovations, the scope for public sector support and reinforcement of market mechanisms in the area of technology and innovation policy remains substantial.

The fundamental challenge before us is to discover where and how best to intervene in the business “ecology” so as to release and channel the energies that are knowledge, innovation and collaboration and be willing to be innovative in our approach to doing so. As Albert Einstein put it: “A problem cannot be solved from the same consciousness that created it”.

This paper is organised into four subject areas, all of which are interrelated in the business of innovation. These are:

- Mining knowledge resources – considering how best to provide ready access to underused resources of knowledge and, in particular, the repositories of patented inventions;

- Sustaining innovation – looking at the fundamental importance of protection and reward for innovation and how the present system is failing to meet its promises;
- Commercialization through collaboration – identifying the opportunity that exists now to encourage collaborative business models and proposing the creation of innovation and commerce organisations that bring inventors and business people together;
- Investment and capitalization of innovation – summarising the main categories of investors, examining the role of valuation in transactions, and considering opportunities for the creation of new investment models.

MINING KNOWLEDGE RESOURCES

The issue here is much the same for a country as for a company and there are valuable lessons to be learned from corporate experience of knowledge management.

There are broadly two kinds of knowledge: acquired knowledge, that is knowledge that is recorded; and tacit knowledge, that is knowledge held within a person’s memory derived from learning and experience. For knowledge of either category to be valuable it must be accessible and shared.

Knowledge has been called “the only meaningful economic resource”. Knowledge has also been likened to a form of energy, like electricity, that exists only when it is being used; the same has been said for talent. Releasing this energy depends on whether talented people are willing and able to contribute and share knowledge in pursuit of common goals. The right knowledge in the hands of bright people is what is most likely to engender innovation and see its potential realised in the market.

Scientific and technical knowledge and a capacity for innovation are only part of the equation. What is also needed is knowledge of the market and of business. The present and likely future expectations of consumers, the workings and preferences of investors and bankers, marketing and distribution; these and other skills are equally important if the products of invention are ever to

realise their commercial value and if research and development resources are to be best directed.

Patents - Unlocking Potential

Every country possesses its own repository of acquired knowledge in the form of learned texts held in its libraries and in the form of patents held in its Patent Offices. While libraries are usually well indexed and eminently searchable by the average person with some understanding of their subject, patent records are not.

The basic premise of the patents system is that in return for the grant of a monopoly in the exploitation of an invention, the invention itself is published so that it becomes accessible to the public and so becomes public knowledge. Yet another premise of the patent system is that a patent should disclose to a suitably skilled person how the invention works. In practice this is anything but the case; patents are not easy to read or to understand.

The result is that the great body of public knowledge resident in patents is significantly under utilised as a resource from which to discover technical solutions and commercial opportunities. How then can this resource be made accessible and its inherent energy be released and made available to business?

It is estimated that companies in Europe waste £20 billion each year repeating research and development work that has already been patented. *The Sunday Times* 25 November 2001

The most obvious solution is indexation supplemented by the power of contextual search engines where the full texts of patent records are available electronically.

Existing indexation systems offer complex means of searching patent information:

- The US Patent and Trademark Office manual of classifications for patents has 400 classifications;
- The International Patent Classification administered by the World Intellectual Property Organisation is divided into 8

sections, 21 subsections, 120 classes, 628 sub-classes and almost 69,000 groups (of which approximately 10% are "main groups," and the rest "sub-groups");

- The Derwent World Patents Index service provides access to over 22 million patents documents covering 11.2 million inventions obtained from the patent records of over 40 patent issuing authorities. This is an electronic service and is an example of what can be achieved using modern ICT. (see www.derwent.com)

Another approach to indexation that could provide a yet more valuable tool for business development is one that seeks to categorise the nature of the solution rather than the specific invention, TRIZ.

TRIZ – The Theory of Inventive Problem Solving

TRIZ was developed by Genrich S, Altschuller, a Russian scientist, in the 1960s and is enjoying a resurgence of interest among businesses today (see www.mazur.net for a summary of TRIZ).

Altschuller categorized patents in a novel way. Instead of classifying them by industry, he removed the subject matter to uncover the problem solving process. He found that often the same problems had been solved over and over again using one of only 40 fundamental inventive principles.

Based on an examination of over 200,000 patents he was able to show that over 90% of the problems engineers faced had been solved somewhere before. He concluded that if engineers could follow a path to an ideal solution, starting with the lowest level, their personal knowledge and experience, and working their way to higher levels, most of the solutions could be derived from knowledge already present in the company, industry, or in another industry.

Were patents indexed according to TRIZ principles, users should more readily find clues as to how problems may be solved. Once in the right area of enquiry, the user can go to the patents themselves to examine the specific solutions recorded.

Patent Matrix – Easy Navigation of Patent Claims

One example of how to make patents more easily understood and managed, while at the same time providing a valuable tool for patent applicants and examiners alike, is the proprietary Patent Matrix system developed by a former USPTO examiner, JiNan Glasgow.

[The electronic version of this document contains a link to an example of a patent structured according to the Patent Matrix system. The document is in [PDF format](#) with built-in links to the body of the patent text.]

Use of the Patent Matrix has already been proven to substantially reduce time and costs in the drafting and prosecution of patent applications.

This is an example of a developed tool with great potential for further development that the inventor has already identified as being an ideal complement to TRIZ.

Accessibility

The ideal outcome is one where both inventors and business people are able, directly or with assistance, to access the body of patent knowledge. This approach would also present a clear service opportunity for professionals such as Patent Attorneys and Technical Consultants who would be able to offer assistance and guidance in the navigation and analysis of this knowledge resource. Patent Offices could themselves provide such services on a fee-paying basis. Some level of education would be needed at the business level, though it would be vital to ensure that the professions are engaged in the process so that business can have the benefit of suitably qualified service providers.

Were the same approach to be adopted among many countries then the collective benefit would be multiplied exponentially.

SUSTAINING INNOVATION

For innovation to flourish there must be proper incentive. Profits for companies and fair rewards for individuals are vital incentives for innovation and commercial enterprise.

The right to reward and protection for a person's creations is regarded by some as of the level of importance of a fundamental human right. Others may not put it quite so highly yet have a very real attachment to what they have created and so experience great personal distress and discouragement when their "rights" are abused. The management and staff of a business that has invested in taking an idea from the laboratory to market will understandably experience collective anger and anxiety where others effectively steal their work and threaten their business survival.

The fact is that many people find it hard to understand that a person who steals your wallet is a criminal and may be arrested and ultimately lose his liberty, whereas someone who steals your livelihood can continue to do so without hindrance until you are able to finance and win a private action to stop them. Furthermore, even if you succeed in enforcing your "rights" there is rarely any prospect of meaningful compensation or financial recovery.

Patent Promise

The patents system has been widely promoted as a cornerstone of the knowledge-driven economy. Individual inventors and small businesses are more than ever before being encouraged to seek the protection of a patent for their inventions.

Research of patent filings in countries such as Japan has led to the conclusion that there is a direct correlation between the number of patents filed and the country's technological and economic superiority. Emphasis has then been placed on education so as to promote the virtues of patent filing, the supposition being that the patents system is not used as much as it could be because inventors and business in general are unaware of its benefits.

Patent filings have generally risen and this is certainly evidence that the marketing effort is having its desired effect. However, it is said that a large part of the business constituency, mostly comprising small businesses, still does not yet grasp the importance of intellectual property rights to their business.

It is also possible that such businesses understand very well the importance of what they have and

use to do business, yet see little evidence of the supposed benefits of obtaining patents and other registered rights and so deliberately stay away.

Technological innovation and commercialization, including licensing, can and does take place without the use of the patents. The sheer cost and time scales involved in securing patents (nationally, let alone internationally) lead many to choose instead to take particular care as to with whom they do business and to rely instead on contractual obligations and remedies. A patent is not the same thing as technology; a patent is a legal fiction. The commercial value of a technology lies in the price the market is willing to pay for it. A patent can only offer the added value of enforceable exclusivity.

Financial benefit to a business of a technology is not obtained from any corresponding patent until such time as that patent is itself brought to bear in generating revenue through licensing or sale or when used as collateral for a loan or other security. At such time the value that the patent adds to the transaction is predicated upon a monopoly right afforded under the laws of the country that has issued the patent. However, the promise of exclusivity afforded under law is in practice of limited practical benefit to all but larger businesses that can afford the costs of enforcement.

Obtaining of patents is certainly of benefit to those intending to sell on to large companies who in turn are happy to promote such activity as it ensures that any technology they do buy has a patent that they can afford to enforce. Patents are also of benefit to the fortunate few able to secure the funding necessary to support litigation against major companies who are often the worst culprits when it comes to deliberate infringement.

Patent Uncertainty

A patent is granted after careful examination to satisfy the Patent Office concerned that the application qualifies for patent protection. However, a patent is never underwritten by the State that granted it. The grant of a patent does not confer an absolute right.

There are a number of circumstances in which a patent may be subsequently revoked. In

infringement proceedings a defendant may challenge the validity of a patent on various grounds including the discovery of prior art from anywhere in the world of which neither the patent holder nor the issuing Patent Office could have been aware at the time the patent was granted.

