

IP Management – Key Skills in a Knowledge Economy

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Introduction

Intellectual property (IP)¹⁾ is an important element in the knowledge economy. Through focused appropriation strategies, companies can use intellectual property to generate profits from the investments they make in new knowledge. To do so, it is necessary for various subsystems of the knowledge economy to be combined at an interdisciplinary level. To support the success of the company, IP management can help to optimize appropriation mechanisms. A consideration of the economic properties of intangible assets and an interdisciplinary background of those involved are required for this. With the management of IP, new competences and skills are entering the knowledge economy. By understanding the generation of wealth in the knowledge economy and the IP exploitation mechanisms, the need for new training approaches becomes clear.

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1) Intellectual property is used to mean intellectual property rights, see TRIPS Agreement for scope.

I. Intellectual Property in the Knowledge Economy

1. Characterization of the Knowledge Economy

The term “knowledge economy” denotes the generation of wealth which is essentially built on intangible²⁾ assets.³⁾ The term “knowledge” is used here in a comprehensive sense, as an intangible resource as opposed to tangible and financial resources.⁴⁾ The conceptual framework of the knowledge economy serves to describe the significant shift in the critical wealth-generating resources from tangible and financial resources to intangible resources. This change in importance is associated with substantial economic changes.⁵⁾ Since the 1950s, there have been attempts in the economic literature to describe this effect.⁶⁾ But there has not been a broad, systematic realization of the consequences in practice, and in particular the resulting extended options regarding intellectual property and its economic application have as yet not been greatly developed.⁷⁾

One characteristic feature of the difficulties associated with the knowledge economy is the fact that there is no common positive definition of intangible resources. Instead, the literature and discussions tend to focus on the negative delimitation from tangible and financial resources.⁸⁾ In a deliberately simplified manner and based on *Alvin Toffler*, it would also be possible to talk of an “invisible economy.”⁹⁾ Just how appropriate this metaphor is to the

2) “Intangible asset” as opposed to “tangible asset”.

3) Granstrand, *The Economics and Management of Intellectual Property* 10-12 (Northampton, MA: 1999).

4) See WURZER/REINHARDT, *BEWERTUNG TECHNISCHER SCHUTZRECHTE*, Chapter 1 paragraphs 11 and citations therein.

5) This includes e.g. the change in employment structure, the change in returns on investment in real capital, and the increase in importance of the information and communication infrastructure.

6) An overview of the attempts at description can be found in: Godin, *The Knowledge-Based Economy: Conceptual Framework or Buzzword?*, 31 *JOURNAL OF TECHNOLOGY TRANSFER* 26 (2006).

7) Granstrand, *Intellectual Capitalism – An Overview*, 25-2 *NORDIC JOURNAL OF POLITICAL ECONOMY* 115-127 (1999).

8) See Nomen, *Revision of the definition of “Intangible Asset”*, 8 *IPR-HELPDESK* 3-4 (2003).

9) See TOFFLER, *DIE DRITTE WELLE - ZUKUNFTSCHANCE* 273 (Munich: 1980).; see also GORZ,

concept of the knowledge economy becomes obvious upon discovering that the knowledge resource itself is not visible and that its economic effects are generally not transparent. Often there is no record on the balance sheet of self-created intangible assets,¹⁰⁾ the macroeconomic recording of the financial effects of knowledge is incomplete¹¹⁾ and there is at present no general accepted model for describing the conversion of intangible production factors into correlated economic profits.¹²⁾

2. Basic Mechanism for Generating Wealth in the Knowledge Economy

Before drawing the attention towards IP as an essential element of the knowledge economy to create value on a corporate level, the basic underlying mechanism for generating wealth in the knowledge economy must be understood. From this understanding, it becomes clear why the contributions made to the knowledge economy and thus the conversion of intangible production factors into correlated economic profits is necessarily interdisciplinary. It is essentially possible to distinguish three subsystems with inherent individual mechanisms and respective groups with a stake or interest therein.¹³⁾

The first individual mechanism is creation, maintenance and enforcement of the IP within the legal industrial property system. The main route of entry into this system comprises the creative efforts of the inventors and authors. The main result comprises industrial property rights and copyrights. In this subsystem, besides the inventors and authors, the groups with a stake or interest therein are in particular patent attorneys and lawyers. This “law”

L'IMMATÉRIEL: CONNAISSANCE, VALEUR ET CAPITAL 35 (Paris: 2003).