There is no centralised patent searching service used by National Patent Offices. Each office undertakes its own searches within the resources available and so there is every chance that even recorded prior art will be missed. It is now common to see offers on the Internet of as much as USD 100,000 to anyone able to find prior art that will knock out patents. This presents a fundamental uncertainty for any business and though the principal of novelty is central to a fair patents system the persistent uncertainty inevitably impacts on investors' view of patents as secure assets.

Patent Protection

The holder of a patent has no more protection under law than the holder is able to secure through private action before the courts. Such actions are often protracted (usually by the defendant who has every interest in delaying adjudication) and so favour the party with the greatest resources.

The costs and time involved in bringing proceedings operate as a practical obstacle to securing the economic benefits of exclusivity that the patent holder and any chosen licensees are supposed to enjoy.

Kane Kramer of Country Secrets has spent thousands of pounds on securing the rights to his product, Metal Coat, a paint with a metal finish, in more than 118 countries, but he still sees it copied regularly by companies around the world, infringing the patents, he says. "I have fired off angry letters but I really can't afford to go to court". *The Times, 1 June 2002*

There are doubtless many patent holders whose inventions are being used by others without authority and from which they consequently obtain no reward. These patent holders are economically barred from ever enforcing their

rights, deprived of the resources to which they are entitled and would otherwise be able to invest in further innovation.

Patent Solutions

- **Declare all patents irrevocable other than on grounds of fraud** - This need not be for the whole of the life of the patent but perhaps for an initial period (such as 5 years from date of grant) during which time the commercial value of many patents will have been revealed and if so have prompted the opportunistic infringement that can starve a new business of vital early revenues or even stop it in its tracks.
- **Compulsory technical arbitration** – All cases of alleged infringement of patents should be referred to compulsory technical arbitration. The costs of such arbitration, other than the costs of the parties and their private advisors, should be covered by the patent authority.

In the event that a defendant chooses to contest a finding of infringement by the Arbitrator before the courts then the burden of proof should shift entirely to the defendant and the defendant should be required to indemnify the patent holder's costs of the proceedings (including the costs of professional advisors).

Compulsory arbitration is one of the recommendations of Professor William Kingston of Trinity College, Dublin, in his report entitled 'Enforcing Small Firms Patent Rights' (published in 2000).

- **Underwrite patent examination** - In the event that a patent is revoked on grounds that the patent should not have been granted, including on grounds of prior art that could have been discovered from known sources of reference, then the costs incurred by the former patent holder in defending the patent (including costs of professional advisors and awards made against the patent holder in respect of defendants' costs where applicable) should be reimbursed by the issuing authority.

- **Patent insurance** – A compulsory scheme of insurance should be established to cover the full costs of a patent holder incurred in defending a patent that is ultimately revoked on grounds of prior art that could not have been discovered from known sources of reference.

These are the sorts of solutions that must be found to redress the failings of the patents system as it relates to business needs.

COMMERCIALIZATION THROUGH COLLABORATION

A common theme among commentators from industry and the professions is one that emphasises the importance of ongoing and close cooperation between inventors, business managers and advisors. The pace of market change and competition for customer attention means that time is very much of the essence. Formalities and hierarchies are being swept away in favour of constant dialogue and collaboration between all involved.

Such collaboration, though still a challenge, is inevitably easier to achieve within a single organisation yet it is precisely such cohesion that the diverse and dispersed community of individual inventors and small businesses will have to emulate to compete.

Where innovation takes place within or is sponsored by an established company then there is little need concern us as such a company will have the means to take such innovation through development to ultimate commercialization. Such organisations are self-reliant and are well able to fund such activities from retained earnings or to obtain investment capital from traditional sources.

Individual inventors, small businesses and research institutions are less able to fend for themselves and their choices when it comes to commercialization of their inventions are severely limited; indeed in most cases the best that they may hope for is to be able to sell or licence their technology to major companies.

The better course must be to encourage local collaboration so as to multiply the value of

technologies through increased dissemination, developing technological competencies and building value at home.

New Business Models

Collaboration involves voluntary cooperation between people in pursuit of a shared purpose. Collaboration as it can now be realised thanks to modern information and communications technologies presents a potentially powerful means by which economic benefits and costs may be better distributed.

The whole notion of what a company is for is being revisited in the context of the forces now at work in the “New Economy”. The architecture of business has undergone significant changes in recent years that represent a substantial departure from the traditional model and reflect a reappraisal of the interactions and value derived from and between “assets” (physical, financial, etc.), including, in particular, intellectual assets.

Whereas a traditional business model would see a company owning its research capability, its means of production, distribution and perhaps even sale, a modern business may choose to outsource all of these functions to others retaining only ownership and management of its intellectual assets. Equally, separate businesses may combine for the purposes of a specific venture; this is called “co-optition”, where smaller businesses come together to compete for business or market share against the major companies.

What keeps small companies small and limits their commercial scope and reach is that they mostly act alone and, therefore, have only the strength of one. If such businesses were able to readily find others with whom to collaborate, and to work within a well-defined and balanced business structure, they could then punch above their weight and offer credible competition to the larger companies. They could accomplish something collectively that they could not accomplish separately.

Conditions for collaboration

Creating the right conditions for collaboration in the commercialization of technologies involves three essential areas:

- **Marketplace** – Those involved in R&D and those with the commercial appetite for innovation must be brought together if commercialization is to be achieved. This involves providing a ready means by which inventors may find people with production, marketing and management skills who may join with them to create a ‘company’ that together will be able to secure investment and bring an invention to market.

There is presently no common and readily accessible marketplace in and through which innovative technologies can be matched with innovative commercial applications. Such marketplaces can now be provided at relatively little expense through the medium of the Internet. B2B (business to business) exchange models and the software that drives them are now readily available and relatively inexpensive, with experienced service providers eager to support them.

- **Confidentiality** – In the field of innovation there is always concern over observance of obligations of confidentiality. Unless people have the confidence to disclose their ideas to others who may have a mutual interest in their commercialization, again no one will benefit.

A collaborative organisation of inventors and business people could establish standard terms of confidentiality for use in dealings among members and with others. Such an organisation could also enforce observance of confidentiality among its membership and pursue third parties for breaches confidence.

- **Structure** – This involves establishing clear and fair parameters for sharing of ownership, responsibility, risk and reward in business ventures.

All too often business people spend unnecessary amounts of time energy and money attempting to devise schemes of business from scratch when well-tested models exist already that require only minimum change.

A collaborative organisation of inventors and business people could offer a number of standard models for doing business. There are doubtless many successful models that could be adapted to the needs and preferences of particular groups taking account of domestic law and regulation.

The issue, as ever, is one of confidence and trust. Where common models can be established and are recognised to be fair, these can evolve through collective experience.

There is much room here for innovation in the way in which people and businesses work together when conditions prevail that reward innovation and encourage high standards of business ethics and social responsibility.

University Models

Universities have developed various models for the commercialization of technologies that are in essence collaborative arrangements that entail reaching agreement as to how rewards are to be shared between staff, students and the Universities themselves. Each has their way of handling licensing and sale of technologies, funding, and new ventures that 'spin-out' from the University to commercialise a particular technology.

The United Kingdom Government has invested £68 million in the foundation of the Cambridge-MIT Institute (CMI) that is to develop a new model for intellectual property generation and commercialization. Such expertise is to be shared with other United Kingdom universities. *Financial Times*, 25 April 2002

In the United Kingdom, the Government is keen to emulate the success of the United States and ensure that the billions spent on research result in efficient transfer of knowledge and innovation to the wider economy. A number of United Kingdom Universities have well-developed methods of dealing with innovation, all working through special vehicles established for the purpose. Each has its own formula for deciding how income from successful innovations is to be divided, invariably the main sticking point and cause for contention between individuals, departments and University.

The Association of University Technology Managers (AUTM - see www.autm.net) is an example of collaboration across many categories of research organisations including universities, hospitals, non-profit research organisations, government research facilities, and commercial R&D. Though a primarily United States organisation, the AUTM also has member universities from other countries, including the United Kingdom, Switzerland, Hong Kong, Japan, South Africa and Russia to name but a few. The AUTM web site has links to the web sites of all members and to their technologies for sale or licence where available.

Inventor Associations

The International Federation of Inventors Associations (IFIA – see www.invention-iffa.ch) has member associations drawn from 91 countries and members from 112 countries. This organisation is engaged in a variety of activities including pressing the case for a worldwide patent.

The IFIA web site includes an 'Internet Inventions Store' offering more than 350 member technologies for licence and sale. The association also promotes technology fairs and other activities designed to bring members' innovations to the attention of the market.

Innovation and Commerce Organisations

Releasing the stored energy of acquired knowledge, providing incentive for innovation and encouraging collaboration as a means of channelling those energies warrants deliberate

intervention to provide structural incentive that will better mobilise innovation.

Innovation and commerce organisations (ICOs) should be established to provide practical support for innovation and business. Such organisations would be able to offer standard business models and terms; legal, financial and commercial consulting services (direct and from panels of independent professional advisors); enforcement and marketing services; and representation before government and trade bodies.

ICOs would be able to seek funding to support selective patent filing, prosecution and enforcement in other countries in return for a share in licensing revenues. This would ensure that successful technologies were protected, and proper return secured, in overseas markets where a patent holder would not otherwise have the resources to finance such patent coverage. Government has a number of means by which the creation of such organisations may be encouraged.

- **Legal**

One approach would be to introduce an ICO as a new form of legal entity, with specified parameters in terms of constitution, ownership, control and activities.

An ICO could be made subject to specific process concerning resolution of disputes, including compulsory technical arbitration, and have the right to pursue infringements of members' rights against third parties. An ICO would be able to seek insurance cover for its own and members' costs of litigation against patent infringements.

An ICO could also create its own fund from which to finance enforcement. Patent holders who have registered patents in home and foreign markets that are being used profitably by others have the opportunity to combine resources in order to convert infringements into income. The idea of constituting a collective of patent holders in the form of a Patent Defence Union is made by Professor Kingston in his paper "Enforcing Small Firms Patent Rights".

ICOs could set their own rules for admission and handle their own member disciplinary procedures, perhaps with right of appeal to an appropriate government tribunal or to the Courts.

- **Fiscal**

A variety of tax concessions and other incentives could be afforded to ICOs to encourage membership and thereby participation in the formal economy. These could include incentives for investors, including concessions for investment trusts and other forms of securities and investments in technology innovation and commercialization.

Tax relief on royalty income received by members of ICOs from licensed technologies from which ICO membership contributions could be drawn would allow ICOs to become quickly self-sufficient. Tracking revenues in this way would ensure that high membership fees did not exclude potential new members. Successful members with higher revenues would pay more but would also be more likely to require litigation support from the ICO as their inventions would be commensurately more likely to be infringed.

ICOs could be given the choice of operating as non-profit making organisations and therefore be afforded other forms of tax relief in order to keep their administrative costs, and therefore membership fees, to a minimum.

- **Funding**

Government could provide grants, loans and guarantees to finance the establishment of ICOs as well as participating directly as members contributing government owned technologies for dissemination to the market.

Subsidies could also be provided to Universities and other research institutions conditional on membership of an approved ICO so as to encourage more market-oriented research.

Innovation and Commerce Exchange

Each country should establish a single electronic marketplace where all innovations, whether patented or not, are indexed (perhaps according to TRIZ principles), listed in complete detail and accessible to authorised users who have subscribed to rules governing access to and participation in the exchange. Such rules would provide for notification to, acknowledgment and fair reward of contributors whose innovations are utilised for commercial purposes, whether or not covered by patent.

One key requirement of such a service would be the user's acknowledgement of the rights of the contributor in any innovation that the user wishes to use, and the contributor's commensurate right to receive fair reward for that use. Innovations covered by patents would earn greater reward where the licensee is able to secure sole or joint exclusive rights and those rights are capable of being enforced by or on behalf of the patent holder.

In order to promote greater dissemination of technology innovations, and so as to avoid protracted and expensive negotiations, such markets could also provide for industry adjusted standard scale rates of licensing royalties or one-off capital payments.

Such markets, though voluntary, would benefit also from recognition under law (perhaps with oversight from a government appointed watchdog) and the support of State sponsored dispute resolution services such as the compulsory technical arbitration suggested above. An online exchange would have the means to track all data accessed or downloaded and all communications exchanged by users in the event of subsequent dispute.

Business Matchmaking

During the Dot.Com boom, ingenuity abounded as people put their ideas forward for funding in a way never seen before. Venture capitalists complained of receiving literally hundreds of business plans every day most of which failed to meet their investment criteria.

One common reason for rejection was that there was insufficient management and commercial expertise on the applicant team, covering marketing, finance and so on. Technical people submitted plans that they simply did not have the commercial acumen to realise. Despite receiving many plans covering similar commercial propositions, VCs do not see it as their role to introduce complementary teams who together might succeed. One simple reason for not doing so was that they were generally bound by non-disclosure agreements.

An Innovation and Commerce Exchange such as is envisaged here should include a 'dating' service to bring inventors and business people together, matching technical expertise with industry knowledge and management skills. An Internet-based marketplace is ideally suited to such a service.

INVESTMENT AND CAPITALIZATION OF INNOVATION

Investment can take many forms, from providing cash to assigning assets for use in a business. Most investors expect returns significantly greater than the amounts invested. The amount of return expected and means by which that return is realised vary according to the nature of the investor and the risk involved.

Investment is indispensable in the field of research, and to new businesses that require substantial start-up capital to achieve their potential rather than growing organically over time. Investment is also needed where rapid growth is desired, to finance new plant, acquisition of another business, and other step changes that require large amounts of capital that the business does not have.

It is important to remember that Banks, though they have a valuable role to play in supporting business, are not investors. Banks lend money against collateral over which they have control and that is certain to provide full recovery of the amount loaned in the event of a default by the borrower, such as a failure to pay an instalment of interest due.

In addition to traditional investment, there are examples of financing models applied in the field

of intellectual assets that have allowed businesses to raise capital funds against future revenues from exploitation of those assets.

Venture Capital

It is commonly suggested that the Venture Capital (VC) market is the ideal source of investment capital for technology-based business as it is less risk averse than the mainstream investment market. The VC market is characterised by large funds to which high net worth individuals and other investment funds contribute, managed by a dedicated team working within the terms of reference of the fund.

For those that remain, their formula is invariably the same: invest only in business with a clear track record, identifiable customer base and high growth potential offering the prospect of early 'exit' at high return within 1-3 years. In return for investment in a business, the VC will require a substantial share of equity, often leaving the original owners as minority shareholders. Exit involves disposal of the VCs stake in the business such as by trade sale or public offering.

VC investment is therefore ideal for those business people who are happy to give up control and a larger part of the ownership of their business to investors who want to make quick gains and leave. In short, VCs are not in it for the long term and their sole objective is to secure maximum return on their investment within the shortest possible timeframe. Such investment criteria will often not suit the longer-term view that technology research and development demands, though is still of value to the commercialization of developed technologies.

Business Angels

This is the name given to individual investors who alone or alongside others generally invest smaller amounts of money than VC funds and often offer management support, perhaps even taking a non-executive Board position so as to be able to monitor a business more closely. Such investors are often retired business people who bring with them considerable commercial expertise and experience.

Like VCs, Business Angels look for equity participation (shares in the business) and may exit

when a VC becomes involved but are generally likely to take a longer-term view. Such investors are particularly encouraged by tax incentives.

Corporate Venturing

This is the name given to investments made from funds set aside by large companies. These investments vary from company to company. Some use these funds for spinning out parts of the company's business or some new initiative that is thought more likely to succeed outside the company. In other cases, investments are made so as to allow companies to gain a closer understanding for example of specific areas of technology or new software tools that the company needs to know more about as having some possible future relevance to its business.

IP Asset Based Financing

Intellectual asset based financing has been developing gradually over recent years. Investment banks have provided capital of an amount representing a percentage of future licence revenues. The projected revenues are calculated, discounted for risk and then further reduced so as to provide an acceptable margin of profit for the provider of the capital.

This type of financing came to prominence when the artist David Bowie secured USD 50 million in return for handing over his expected royalty revenues for 10 years. The same technique has been used for patent portfolios. A variety of structures are used, most common being the creation of a special purpose corporate vehicle to which the assets or the right to receive licence revenues are assigned.

IP Asset Derivatives

One proposal put forward by Alexander K. Arrow, formerly of The Patent & Licence Exchange Inc, is the creation of Technology Unit Investment Trusts (TUIT) comprising bundles of technology assets whose collective value is represented by future licensing revenues. Under such schemes, IP owners would not have to give up ownership of their technologies but take a share in the ownership of the TUIT commensurate with the computed value of the assets they have contributed.

The TUIT concept may be ideally suited as a means of generating funding for members of ICOs. Members would be able to contribute their innovations so as to create an asset pool from which capital funding could be raised for further innovation and commercialization.

Such new ideas should be encouraged and the investment community at large should be asked what conditions it would consider favourable to investment of the funds that they manage. This could give rise to new forms of investment fund designed to exploit the opportunities created by new technology collectives and encouraged by tax concessions/incentives and improvements in the enforcement regime.

Valuation

In ordinary business transactions value ultimately has more to do with perception than calculation. In a free market, a buyer will always pay the least possible and the seller will seek the most. The respective needs and circumstances of buyer and seller and their direct and collateral relationships will all have an influence on the day.

There is only so far one can go with valuation theory. The various and complex tools available are in the end used to justify the price objectives of buyer and seller. Any method for projecting future value necessarily depends on making assumptions. If the parties agree on those underlying assumptions and on the formula applied then well and good. If not, then traditional negotiation, albeit more scientifically based, will take its course.

The sale and licensing of technologies give rise to issues of valuation and respective bargaining power that often leave the smaller player disadvantaged. Ensuring that sellers have access to good advice as to the commercial value of their technologies can go some way to improving their negotiating position.

One way of matching the scale and economic power of the major companies is for smaller companies to participate in collaborative organisations of sufficient scale as to be able to establish their own market authority.

INTERMEDIARIES AND ADVISORS

Lawyers, patent and trademark agents, accountants, technology brokers, commercial advisors, and many other types of provider have a vital role to play in providing practical counsel and guidance, and thereby reducing the incidence of business failure.

The protection of intellectual properties through registration is a specialised discipline and one that demands careful planning and management. Equally, the business models through which those assets realise their value must also be constructed with care and consideration for the many issues that can arise. Professional advisors have a key role to play in innovation and commerce.

While some business people have the benefit of specific business education, the vast majority do not. Government can hope to offer information and some general guidance to citizens through dedicated agencies, however it is the professional services sector to which businesses traditionally turn for advice. The professions will be encouraged to gear up to meet a demand for service when they can see that service opportunity being generated through measures to promote commercialization of technologies.