10) DAWO, IMMATERIELLE GÜTER IN DER RECHNUNGSLEGUNG NACH HGB, IAS/IFRS UND US-GAAP 1-10 (Herne/Berlin: 2003).

11) For example, national licence and patent records only include transfers made in return for payment and is dominated by intra-company licences (transfer prices), cf. Greif, *Internationaler Patent- und Lizenzverkehr: Formen-Fakten-Regeln*, in *ORDNUNGSPROBLEME DER WELTWIRTSCHAFT, SCHRIFTEN ZU ORDNUNGSFRAGEN DER WIRTSCHAFT* Vol. 71, 180-200 (Schüller/Thieme ed., Stuttgart: 2002).

12) Foray, *Economics of Knowledge* 9 (Cambridge, MA: 2006).

13) *In conformity with*. Heiden, *Bioscience innovation in the wake of the emerging knowledge economy*, in *INTELLECTUAL PROPERTY AND BIOSCIENCE, COMPENDIUM OF WORKING PAPERS FROM SCANBALT IPKN PROJECT 14* (Berlin: 2007).

subsystem is dominated by legal questions and matters. The second individual mechanism is the capitalization of IP. In order to generate wealth, it is vital that this created IP is put to productive use. Through this productivity, the IP becomes an intangible asset. Recognition thereof is essential for capitalization, i.e. representation as a company asset. Important groups with a stake in this “capitalization” subsystem are the company management, and accountants. The third individual mechanism is the conversion of intangible assets into alternative commodities. Conversion paths may include the exploitation of the asset within the company or outside the company, e.g. by issuing licenses, and also direct conversion of the intangible asset into equity and debt capital. This conversion path must work in both directions with the lowest possible transaction costs. The main groups with an interest in the “conversion” subsystem are financial services providers such as commercial banks, private equity companies or leasing companies. Through conversion, the available capital can be used by the company to generate further intangible resources.

As a result, along the basic mechanism and via the individual mechanisms of creation, capitalization and conversion, there is a generation of wealth based on the intangible asset. It becomes clear from this description that at least the three different subsystems—law, capitalization and conversion—have to interact in order to generate wealth.¹⁴⁾

At present, however, this value-added mechanism is characterized by massive inefficiencies. Added to this is the fact that, in the OECD countries, there are as yet hardly any efficient and widely available conversion mechanisms for converting assets into cash and vice versa.¹⁵⁾ Recently, therefore, *Werwigk* came to the conclusion that the raising of capital through intangible assets is possible in principle, but in practice is barely attainable due to valuation difficulties.¹⁶⁾

14) LEV, *INTANGIBLES, MANAGEMENT, MEASUREMENT, AND REPORTING* 19 (Washington, D.C.: 2001).

15) PETRUSSON, *INTELLECTUAL PROPERTY & ENTREPRENEURSHIP, CREATING WEALTH IN AN INTELLECTUAL VALUE CHAIN* 250 (Göteborg: 2004).

16) WERWIGK, *KAPITALAUFBRINGUNG DURCH IMMATERIALGÜTERRECHTE* 220-228 (Baden-Baden: 2006).

3. *Self-referential Subsystems: Interdisciplinarity as a Consequence*

As explained above, the generation of wealth in the knowledge economy is characterized by the integrative cooperation between three subsystems. As will be demonstrated, one main source of the inefficiencies that exist in the basic mechanism lies in the intrinsic interdisciplinarity of the necessary cooperation between the subsystems. Since the individual subsystems are dominated by groups from various disciplines, the need for cooperation between them gives rise to an interdisciplinarity problem.¹⁷⁾