CONCLUSIONS

What is clear is that innovation of itself is not enough. We have to address the entire journey to and through the market and consider the practical issues that confront business from the perspective of all of the principals involved. The participation of inventors, entrepreneurs, professionals, and investors are all required to achieve successful commercialization. Their particular needs and capacities must be taken into account, individually and collectively.

The present business situation in the field of technology innovation and commercialization is inefficient and inequitable. If more energy is to be released then selective intervention is going to be needed in a number of key areas. Such interventions will not please everyone and will present their own problems, yet without such initiatives one is merely tinkering and substantive improvement cannot be expected.

Stories abound of valuable intellectual properties being abused by those who know that they have the financial muscle to deter enforcement. Concerted action, perhaps subsidised by government grant, would allow patent holders to build licensing revenues from presently unauthorised users who have profitably exploited proprietary technologies. This kind of self-help is an obvious first step in building a licensing culture and generating income for investment from existing resources.

Investment capital will only be attracted to finance future value potential from innovation where investors also have confidence in the enterprise responsible for realising that potential. Investors want to see a track record of successful innovation before they will invest and so one cannot expect capital flows to improve overnight.

Innovation and commerce organisations of the kind suggested offer a possible collaborative vehicle for businesses that are otherwise too small and too dispersed to compete effectively or to attract investment. Through such collaborative organisations, combined with the power of a shared marketplace and with the right fiscal incentives, conditions for mobilising innovation could be significantly improved.

In all of this effort to promote innovation and wealth creation, the one issue that will have to be

addressed is that of fair reward. This issue is particularly relevant in the context of the monopolies, and near monopolies, afforded by intellectual property rights and is being brought to centre stage as consideration is given to the impact of the WTO/TRIPs (Trade Related aspects of Intellectual Property) agreement of the WTO on developing countries.

It is often said that business is driven mainly by fear and greed, and this is sadly not far from the truth. The seemingly insatiable demands of the stock markets for ever-greater profits have distorted values in every sense. While all wish to leverage their intellectual assets for maximum return, a balance has to be struck that promotes innovation and fair reward yet still allows responsible business to find profit opportunity and growth.

All these challenges should be thrown out to our academics, professionals and business people to encourage fresh thinking and practical proposals. Government policies can serve to establish the right conditions for innovation and commercialization. The rest is up to the market, which when it sees the opportunity will not be slow to innovate and exploit new ways of generating value.

FROM COLLABORATIVE INITIATIVES TO HOLISTIC INNOVATION

A first set of lessons learned through the implementation of Innovation Projects of the Fifth Framework Programme of the EC

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INTRODUCTION

Innovation is the engine that drives the economy and should be viewed as a complex multidimensional concept. The statement that innovation is under-utilised is often linked to the fact that the company lacks the resources to bring the technology to market or that a technology is exploited in only a few applications relevant to the company's core business. Yet that same technology could be applied in many ways, across products, industries, sectors or regions and could offer the potential to enhance economic and social development. However, this potential can neither be realised through technology push strategies (more research and more technology transfer), nor through pure market orientations. To establish a 'culture of innovation' supporting sustainable economic development, new ways of managing the inherent complexity of innovation must be explored.

Scientific advances have opened wider opportunities for innovation than ever before. Increasingly, the real innovation bottleneck is not the supply of new knowledge but external factors surrounding the process of technology transfer. Managing information overload, social acceptance of new technologies, environmental concerns, and the basic logistics of introducing change often pose a far greater challenge to businesses and institutional structures than the underlying technologies themselves.

As a possible remedy, earlier approaches essentially focused on building innovation support infrastructures such as science parks and incubators, and on the promotion of specific transfers of technology. They tended to concentrate on the adaptation of a product or process to solve a particular problem. Many included a programme of pilot testing, in some

cases supported by a market study. Over time the emphasis has shifted and today, the aim is orientated much more to integrate sectoral or regional structures and create mechanisms and processes with the potential to solve a wide range of problems in many different disciplines.

That experience revealed a need to look more carefully at the global context in which innovation takes place - at the management of the obstacles and risks imposed by external factors. The acceleration of scientific progress, globalization, and the advent of the information society have all contributed to the growing expression of the intrinsic complexity of our societies. Innovation typically conjures up an image of a new technology passing from the realm of research into the commercial sphere, to provide benefits in the real world. But this simple linear model, with a technology provider supplying end-users, does little to improve the wider capacity for innovation. Traditionally, efforts to support technology transfer have focused on 'hard', technical issues. They have also tended to deal only with those organizations taking part directly in the technological transfer.

A Reference Concept for Innovation

The importance of 'softer', non-technical barriers - once viewed as extraneous or even irrelevant - has gained increasing recognition. In reality the innovation process affects a far wider range of organizations than just those directly involved. Innovation is about people, not just technology. Aptitude and attitude will always be major factors in the process.

A number of non-technical barriers can hamper effective technology transfer and adoption, including inadequate management capacity, bad communication, poorly understood end-user

requirements, lack of long-term strategies or responsiveness to change. Organizations that have systematically addressed these pitfalls in parallel with more conventional technical work have derived substantial practical benefits in terms of the speed, range and sustainability of the resulting innovation. Frequently, they have a more advanced infrastructure and long term information strategy and can enjoy the critical competitive advantage in the global economy of the next generation.

Stimulating a culture of 'thinking differently' in both policy and process can induce intraor inter-company innovation mechanisms, developing competencies that enable enterprises to grow in new dimensions. As a first approach this process could be conceptualised in the *adaptation* of codified knowledge, *anticipation* of future developments based on tacit knowledge and on *organisation* skills.

Making relevant information more easily accessible to specialised sectors of the economy, by adapting the terminology and consolidating the information on best practice solutions for the cleaning of metal surfaces, has been tackled by a publicly funded body.

A Case Study

Metal surface cleaning is a common process in industrial sectors such as food, automotive parts, aircraft, heating systems, and electrical equipment. The market for cleaning equipment and agents is diverse and complex. The range of proven solutions is enormous, but several factors must be taken into account when selecting a product or process. Clearly, cost and efficiency are of prime importance, but companies are also increasingly concerned about environmental and health and safety performance.

The range of expertise from partners in Germany, Spain, Iceland, Estonia and Greece, providing a comprehensive analysis of the existing cleaning processes, includes socioeconomic considerations such as environmentally friendly solutions and renewable resources.

The organizational structure behind this open and interactive source of targeted information will help industry to strike a better balance between

economic objectives and social responsibilities, especially in light of the growing focus on sustainability as an overarching socio-economic goal.

The holistic innovation system is a prerequisite for long-term global competitiveness, beyond economic consideration. Technological development is essential for economic growth, but the innovative dynamism that is necessary to make it sustainable must integrate considerations of social relevance and environmental protection.

Innovation Projects as Innovation Systems

The described methodology is extending a commercial exploitation of pre-existing technologies, tackling common barriers to wider uptake and adoption. As an incremental change, codified knowledge is *adapted* to the broader socio-economic context. *Anticipatory* initiatives explore the scope for novel products or the development of new markets and the way it should influence, for example, in-house competencies. Projects, considered as 'innovation systems', *oscillate* between *adaptation* of existing competencies and *anticipation* of future developments within and beyond their sectors of activity.

Organizations or groups can cope with these three dimensions in a fragmented way. To integrate fragmentation, *facilitation* aims at gearing internal and external dynamics. It provides access to a wide range of *external* knowledge and competencies, in a *ready touse* format, while activating *aptitudes* and stimulating open and proactive *attitudes* of those organizations in the project that may behave as *Trojan horses* for Change.

The capacity to innovate is equivalent to any number of assets that can be adapted over time, stored and deployed when needed. Future opportunities take place within the context of the external competitive, economic and political environment which prevails, taking into account the respective internal resources, capabilities, cultures, structures and systems. Identifying the demand of society and turning obstacles into opportunities demand a flexible organization and broadly shared collaboration. The importance of sharing knowledge, and the need to find solutions

based on co-operation and consensus, are becoming increasingly evident.

It is possible to formulate the organization's strategic priorities for relevant arenas, through the analysis of existing and potential interest. Some actions can turn out to be unfeasible, but when a suitable strategy has been defined, the critical competitive factors and the associated sustainable impact become the reference point for any functional strategy and management decisions. To implement *innovation systems*, *anticipation* and *organization* emphasise close collaborations (leadership, management, governance, strategy, constructive diversity between public and private sector, etc.) and involve organizations that may have never been part of an *innovation system* (users, public authorities, trade unions, and non-profit organizations).

Conclusion

Metaphorically, *Innovation Systemics* can be compared to Cell Biochemistry. External physico-chemical mechanisms generate viable *fragments* channelled to individual cells through complex *organisms*, which are integrated selective responses to evolving boundary conditions. Indeed, the sustainability of the process demands the presence of specific replication mechanisms in cells themselves as a way to ensure the durability of this *innovation* process. *Facilitation* mechanisms contribute to an optimised correlation between internal *capabilities* and external *opportunities* and *threats*.

The very concept of 'sustainable development', key factor in the pursuit of long-term economic and social progress, is based on the principle of consensus-building. Innovation's success increasingly relies on non-technological factors, and businesses are gradually acknowledging the benefits of integrating all the stakeholders in the innovation process. 'Corporate citizenship' is

widely recognised among larger corporations, many of whom prepare an annual 'social balance sheet' to review company performance in areas such as environmental impact, staff relations, and relations with local communities.

Screening different approaches to sustainable innovation has come a long way from their earlier focus on solving single technological problems to tackle wider socio-economic, health and other themes. To maintain and improve their competitiveness, the enterprise arena will need tools to assess the impact of future technological development. These tools can not be seen as isolated methodologies for technological adaptation but must work as an integrated platform with a broader scope of social, economic and environmental indicators, for society to benefit fully from research and innovation.

Enterprises in different production sectors could open a platform to exchange the needs and solutions with services that offer competencies. In order to function harmoniously, all will have to fit some basic parameters such as comparable quality management, identified value analysis, consolidated human resources and flexible decision-making mechanisms. Based on trust and sector knowledge, facilitation to circulate the available competencies will create groups of small companies that become problem solver.

Beyond economic considerations, holistic *innovation systems* are prerequisite for long-term global competitiveness. The capacity to innovate is determined by any assets that can be adapted over time, stored and deployed when needed. Future opportunities take place within the context of the external competitive, economic and political environment which prevails, taking into account the respective internal resources, capabilities, cultures, structures and systems. Identifying the demand of society and turning obstacles into opportunities demand a flexible organization and broadly shared collaboration.

VALUATION AS A TOOL TO SUSTAIN INNOVATION

by *Eric J. Iversen and Aris Kaloudis, The STEP-Group*

INTRODUCTION

The creation of new knowledge, its commercialization, and the ability to appropriate the economic benefits have increasingly become a competitive factor both for firms and, indeed, for economies. Therefore initiatives that improve the conditions for the generation, the diffusion, and the exploitation of new knowledge in the economy are increasingly sought after. In this light, this short note considers how more efficient methods to value and capitalize intellectual assets might contribute to chief policy-objectives of promoting and sustaining innovation in the changing environment.

1. INTANGIBLE ASSETS IN THE EMERGING 'KNOWLEDGE MARKET'

We argue that the valuation and capitalization of intellectual assets should be seen in terms of the growing need to improve the way economically important knowledge is generated and utilized in the economy. The ultimate goal should be to promote and sustain innovation processes.

Therefore, we start by briefly exploring the role intellectual property (intangible assets protected by IPRs) plays in the emerging 'market for knowledge'. (Baumol, 2002) The idea of a 'market for knowledge' goes beyond the generally accepted premise that new technological knowledge has become more important to the economy. It emphasises moreover that the way economic activities are organized is also changing and in doing so, new challenges are emerging. One relevant observation is that that an increasing division of labour is establishing itself in the innovation process, involving joint ventures, R&D collaborations, and other multi-actor arrangements. (Arora, Fosfuri, Garbardella: 2001) In this emerging market's division of labour, methods for valuation of intangible assets as technological intermediaries become important.

In such a scenario, the chief priority is to provide the conditions for the sustainable and equitable functioning of the 'market for knowledge'. In a well-working market, new knowledge can find the right complementary resources (not least funding); knowledge creators and users can be brought together under conditions that are favourable for developing the idea; and the same pertains to promoting collaboration between different developers, in order to coordinate larger projects based on different pieces of knowledge. Hence, firms rely on multiple external sources of knowledge to generate innovation and value. The quality of those external sources is a determining factor of the future value of intellectual intangibles, i.e. patents, trademarks or R&D portfolios. A key point, here, is that the intangible value of the particular firm depends on the firm's place in the innovation system.

Based on this perspective, there are, therefore, two sets of questions: one is improving information and interactions within knowledge markets. The other is to improve the interaction between the 'knowledge production' (generation and utilization of new knowledge) and other fixtures of the innovation system, specifically financial markets.

1.1. *Conditions for valuation and capitalization of intellectual assets*

In this setting, accepted measures to value intangible assets may be needed. There are first some fundamental economic functions that valuation techniques of intangibles may be related to:

- The first function is to enhance conditions for the generation of new knowledge. This entails the organization of markets for new knowledge, relative structures and appropriability mechanisms. The dissemination of knowledge and its spillover effects is also dependent on the existence of

efficient markets for knowledge appropriability.

- The second function is the (dynamically) efficient allocation of resources, such as, financial capital, human capital and knowledge capital in the economic activities. Given the importance of these factors to economic growth a more effective utilization of those becomes a major policy issue.
- The third function relates to the uncertainty generated in the economy when there are systematic and large gaps between the market value of companies and the book value of their tangible assets.

New reporting techniques on firms' intangibles may reduce this gap and contribute to more stable economies. It is not our intention here to discuss the complex interactions between institutions, such as reporting technique standards, the financial system and macroeconomic trends. However, it is important to be aware of the role of reporting techniques as a one of the determinants the market valuation of risks over the course of a business cycle. Is it possible to reduce macroeconomic instability and avoid procyclical tendencies due to well-designed and new reporting techniques. In short, what may be the macroeconomic effects of the new reporting initiatives on market perception and distribution of risks?

Information has a fundamental effect on the organization of markets, and on the perception of risks. (Arrow, 1999) Therefore, when designing reporting standards, one should both focus on their potential effects on the micro, as well as on the macro level. In particular, one should investigate the possible effects of different methods and standards of intangible valuation on financial stability. The work of the Bank for International Settlements on financial risk measures and pro-cyclicality (see Lowe, 2002) is a good example of this line of thinking.

1.2. *Some potential benefits*

In this light, improved accountancy practices on intangibles can have a variety of positive effects beyond immediate, actuarial tasks. For example, they can contribute:

- (a) To making enterprises more aware of

value-potential which might otherwise be overlooked: (or under or overvalued)

- (b) To sensitizing other actors in the innovation system to a more realistic understanding of the risks and rewards of this value
- (c) To improving the working of different financial markets (more perfect information) which are important to the innovating SME firm.
- (d) To facilitating access to other markets (e.g. the US), including promoting different types of cooperation with foreign companies (mergers and acquisitions, also R&D collaboration)
- (e) To improving our analysis of the workings of the economy in significant ways: that is, they may lead to better economic and innovation policy.

2. **BRIEF SURVEY OF INTANGIBLE VALUATION APPROACHES**

It is worth looking in more detail at some different approaches to intangible valuation. In general, there are two main lines of approaching the intangible valuation issue. These represent quite different philosophical and academic traditions. The first line focuses on methods to evaluate the intrinsic value of intangibles which may or may not be included in the traditional financial reports. We register that there are basically three different methodological avenues under this tradition:

- cost-based valuation
- market-valuation methods
- real option-based methods.

2.1. *Cost-based valuation approaches provide an overview of the costs related to the generation of an intangible.*

Cost-based measures are limited but not without relevance. Their limitation is that the market is interested in information about the value (not the cost) of internally generated intangibles. Accumulated R&D costs in a particular project or programme, for instance, may represent partly or fully sunk costs if they are rendered obsolete due to a competitor's success.

The main weakness of market-valuation methods is that they usually are based on the assumption of efficient capital markets. This assumption

implies that there are no imperfections in the market of intangible assets due to insufficient information and information asymmetries. This is obviously a serious limitation if the aim is to find the intrinsic value of the intangible. On the other hand, this approach provides tools to systematically investigate the shadow value (or marginal contribution) of each intangible relative to tangible assets (see Bosworth et al., 2000).

2.2. *Real option-based approaches are a promising area for valuation of intangible assets.*

Real option valuation techniques take into account risks and other properties that may be captured in the option element of the intangible. One of the weaknesses of this approach is that the determination of the parameters necessary for estimating the real option value may become somewhat arbitrary.

The second line of approach contains conceptual models such as the balance scorecard or the intellectual capital model. These approaches may be conceptualised as ‘the new reporting paradigm’ (see Upton (2001)). An example of this line of approach is the Canadian Performance Reporting Initiative (CPRI). The fundamental premise behind CPRI is that the market and the firm need to acquire more insight into pre-transactional and forward-looking value creation processes of the firm. Traditional financial reporting is inherently limited in its ability to measure value creation. One can imagine, therefore, a parallel reporting system to traditional cost-based financial reporting which enables measurement of value creation as it occurs.

2.3. *Towards narrowing and focusing the issue of intangible value creation?*

Much in line with some of the conclusions from the 1999 OECD symposium, we believe that there is a need to concentrate on a firm’s innovation processes and how these generate value. The new reporting paradigm approaches come closest to this requirement. Yet, valuation approaches based on intellectual capital models or business scorecard models are often inflated by a large number of indicators encompassing all areas of business activity. This may cause

informational overload and reduce the efficiency of the new reporting standards. Therefore, there is a need to economise efforts and to concentrate on the essential value drivers in the economy.

There is an increasing understanding in the literature that essential value adding processes in the firm are those of knowledge creation and accumulation. To approach the question here, it is reasonable to start with intangibles that have been codified in formal ways, such as in a patent, design right, trademarks or, otherwise, through contracts. These represent accumulated knowledge that is also quasi-transferable.

Understanding what determines the value of intellectual intangibles entails understanding the firm’s place in the innovation system. Baum G. et al. (2000) found that the most important value drivers in a company are (in rank order) innovation, the ability to attract talented employees, alliances, quality of processes, products or services, environmental performance, brand investment, technology, customer satisfaction. Hence, Baum (2000) supports the argument that some firm aspects are more important than others. To be successful, a firm must know the potential value of its knowledge base, have a strategy for monetising its intellectual assets, and be effective in generating a return on these valuable assets. This innovation specific focus may give a more coherent direction in many of the valuation approaches mentioned above, particularly those in the new reporting paradigm.