Those problems are already found in the individual subsystems. For example, the law system of industrial property protection itself is highly differentiated. Evidence of the associated reduction in efficiency, is provided for example by *Ann*, who complains in his article regarding know-how protection: “One reason for the relatively weak treatment of know-how protection, [...], may certainly lie in the tailoring of advisors’ activities: [...] patent attorneys tend to consider themselves as ‘patent and trademark lawyers’ rather than as universal IP advisors.”¹⁸⁾ *Harhoff* and *Reitzig* deal with the process of applying for patents and state: “The historically grown division of responsibilities between R&D managers and patent attorneys has led to the situation where those involved increasingly communicate via sharply defined interfaces,” and also, in respect of the strategic considerations in the application process: “While technically or economically trained innovation managers often do not recognize these aspects in detail, patent attorneys do not always have a good insight into the strategic and economic importance of individual protection rights for the overall development of a company.”¹⁹⁾ These practical-oriented observations within the “law” subsystem are documented for the entire basic mechanism. The fundamental issue is the separation between the legally dominated “law” subsystem and the economically dominated “capitalization” and “conversion” subsystems which

17) PETRUSSON, INTELLECTUAL PROPERTY AND ENTREPRENEURSHIP, CREATING WEALTH IN AN INTELLECTUAL VALUE CHAIN 92 (Göteborg: 2005).

18) ANN, GRUR, KNOW-HOW – STIEFKIND DES GEISTIGEN EIGENTUMS 40 (2007) .

19) Harhoff/Reitzig, *Strategien zur Gewinnmaximierung bei der Anmeldung von Patenten*, 71-5 ZfB 510 (2001).

can be combined as “economy.”²⁰⁾

In conclusion, it must therefore be stated that the necessary interaction of the various groups having a stake or interest in the generation of wealth in the knowledge economy is inefficient due to the separated nature of the subsystems.²¹⁾ The individual subsystems tend towards self-definition by delimitation, self-referential communication and self-perpetuation through recursive network processes. The management of IP with the aim of generating wealth in a knowledge economy must accordingly face this interdisciplinary challenge and overcome the subsystem boundaries by means of integrative, interdisciplinary approaches. The important issue here is the integration of the legal decision-making process, the future-oriented economic decision-making process and the application of technology through engineering.

II. IP as an Essential Element of the Knowledge Economy

Based on the description and the identified deficiencies of the necessarily interdisciplinary basic mechanism to create wealth in the knowledge economy the effect and relevance of intellectual property in the knowledge economy must be further elaborated. This further specifies the basis for value creation and the management of IP.

IP as an essential element of the knowledge economy on a corporate level combines three different perspectives. The first way of looking at it is in a capital-oriented manner. For the individual company, IP is part of the company’s assets, a resource and a basis for competitive advantages. The second perspective is based on a functional observation. IP serves to define property based on the resource of knowledge. The third perspective focuses on the way in which an economic advantage can actually be achieved from the resource and the property, i.e. appropriation strategies.

20) Granstrand, *Innovations and Intellectual Property Studies*, in *ECONOMICS, LAW AND INTELLECTUAL PROPERTY* 22 (Granstrand ed., Boston: 2003).

21) PETRUSSON, *INTELLECTUAL PROPERTY & ENTREPRENEURSHIP, CREATING WEALTH IN AN INTELLECTUAL VALUE CHAIN* 92 (Göteborg: 2004).

1. IP is Part of the Company's Assets.

For internal and external addressees, a correct presentation of the assets situation within the company as a basis for decision-making and investments is indispensable. One consequence of shifting the emphasis for the company's success towards intangible company resources is an intensive discussion about the systematic representation and identification of these company assets.²²⁾ Intangible resources are increasingly being thought of as assets,²³⁾ i.e. a potential for future economic advantage. According to the general definition *Lev specifies*: "An intangible asset is a claim to future benefits that does not have a physical or financial embodiment. A patent, a brand ... are intangible assets."²⁴⁾ Based on long-term experience, for tangible and financial assets there are detailed rules regarding the recording thereof in internal and external accounting procedures and therefore in the management and documentation of the company's assets. There is no such generally accepted structure for intangible assets. Various proposals have been made, but the questions as to whether the assets are immaterial, intellectual or intangible and as to whether patents, trademarks and know-how fall within the same category or different categories are still disputed.²⁵⁾ These difficulties are based not least on the fact that the value-adding processes of intangible company assets are not yet fully understood by all those taking part in the discussion.²⁶⁾ Added to this is the fact that this discussion starts from different perspectives. Inventors, accountants, companies' management and marketing, as well as industrial property experts and company financiers have different self-referential systems²⁷⁾ and have difficulty finding a interdisciplinary accepted

22) For example *Lev, Sharpening the Intangibles Edge*, 6 HARVARD BUSINESS REVIEW 109-116 (2004).