Another issue that, perhaps, is underestimated in the literature is the potential costs related to a mandatory standardisation of information disclosure techniques. In general, there is reason to suspect that poorly designed accountancy standards may be detrimental to the functioning of intangible markets. This raises the question of what the potential dangers of this exercise are. This is an issue that we leave to the discussion of this working group.

However, some important issues here are reporting incentives, macroeconomic effects, costs particularly for the SME’s, arbitrariness of what is reported and what is not, etc. In any case, a bad standard for reporting may be much worse than no standard at all.

3. THE IMPORTANCE OF GETTING THE VALUE RIGHT: EVIDENCE FROM NORWEGIAN PATENTING

The successful transformation from intangible assets to value in competitive markets is contingent on a multitude of factors, many of them external to the firm. How do intangible assets fare as firms attempt to navigate these contingencies? In the light of the above theoretical discussion, this final section explores Norwegian patenting behaviour for indications as to how the knowledge market functions in Norway. It is based on a study sponsored by WIPO to understand how SMEs use the IPR system in Norway.⁴⁸

This glance through a patent-lens⁴⁹ suggests that some firms in particular have difficulties navigating the contingencies along the way from new knowledge (patent application) to intangible asset (valid patent grant). In this exercise, we observe how different size-classes of firms not only enjoy higher levels of success in terms of grants: more to the point, we see the smaller the firm, the higher the probability that it will itself withdraw the application. Withdrawal rates reveal something about the way individual firms evaluate the worth of their intangible assets and their ability to realize it.

3.1. *Patenting and value*

The premise for this exercise is that patent application represents accumulated knowledge and it represents an expectation of some economic return or other value. The fact that an economic agent applies for a patent indicates that the firm has accumulated novel knowledge, which it considers to be an asset with commercial possibility. We recognize of course that this mode of formalizing one's intangible asset is neither equally attractive nor equally pertinent to all new economic knowledge in all firms in all industries. Notwithstanding, those who do apply dedicate resources (both in time and money) in the quest to

derive some value from new knowledge that they presumably have developed.⁵⁰

In this light, the fact that an applicant withdraws his own application can indicate a number of things. On the one hand, it can indicate that the application was poorly framed and the applicant had reason to believe that it would not be granted in an acceptable form. A more likely reason for why an applicant does not follow up the application (following a fee schedule) is that it has run out of funding to bring the idea to market (cf. the capitalization process, above) and/or that it has lost faith in the idea's ultimate success seen in relation to costs. We can therefore interpret withdrawal to mean, in one way or another, that the initial value expectations by the applicant became disappointed.

3.2. *A decade of domestic patenting in Norway*

The WIPO study indicates several aspects about the Norwegian knowledge market. The first is largely anecdotal. In raw terms, innovative Norwegian firms tend to be less active in protecting their IP than firms in other European countries. (cf. CIS) Whether this is due to their failure to recognize the value of their intangible assets or to some other reason⁵¹, is not known. One can assume a problem (especially among some firms) in recognizing intangible assets and formalizing them. As indicated, one potential advantage of improved valuation exercises is that they might get firms to take stock of their intangible assets.

A second observation is, however, that Norwegian actors, not least SMEs, have used the patent and trademark systems more actively in the course of the 1990s. This suggests that the knowledge base is growing, the propensity to formalize intangibles is growing, the propensity

⁴⁸ Iversen (2001).

⁴⁹ Based on the WIPO study, the patent-lens used here picks up 6,303 Norwegian entities who, together, were involved in 14,319 'active' domestic patents during the 1990s. By "Active", we mean any patent that was applied for and/or granted during the 1990s AND any patent applied for before then but granted during the nineties.

⁵⁰ We recognize the 'value' of patenting will differ among these actors and across time. Primarily, the value is seen in terms of aiding the competitive position of the firm by affording it the room to cultivate its distinct qualities without threat of direct competition from imitations. In addition there are other ways in which patenting can hold 'value' for the assignee which do not immediately involve a dollar sign: e.g. signals to the market, strong-fences in R&D collaborations, etc.

⁵¹ ie related to the competitiveness of their markets, the relevance of patenting to their markets, etc.

to use the IPR system is growing, or a combination. In this situation, it is important to make sure that all actors have realistic expectations about this exercise and that they have equal chances to derive value from it.

A final general observation is that the propensity to get as far as a patent application is strongly dependent on the size of the firm, for whatever reason. Smaller firms are on average much less likely to apply for patents than larger ones, even in the same industries. For example, a large firm (over 100 employees) in the electrical equipment industry filed on average 1.6 applications in Norway, while a medium-sized firms (50-99) on average filed 0.25 applications in the same period: the smallest are almost off the chart. (0.03) This suggests that either large enterprises tend to be more innovative, that they tend to be better at recognizing the potential of intellectual property rights to make the most of their new knowledge, that they are in a better position to capitalize on formalized intangible assets or a combination

3.4. *Size-dependent Withdrawal*

A more specific point from the WIPO report is that SME patents are more often withdrawn than those of large entities. This raises suspicions that smaller entities find it more difficult than larger ones to follow through on their attempts to capitalize on formalizing intangible assets. In this vein, the figure shows that ‘successful’ Norwegian patenting is indeed dependent on firm size. There may be many factors behind the differences in success rates, where “success” is measured as non-withdrawal. Part of the explanation is probably to be found at the firm level: larger firms have a better working understanding of the IPR-System, they have internal resources (and thus staying power and fighting power in litigation), and they have a more conscious and better informed policy about intangible assets built into the enterprise’s business strategy.

The reason that a much larger proportion⁵² of SME applications is withdrawn (1/3) than large enterprise applications (1/6) has to do both with

such internal factors. However, it presumably also involves factors that are external to the firm, especially access to funding at critical stages in the development process. In general, the variable withdrawal rates suggest that several types of factors that might be at play, including:

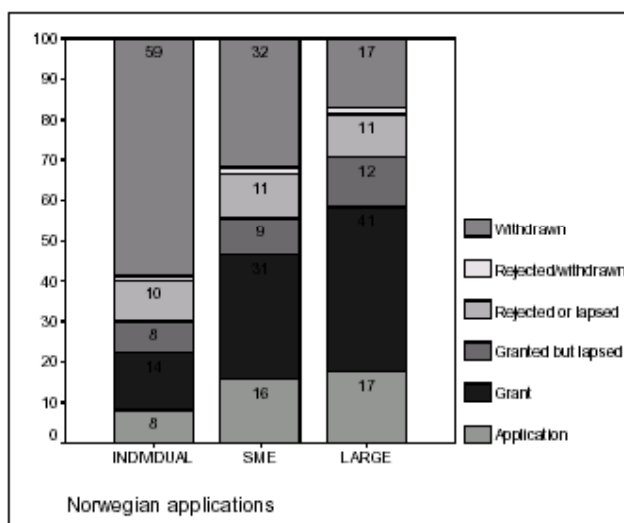
- (i) that smaller actors, especially independent inventors, tend to overestimate the value of their intangible assets going into a formalization process;
- (ii) that smaller applicants are forced to cut losses during the long development process because of difficulties accessing complementary assets—especially funding. This suggests that many, perhaps good ideas, are not developed. (capitalization problem and the functioning of investment markets); and
- (iii) that smaller applicants have a poorer working understanding of the patent system and could use a greater degree of assistance when approaching it.

3.3. *Some implications*

In terms of valuation and capitalization of intangible assets, this exercise indicates that there is potential to raise the efficiency of intellectual assets utilization not least in a country with a large population of small enterprises. Here, the domestic patenting record illustrates that the value of intangible assets is by no means predetermined or constant. The fact that smaller firms patent less often, on average, than larger enterprises indicates that something about the generation and/or utilization of new knowledge and/or the utilization of the patent system is subject to scale.

If we interpret this observation to mean that scale can influence the degree of formalizing intangible assets, we can posit two implications for improved valuation methods. The first is that standard methods need to take into account this type of difference. The second is that, as small firms become acquainted with valuation methods, there is the possibility that they might become more aware of the potential value of their intangible assets. A positive side-effect might be that they will more actively integrate a policy of formalizing intangible assets into their business strategy.

⁵² 2,042 unknowns and unregistered applications are removed



Source: Iversen (2001)

Figure 1. Norwegian applications by size-class and status (N=12.277)

The size-related tendency to withdraw patent applications emphasizes the importance of improving firm-internal processes. The large proportion of SME withdrawals indicates that we face a need not only to increase awareness, but, moreover, to increase expertise about formalizing intangible assets. Here it is important that the smaller enterprises also have a realistic expectation of the potential value of intangible assets in the face of great uncertainty. The routinization of valuation exercises can promote this at the firm-level.

Establishing accepted standards for IP valuation may have a more instrumental affect in terms of factors external to the firm. We need also to increase awareness and expertise in not only in other companies, but in the institutional framework surrounding these companies. This wider recognition and more nuanced view of intangible assets, especially among banks and funding agencies, might improve the way

financial markets work in relation to innovating firms.