23) See SMITH/PAAR, VALUATION OF INTELLECTUAL PROPERTY AND INTANGIBLE ASSETS 1-3 (New York: 1994).

24) See LEV, INTANGIBLES, MANAGEMENT, MEASUREMENT, AND REPORTING 5 (Washington: 2001).

25) For example, cf. *Kozyrev, Evaluation of Intellectual Property and Intangible Assets*, WIPO.

26) With regard to the description of the value-adding and appropriation processes, cf. Part (I.c.).

27) Cf. with regard to the characterization of self-referential systems Part (III), with regard to

structure.²⁸⁾ This definition difficulty is an expression of the interdisciplinary nature of the generation of wealth in the knowledge economy based on intangible assets, as explained in Part II.

2. Function of IP in the Knowledge Economy

Intellectual property nowadays rests on a predominantly economic basis.²⁹⁾ The minimizing of property-oriented conflicts is attributed to the possibility of gaining ownership of an intangible asset. Economically efficient exchange contracts (e.g. license agreements, trade, etc.) can take place on the basis of strictly defined rights of disposal attached to the intangible asset. By using the property as an institution³⁰⁾ the assignment of rights of disposal is ensured, a motivation and incentive effect is obtained, and the diffusion of information is made possible.³¹⁾ Industrial property rights thus form the basis for the incentive that a company has to invest in the creation of inventions or in opening up the market.³²⁾ Legally they are configured as exclusion rights. One very simple image which can be used as an analogy is that of a claim of land and a fence. In this image, the claim of land corresponds to the invention and the fence represents the property right.

This analogy leads in several directions to the essential functions of IP for

the term self-referential cf. KNEER/NASSEHI, NIKLAS LUHMANN'S THEORIE SOZIALER SYSTEME 57 (4th ed., Munich: 2000).

28) Cf. with regard to this phenomenon of the different subsystems of the knowledge economy Part (II).

29) Hall, *Exploring the Patent Explosion*, JOURNAL OF TECHNOLOGY TRANSFER 30 (2004); Harhoff, *Patente – Segen oder Fluch für Innovationen*, 54 ZFBF SONDERHEFT 86-109 (2006); Cole, *Patents and Copyrights: Do the Benefits Exceed the Costs?*, 15 JOURNAL OF LIBERTARIAN STUDIES 79-105 (2001).

30) Institution here is to be understood according to Richter/Furubotn as “a system of linked, formally bound (formal) and formally non-bound (informal) rules (standards) including provisions for implementing them”. They serve to define incentive structures to control individual behavior in a given direction, cf. RICHTER/FURUBOTN, *NEW INSTITUTIONAL ECONOMICS* 7 (3rd ed., 2003).

31) In the case of patent rights: Regibeau/Rockett, *The Relationship between Intellectual Property Law and Competition Law: An Economic Approach*, Economics Discussion Papers 581, University of Essex, Department of Economics, available at <http://ideas.repec.org/p/esx/essedp/581.html>.

32) Furubotn/Pejovich, *Property Rights and Economic Theory: A Survey of Recent Literature*, 10 JOURNAL OF ECONOMIC LITERATURE, 1137-1162 (1972).

the knowledge economy. Firstly, this is the definition or creation of property rights based on knowledge. Without such rights, it would not be possible to exclude third parties from using it and therefore the knowledge or the invention becomes public, as a result of which the financial exploitation would at least partially no longer be possible for the individual.³³⁾ Only through the property is it possible to create a process of generating wealth by means of conversion mechanisms.³⁴⁾

The question regarding the economic function of the fence is important for understanding the practical approaches to the management of intellectual property, i.e. the origin of the economic advantage of the fence. Implicitly, the economic reasons for intellectual property are based on the assumption that an economic advantage results essentially directly from the monopoly situation, or the monopoly-like situation.³⁵⁾ This economic advantage is an appropriation mechanism used by the patent owner to amortize its investment in new knowledge. This implicit basic assumption no longer exists in many sectors for various reasons.

With the increasing economic relevance of complex technologies, the monopoly-like effect is increasingly to be rejected for individual protection rights as a direct and sole appropriation mechanism.³⁶⁾ In anticipation of this, companies are increasingly turning to cluster strategies for building patent portfolios.³⁷⁾ Empirical analysis of the use of IP usually finds that companies consider the use of patents very differently³⁸⁾ and often favor alternative forms of protection.³⁹⁾ In these studies, it is implicitly assumed that the fence around

33) Harhoff, *Patente – Segen oder Fluch für Innovationen*, 54 ZFBF SONDERHEFT 92 (2006) .

34) Cf. *supra* Part II., Basic mechanism for generating wealth in the knowledge economy.

35) KAUFER, *THE ECONOMICS OF THE PATENT SYSTEM* 1-5 (Chur: 1989).

36) Pretnar, GRUR Int. 9 *Die ökonomische Auswirkung von Patenten in der wissensbasierten Marktwirtschaft* 776-786 (2004).

37) Shapiro, *Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting*, in *INNOVATION POLICY AND THE ECONOMY* 119-150 (Jaffe/Lerner/Stern ed., Boston, Mass.: 2004); Parchomovsky/Wagner, *Patent Portfolios*, UNIVERSITY OF PENNSYLVANIA LAW SCHOOL. SCHOLARSHIP AT PENN LAW. PAPER 51(2004), available at <http://lsr.nellco.org/upenn/wps/papers/51>); Reitzig, *The private values of "thickets" and "fences": Towards an updated picture of the use of patents across industries*, 13 ECON. INNOV. NEW. TECHN. 457-476 (2004).

38) For example depending on the sector, size of the company, technology, competition situation, etc.

39) Cohen/Nelson/Walsh, *Protecting their Intellectual Assets: Appropriability Conditions and why U.S. Manufacturing Firms Patent (or not)* (NBER Working Paper 7552, 2000); Levin/

the claim of land, i.e. its mere existence, is a mechanism for making economic use of the claim. However, from the point of view of the company, the question is something quite different.⁴⁰⁾ The existing claim of land is intended to be put to optimal use, for example as a feedlot, for mining natural resources, as a site for a factory, or as a plot for an apartment building, etc. These use forms are appropriation mechanisms for the value of the claim of land. Only these appropriation mechanisms generate a payment flow for the owner. The fence, i.e. the protection mechanism, must be configured very differently in these various use forms and performs various functions and possibly, as in the case of the feedlot, even the deliberate omission of the fence may be helpful for exploitation.⁴¹⁾ The important thing for using the claim of land or appropriating the innovation returns is the implementation of an appropriation strategy and the existence and suitable use of the necessary complementary factors such as capital, know-how, technology, experts, and access to the market.⁴²⁾ Companies are therefore not interested in protection per se for example through patents, but rather develop appropriation strategies for achieving the highest possible returns from their knowledge.

In such appropriation strategies, protection rights are increasingly being used for various more strategic functions, which include competition or technology blocking, license and cross-license potential, inventory for subsequent market entry, reinforcement of negotiation position, generation and protection of company assets, M&A currency, etc.⁴³⁾ It is even becoming more and more clear that the proportion of strategic functions compared to

Klevorick/Nelson/Winter, *Appropriating the Returns from Industrial Research and Development*, 3 BROOKINGS PAPERS ON ECONOMIC ACTIVITY 783-831 (1987).

40) Stirih/Rapp, *Modern Methods for the Valuation of Intellectual Property* (1998), www.nera.com.

41) The analogy here would be the use of IP in the context of Open Innovation or Open Source.

42) Teece, *Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy*, 15 RESEARCH POLICY 285-305 (1986); SULLIVAN, PROFITING FROM INTELLECTUAL CAPITAL 103-118 (New York et al.: 1998).