4. PRELIMINARY CONCLUSIONS

Value-creation in the economy is connected to knowledge creation, dissemination, and utilization in its constituent enterprises and institutes. Methods to improve the way intangibles are recognized and valued via accountancy methods can improve the way the market for knowledge functions and, moreover, the way that emerging market interacts with established financial markets. This purpose of this short note has been to explore the relationship between valuation of intangibles and innovation processes, which was done both in theoretical and empirical terms. The ultimate goal is further off.

The goal facing us is to improve the way intellectual assets are generated and utilized in an environment in which intangible assets have become more important.

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STRATEGIC QUESTIONS REGARDING THE PATENTING SYSTEM - GLOBAL MARKET ACCESS DEMANDS IPR PROTECTION

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Introduction

The role patenting is playing in corporate strategy and more generally in the global economy at large is changing. During the last two decades, it has become a key instrument for *market access* and *trade* strongly associated with economic development in a more “co-productive” fashion. The previous “monopoly right” is converging in *usage* towards an instrument to secure market access through intellectual assets, or property, when the economy goes from a regional product economy to a global service economy.

Management of risk⁵³

The sole purpose of patenting, from a corporate perspective, is then to manage the risk and uncertainty in the (global) market. This view of patenting best explains the usage of the patenting system. It also gives a way of thinking for changing the system to become more efficient in absorbing risks and uncertainties in today’s more complex and uncertain world. The patent *right* is transferable with mutual consent and thereby provides a basis for a “market in ideas”. Not only the customer’s are customers but also strategic partners become customers to the technology you have developed. This transferability or right puts competition closer to the customer. Knowledge becomes a tradable commodity in the patenting process. This commodity can be traded, licensed, cross-licensed, introduced in international standards and securitized (to get a financial value and access to capital markets), etc.

I. Management of intellectual resources

General structure

The general legal structure of assets is divided into two categories: Physical assets and intellectual property rights.

Physical assets are defined as “value in possession”. This means that the value is there whether you do something or not. You must use it to create value but the right, and the value, is in the possession of the object. Here a portfolio strategy can be developed to spread risks effectively.

Intellectual property rights, IPR, on the other hand, are “value in action”. You don’t possess any asset but the only value is in doing something with the right. These rights are therefore much more connected to the *management* of this opportunity. A portfolio of IPRs has been used for long to spread risks here but since the action part demands knowledgeable people (working typically in companies) a more “systemic” view of the value creation is demanded to get the most out of the asset. This is true both for the creation of these assets and the exploration of the assets. Trading these rights therefore becomes a basic tool, a commodity, of the new, more knowledge driven, service economy. Here several constraints are present today due to the rather recent development of this trade. The developing countries, and small countries, are here challenged the most to be able to participate in the “global trade” of IPR. The usage of *patents* for market access then becomes most challenging for economic actors in securing their intellectual property worldwide.

II. Capitalization

The capitalization refers to the theme of the paper – “Strategic questions regarding the *patenting* system - Global market access demands IPR protection”.

⁵³ Risk management issues discussed: *Risk Management - from portfolio strategy to value creating systems strategy*, Ullberg, et. al. Geneva Papers, July 2002.

III. The patenting system challenged

This development towards the *usage* of patents and IPR is moving the whole patent industry “from patent to patenting”. A *system* of value creation is developing, rather than “technology monopolies” of competing actors. This is in particular true in complex technology industries like IT, where no single actor has “monopoly” on all technologies used in a product, for example a single computer, to be competitive in the market place.

This challenges traditional ways of doing business and managing risk. The “obvious” rights to market access it not so obvious anymore. The need for securing IPRs increases if one wants to have direct customer relations and not only become a “supplier” in the system.

This development is however not only technological nature but of a business logic nature. The previously dominating “production logic” where the production of the product is at the center is being replaced by a “service logic” type of value creation where the knowledge is at the center. This shift in logic challenges the whole patenting system. New ways of doing business, in close collaboration with the customer, innovating “business concepts” rather than innovating technology also poses needs for increased risk taking. However, the patenting systems of were not made for this “non technology” aspect of innovation.

This has let to different position worldwide. In the US “business method” patents are in fact granted. These patents are not technology patents but “schemas” of doing business. “Abstract schemas” are traditionally not patentable. In Europe the technology position is firm – no business method patents. Japan follows the US approach. The effect of this is that other, less efficient, IPRs are used to manage risk like trademarks, copyright, design, undisclosed information, geographical indication, licensing agreements (for software) (WTO/TRIPS IPRs).

The patenting system is therefore challenged as instrument to absorb risk in the “new” global service economy.

At the same time it is the “service sector” or service activities of the economy that dominate and grow. This has created an increasingly complex situation for policy makers, investors and inventors.

Valuation of these assets also poses challenges. Since they are very uncertain on average when it comes to value – only 2% of all patents lead to any business – a more “innovation system” approach is necessary.

A “risk management” approach to the patenting system is therefore a key to understanding the strategy of patenting systems and their usage. The system becomes an “infrastructure” to the economy.

This has policy implications for patenting institutions. A more “active” role is demanded in the economy being part of the risk management of companies.

There is also a “chicken and egg” problem related to adopting patenting systems for developing countries. The European Patenting Office, EPO, is an interesting case with respect to strategic moves to an “infrastructure for growth”.

1. From Patent to Patenting – how business capitalizes on patents

The usage of patents has changed since first conceived.

During the 18:th century “protection” was on the agenda. The development of national industry required trade barriers. Manufacturing monopolies in the UK allowed boosting the industrial revolution. This protection was the fundament of the system: The industrial manufacturing logic – “the product”.

During the 19:th and 20:th century, the formula changes somewhat to “innovation and information for monopoly”. The idea was to enable companies to recover R&D expenses by monopoly pricing of products.

Towards the end of the 20:th century and now in the 21:st century, it seems that the usage is changing again towards “market access”.

Patenting becomes “a business” (through extensive licensing/cross licensing). With more complex products that turn into systems not a single supplier can make all R&D investments. A multiple of patents are needed to make a “system”. This development moves into services as indicated above. This means that portfolios of patents are interesting for all actors just to get market access – something new for many industries. These portfolios thus gives incentives to competitors to cross license since they also would like to have access to all and the best technology. In a global market, building a national industry is no longer relevant, nor is recovering cost the only way to capitalize on knowledge. The capitalization reaches far beyond and increasingly becomes a source of income. New risk management strategies are developing with these new perspectives.

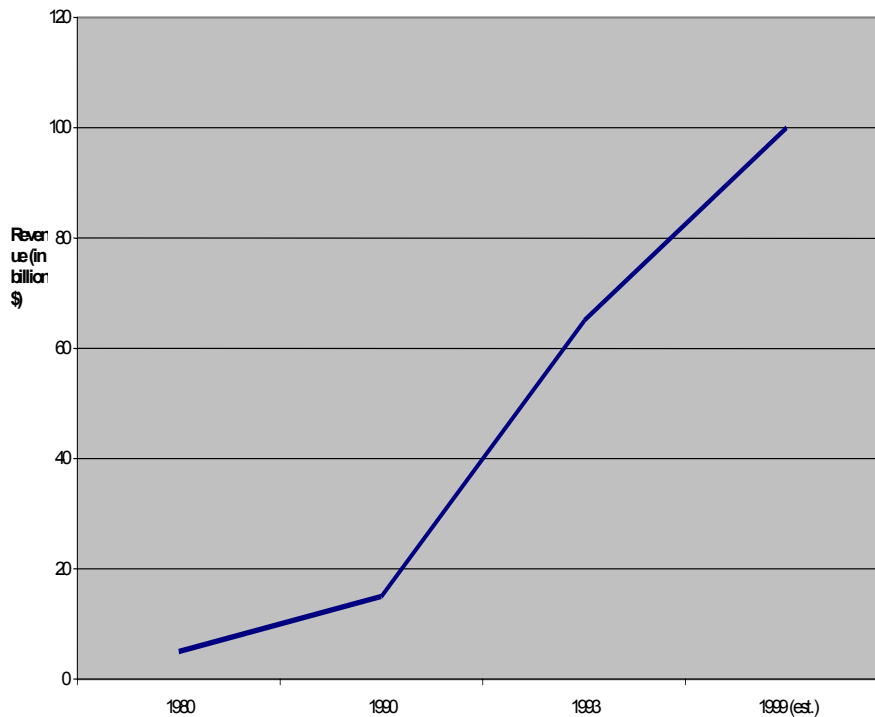
a) Usage of patents on ”everyone’s” strategic agenda

Different strategies are developing in this more

competitive global, innovation driven, service economy. IBM for example, “the inventors” of modern patent portfolio management only patents in the large patenting markets in the world. Here large patent portfolios are built up. These are used to cross license with actors from small countries. In that way both actors get a wider market access – but at lower cost for IBM. Apart from these cross licensing activities, IBM licenses patents for more than 1b\$ per year. This equals 1% of world licensing revenues!

Telecom companies used to have “gentlemen’s agreements” on innovation and patenting. Towards the end of the 1980’s, this lack of patenting strategy “stopped” European manufacturers to enter the US market. Now these “gentlemen’s agreements” are replaced by global competitive market where IPR plays a role. Companies also tend to include patented technologies in to world standards. This give the *right* to licensing revenues (under RAND conditions), replacing the original “monopoly

Patent Licensing Revenues, 1980 - 1999



Source: The Economist, 22 August 1992, 53; Fred The Patent Wars: The Battle to Own the Worlds . Autign Systems

idea” of patenting with a market access idea where standards play the most important role for market access: example GSM, GPRS, etc for mobile telephony.