43) In the semiconductor industry, for example, patent portfolios are used as a potential threat and the application behavior is largely separate from the R&D input, cf. Hall/Ziedonis, *The Patent Paradox Revisited: An Empirical Study of Patenting in the U.S. Semiconductor Industry, 1979-1995*, 32 RAND JOURNAL OF ECONOMICS 101-128 (2001); Hundertmark/Reinhardt/Wurzer, *Portfoliosteuerung im strategischen Patentmanagement*, 3-4 MITT. 105-110 (2007).

mere protection is increasing.⁴⁴⁾ This trend can be seen not only in Europe and in the USA but also and Asia.⁴⁵⁾

3. Basic Forms of Appropriation Strategies

The appropriation strategies of companies build on the expanded functions of intellectual property. The exploitation itself is only part of the overall appropriation mechanism, i.e. the way in which companies generate their innovation returns. Companies are faced with the question of how they can use their special complementary factors and their position in the market and sector⁴⁶⁾ based on their creativity to generate financial success with the aid of IP.⁴⁷⁾ Companies' appropriation strategies can be classified by how strongly or how fully the emphasis is placed on the integration of IP, complementary factors and business model.⁴⁸⁾ As a rough structuring, a distinction should be made here between IP-associated, IP-driven and IP-based appropriation strategies.

The class of IP-associated appropriation strategies is characterized by a low integration of the components IP, complementary factors and business model. The business model is dominated by tangible and financial assets. IP is gained separately and not significant or essential for the business model. The use of strategic functions of IP takes place where necessary, but independently of the business model.⁴⁹⁾

IP-driven appropriation strategies are characterized by the fact that IP is

44) Blind, *Motives to patent: Empirical evidence from Germany*, 35 RESEARCH POLICY 655-672 (2006).

45) Hanel, *Intellectual Property Rights Business Management Practices*, 01 NOTE DE RECHERCHE (2004), available at www.cirst.uqam.ca

46) Arora, *Patents, licensing, and market structure in the chemical industry*, 26 Research Policy 391-403 (1997); Wurzer/Kaiser, *Patente, Produkte und Profite*, 03 HARVARD BUSINESS MANAGER 23-35 (2006).

47) Khain, *Prospects for Knowledge Policy*, in *ADVANCING KNOWLEDGE AND THE KNOWLEDGE ECONOMY 3* (Brian/Foray ed., 2006)

48) Wurzer/Reinhardt, *Patent Portfolio Management – Value and Quality Based Patent Portfolio Management*, XLI LES NOUVELLES 266-273 (2006); PIKE, *VIRTUAL MONOPOLY* (London: 2001).

49) Kamiyama/Sheehan/Martinez, *Valuation and Exploitation of Intellectual Property* (OECD STI Working Paper 2006/5), available at www.oecd.org/sti/working-papers; Delain, *The Intellectual Property Audit*, 12 LES NOUVELLES 193-198 (2003).

assigned a dedicated value-adding role in the business models of the companies. The IP strategies are designed alongside and in parallel with business models.⁵⁰⁾ The complementary factors are selected and used in a targeted manner for implementing the appropriation strategies. This role of IP also becomes clear in its change in importance for corporate finance⁵¹⁾ and in the M&A business.⁵²⁾ If IP makes a dedicated value-adding contribution, purchasing a company without the IP is like purchasing only the outer shell, and implementation of the business model would no longer be possible.

In the case of IP-based appropriation strategies, a full integration of the components IP, complementary factors and business model is achieved. The business model is, so to speak, the implementation of the IP using the complementary factors.⁵³⁾ Pike provides a few examples of this from various sectors. These highly integrated appropriation strategies include for example a fortress monopoly in the pharmaceutical and chemical industry. Here, use is essentially made of the protection function, and blocking effect of IP. In the case of a hub monopoly in the telecommunications industry, the benefit of standards is used by the independent company or network partner. In the added-value monopoly, such as in the automotive industry for example, the emphasis is placed on appropriating the benefit of a comparably small feature compared to the overall product, but significant for the customer benefit. This can be seen for example in the ABS technology or in driver assistance systems. In the case of a nutshell monopoly, the protected technology as an embedded system for the customers and is visible only indirectly via its effect or does not appear at all. However, the protected element is critical for the overall function of the device, such as for example in the case of computer

50) DAVIS/HARRISON, EDISON IN THE BOARDROOM 19 ff (New York et al.: 2001); Fox, *Intellectual Property Management: From Theory to Practice*, in SULLIVAN, PROFITING FROM INTELLECTUAL CAPITAL 142 (New York et al.: 1998).