This change in patenting strategy (the usage of patents as enabler of new more competitive corporate strategy) reflects a shift in competitive focus towards a service logic and economy.

b) The challenge for the patenting system – the service economy is where the value is created

The development of the service economy has changed the driver in the economy. It is not totally driven by customer oriented usage concepts. The west has a lead of 30 years to the rest of the world in this development. Intellectual property and innovation here plays a critical role in a country’s knowledge strategy for the future⁵⁴.

Service sector in % of GDP ⁵⁵		
Year	West	World
1900	25%	
1970	50%	
2000	>70%	~50%

c) Patenting system competition

Innovation is now taking place on a global basis. Experience from South-East Asia is shared with those of US, Sweden, Australia, etc. This “global innovation” needs global protection. The protection can today only be given nationally (even the EPC is a “bundle” of national patents) thus putting patenting systems in competition with each other. Their respective risk management capabilities play an essential role in attracting IPR and then enabling to for example cross license and open “global” market access⁵⁶. The competition is national versus “regional” in Europe. US – Europe – Japan when it comes to where to patent first. This is guided by language, market size, presumption of

validity, enforcement, etc⁵⁷. With high presumption of validity, more risk can be assumed and stimulate investment in innovation. Competing systems then gets increased importance for market access. Today, when many international customers choose, they use increasingly the PCT route since it manages risk better, faster, more uniform (one standard), etc.

2. Complex issue

The issue competing patenting systems and importance of IPR is a complex issue for: a) policy makers, b) investors and other stakeholders as well as 3) the inventors.

a) Policy makers

Policy makers are in the situation of choice of system. This has to be done in coordination with other overall economic and international trade policy decisions.

The USPTO with “internet patents” have extraterritorial ambitions. If using certain technology on the Internet, then you are infringing US patents.

The EPO has an “extension system” which allows, as the only system in the world, to engage in *bilateral* agreements. A nation can choose to opt in / opt out of a validation system, which grants patents on state-of-the art basis (all major technology is patented in US, Europe, Japan). The concept of “back-yard” (The Wilson doctrine) does not hold any longer. New approaches to intellectual property field can be made after WTO/TRIPS. The WIPO standard, PCT, is the “preferred choice” of international users.

Standards, which are set by WTO/TRIPS, are not easy to fulfill and not obvious for all economic development levels. IPR depends on a certain innovation activity. Since TRIPS standards are “maximum” standards rather than “minimum” standards it is difficult to set standards at will. It is also very challenging, if

⁵⁴ Ref. to presentation at UNECE IP Advisory Group in Belgrade, 2004-03-27, “Management of IP Assets for Strategic Advantage and Development of IP-driven growth strategies”, E. Ullberg.

⁵⁵ Geneva Association and other sources

⁵⁶ Much additional research is needed here to get empirical facts on the relationship between IPR and FDI (Foreign Direct Investment).

⁵⁷ In the US, since early 1980, a change in principle was made regarding the presumption of validity. The view used to be that the courts made a fresh investigation upon challenge of a patent. Now the courts presumed that it was valid.

not almost impossible to build a database of all state-of-the-art in the world if one does not get all applications of relevance to the art. This economic equation then favors centralized *handling* of patents.

Developing a patenting system- "Chicken and egg" problem

For nations, the patenting system can be a "chicken and egg" problem. All European patenting systems have come into place after an extensive copying of technology from abroad. German and Swiss chemistry is an example. The copying led to growth of a national industry in the field. The national industry then demanded protection from national competition – and got it. Some recent examples of this are Taiwan and India.

Taiwan started out as a high tech US manufacturing facility. This spurred local innovation. Demand from local inventors – and investors – for protection in the local market brought the patenting system in place.

India is a big ("illegal") medicine manufacturer, which is spurring local innovation. Now voices are raised from local inventors for protection in the local market. Soon maybe an efficient patenting system will be in place.

Now it is the quality issue of patent that is the predominant issue: EPO "quality" of search etc. versus US "registration" policy with extraterritorial claims.

b) Investors and other stake holders

From the investor perspective, the risk management issue dominates. Here financing issues are driven by the uncertainty of investments in R&D activities. A strong right reduced the uncertainty. Other measures of the value include groundbreaking research by Prof. B. Lev. Based on citations. If a certain patent is cited much in comparison with other new applications is has been shown to indicate future earnings from that patent / technology very well. The quality issue is a real issue here. Quality of search is crucial for any judgment on the value of the patent.

c) Inventor

For the inventor today's system lack much. It is heavy, cumbersome, slow and not very transparent (timeliness of decisions easily manipulated, etc.) The system is predominately used - and therefore also built – for the industrial policy is should support. These have been primarily large companies, not small. Although the IPR has "equalizing" effect between companies and countries, the procedures and efforts needed to secure one's assets are far from "efficient" for smaller companies.

A democratization of IPR seems to be a good idea for the global economy, when the economic differences are exposed in free trade.

3. Summary Capitalization

Summarizing this section on capitalization, patents (or IPR) become part of every business as the only way to secure freedom to market.

This is not a simple granting issue any more but a complex, business issue with strong global undertones (innovation, patent systems, etc) in fierce competition, multiple laws and possibilities to cheat.

This development is different from industry to industry but globalization drives even medical companies to rethink their market policy⁵⁸.

IV. Valuation

1. Valuation – a system's issue

In valuing a patent or IPR is typically not a "single patent" issue but a much more systemic issue. It is the "technological capabilities" of the company that are valued.

Biotech and Citations

Valuation of hi-tech biomedical companies in the US shows a direct relationship between citations of researchers / patents and market value of companies⁵⁹

⁵⁸ Ref. to Economist article on Pharmaceutical companies, July 13th 2002, page 51-52.

⁵⁹ B. Lev, et al., Stern, N.Y. Univ.

This indicates that it is not an individual patent issue but more a "technological capability" issue.

IT and # Patents

IBM states # patents in annual report for the purpose of consistency in technological capability and R&D investments.

Citations/patent

According to B. Lev's research consistency in performance of new technology is a good differentiator of relation between investments in R&D activity and market value. For example, Dow Chemical has low citations/patent but DuPont high citation/patent. Consistency in patenting is the value. The "R&D activities" are given a number by the fact that a lot of things are going on with relation to a specific technical area.

From a policy point of view, a good idea would then be to provide for "valuation systems" actors (in other words not to preempt that market with for example government subvention statistics).

2. Valuation – corporate side

Risk in R&D investments

Risk in R&D investments can be managed by classifying patents according to citations give a sharp instrument for investors and management. The patenting system can thereby help create great institutions.

The typical average patents has a 2% success rate but taking "high quality" patents and innovation systems (with high number of citations) into account the volatility of future earnings with respect to investment in R&D activities goes down with a factor of 460. The risk is then at comparable level to physical assets.

Generally valuation is then related to "innovation system" and "inventor". Valuation is also linked to *access* to global experiences.

Actors outside the innovator's and company management's control in this case hold the citation information. It provides for a neutral, transparent position, rather than overstated company "innovation reports".

A great institution can then be built not a "bright idea", nor on a "great company" but more **the management** of that organizations capacity to produce consistently hi quality hi tech.

V. The system

EPO Case

The European Patent Office, EPO, has adopted this risk management view of the patenting system, for the benefit of the economy as a whole. They focus on the role of creating an "infrastructure for the economy" – managing *economic* risk and uncertainty. The ultimate potential of this is a more efficient patenting system. More on this can be found on the EPO website.

Rethinking the patenting system

Strategic issues related to the patenting system from a policy and corporate perspective then arise from several sources:

- From patent to patenting – adopting a systemic view and risk management focus
- The usage of the system has gone from a simple monopoly right to global market access. The success and challenge is more in business concept innovation.
- Global patenting system competition create efficiencies by the customers choice
- Introducing a patenting system successfully - a "chicken and egg" problem. Yesterday local innovation was the driver. Today we have global innovation. New institutions are needed to absorb this risk more effectively.
- Valuation of patents - a system's issue
- From the individual investor - "democratization" of patenting

The issue of “survival” of the patenting system is challenged. The local protection argument is gone in a global economy with TRIPS-agreements. The usage is changing with “global innovation” and the service economy – standards must also change!

The patenting system then gets a new goal: Generating growth for the economy. This goal supersedes the national industry protection, R&D recovery and focuses on a new dimension demanding:

- Global standards/competition
- Independent from government policy
- Service economy
- Private inventor usage (democratization)

The new goal can be achieved by giving the patenting system a **global (economic) risk management focus**.

VI. Recommendations

There are several issues of interest to discuss further. First the “systemic view” of patenting based on the risk management aspects of the system.

Secondly there is a multi government agency issue. Typically several agencies are involved in the patenting system: Legal, economic, financial are the most commonly used to “host” the system. They have conflicting interests and in order to create an efficient patenting policy these initiatives must be coordinated in some way.

Thirdly the “chicken and egg discussion” needs much empirical evidence.

Forth there are public issues here: efficiency of patenting system, quality of system, scope of patenting (value driven), transparency (sharing information), etc.

Fifth there are private challenges in creating global protection of intellectual *property* enabling a global market economy. This is a very central economic policy point of view.

Taking the role to manage risk for growth combines the private and public interests – not simply “granting monopolies”. How patents (both the innovation and the right) are *used* to manage risk then becomes the key issue to understand.