51) HOWREY EUROPE: A SURVEY OF INVESTOR ATTITUDES ON IP PROTECTION (2002).

52) Fabry/Ernst, *How to Make Investors Understand The Value of IP Assets*, 12 LES NOUVELLES 201-208 (2005).

53) Klaila/Hall, *Using intellectual assets as a success strategy*, 1-1 JOURNAL OF INTELLECTUAL CAPITAL 47-53 (2000); Arora/Ceccagnoli, *Profiting from licensing: The role of Patent protection and commercialization capabilities*, MANAGEMENT SCIENCE (Conditional acceptance in); Arora/Fosfuri/Gambardella, *Markets for Technology and Corporate Strategy*, in ECONOMICS, LAW AND INTELLECTUAL PROPERTY 77 (Granstrand ed., Dordrecht: 2003); N.N., *A Market for Ideas*, 22nd THE ECONOMIST 3-20 (2005).

processors.⁵⁴⁾

The development of these appropriation strategies can be understood by way of example on the basis of the telecommunications industry. For the manufacturer of chipsets and mobile telephones, the physical and financial assets are central to the implementation of their business model, and the value-added chain is oriented towards the exploitation and production of tangible assets. This view changes for the network operators. Tangible assets for setting up networks are still important, but the business models implemented thereon are massively dependent on IP for generating a payment flow. The added value is achieved through the use of the networks, and they are based on the application of various standards regarding data exchange. Building on devices and networks, service providers offer services such as Email, ringtones, route planning, etc. The value-adding chain of these companies is completely intangible and the generation of the payment flows is determined almost exclusively by IP. From this perspective, it becomes clear how the expansion of the functions of IP and the increasingly important development of appropriation strategies stresses the demand on the economic management of IP.

4. Dimensions of IP in the Knowledge Economy

In addition to the described qualitative changes, the existing quantitative dimensions also provide information about the increase in importance of the knowledge economy. These are figures which are based on the economic exploitation of IP and other intangible resources.⁵⁵⁾ 50-70% of the gross national product in the private sector presently comes from the implementation of IP.⁵⁶⁾ 70% of US growth in 2002 is estimated to result from the exploitation of intangible resources.⁵⁷⁾ The worldwide volume of licenses rose from USD 15 billion in 1990 to more than USD 100 billion in 2000.⁵⁸⁾

54) PIKE, *VIRTUAL MONOPOLY* 28 (London: 2001).

55) Cf. intellectual capital analog to SULLIVAN, *VALUE-DRIVEN INTELLECTUAL CAPITAL* 18 (New York et al.: 2000).

56) Harvey, *Why intellectual property matters*, in *A HANDBOOK OF INTELLECTUAL PROPERTY MANAGEMENT* 3 (Jolly/Philpott ed., London: 2004).

57) BRYER/SIMENSKY, *INTELLECTUAL PROPERTY ASSETS IN MERGERS AND ACQUISITIONS* XXVII (2002).

58) DAVIS/HARRISON, *EDISON IN THE BOARDROOM* 73 (New York et al.: 2001); Kiso, *The role of*

Based on data concerning the expenditure on R&D in the OECD countries, *Harhoff* estimates the value of the patents granted in 2001 as being USD 97-150 billion and, based on the assumption for the sake of simplification that this value decreases linearly over the maximum validity period of 20 years, he determines a value for the stock of patents as being USD 1.0-1.5 trillion.⁵⁹⁾

The economic impact of the knowledge economy can also be seen in the transition of Korea from a newly-industrializing economy back in 1960 to a major player in modern technology driven markets. In 1986 Korea was paying royalties for foreign licenses of USD 1.18 billion to exploit technologies that have been developed abroad.⁶⁰⁾ In 2000 the situation turned upside down and annual licensing income is estimated with USD 1.8 billion for countries like Korea.⁶¹⁾ Furthermore the R&D investments of the private sector in Korea increased to USD 12.2 billion compared to USD 28 million back in 1970 and the growth rate of R&D spending per gross domestic product (GDP) is the highest in the world. The result of these massive investments in the development of knowledge and thus intangible assets is visible in its intense global patenting activities. After a continuous rise, Korea entered the 6th position of US patent applications in 1999 with 3,679. The Korean firm Samsung Electronics was ranked 4th in US patent applications right behind major players like IBM, NEC and Canon.

Even at company level, the dimensions of the knowledge economy are considerable. Besides the increase in importance of intellectual property subjectively perceived by management,⁶²⁾ empirical studies repeatedly come to the conclusion that company investment in intangible resources makes it possible to achieve returns that are far above average.⁶³⁾ The change in

entrepreneurship and venture businesses in redefining the value of intellectual property in Japan, in TAPLIN, VALUING INTELLECTUAL PROPERTY IN JAPAN, BRITAIN AND THE UNITED STATES 33-45 (London: 2004).

59) HARHOFF, INNOVATIONEN UND WETTBEWERBPOLITIK – ANSÄTZE ZUR ÖKONOMISCHEN ANALYSE DES PATENTSYSTEMS, PRESENTATION AT THE ANNIVERSARY EVENT “30 YEARS OF THE MONOPOLY COMMISSION” (Berlin: 5.11.2004); Schankerman, *How valuable is patent protection? Estimates by technology field*, 29-1 RAND JOURNAL OF ECONOMICS 77-107 (1998).

60) Here and in the following Linsu Kim, *Technology Transfer and Intellectual Property Rights: the Korean Experience* 6, available at www.ictsd.org.

61) Hoeckman/Maskus/Saggi, *Transfer of Technology to Developing Countries* 5 (World Bank Policy research Paper 3332, 2004).

62) *The Economist Intelligence Unit: The value of knowledge*, THE ECONOMIST 4 (London: 2007).

importance can also be deduced from the increasing proportion of intangible assets in the total assets of the company.⁶⁴⁾ Across all sectors, this is on average around 50%.⁶⁵⁾ In summary, the following is stated to describe the change in importance: “it is not rare for ... trademarks, licenses, patents ... to be put forward as central components with regard to defining the value of a company.”⁶⁶⁾ The inventors of the “balanced scorecard,” *Kaplan* and *Norton*, sum up the importance of intangible assets for the company as follows: “Anyone who is able to measure the benefit of intangible assets has found the holy grail of accounting.”⁶⁷⁾

III. Management of Intellectual Property

Positive correlations between the success of the company and the existence and exploitation of intellectual property within the company were shown in case studies⁶⁸⁾ and initial findings also exist on an empirical, econometric basis.⁶⁹⁾ Even industry representatives themselves consider the relevance of IP for the success of a company to be increasingly important.⁷⁰⁾ The insight that intangible assets are an important factor for success means that there is a

63) See Wurzer/Reinhardt, *Bewertung technischer Schutzrechte*, Chapter 1, paragraph 77 and citations therein.

64) LEV, *INTANGIBLES, MANAGEMENT, MEASUREMENT, AND REPORTING* 9 (Washington, D.C.: 2001).

65) Various studies arrive at this result in various ways; cf. inter alia, LEV: *INTANGIBLES, MANAGEMENT, MEASUREMENT, AND REPORTING* 9 ff (Washington, D.C.: 2001); Ballow et al., *ACCENTURE INSTITUTE FOR HIGH PERFORMANCE BUSINESS, A NEW PARADIGM FOR MANAGING SHAREHOLDER VALUE* 6-7 (Wellesley: 2004).

66) Küting/Dürr, “Intangibles” in der deutschen Bilanzierungspraxis, 1 *StuB* 1-5 (2003), with reference to KÜTING, *BILANZIERUNG UND BILANZANALYSE AM NEUEN MARKT* 463 (Stuttgart: 2001).

67) Kaplan/Norton, *Measuring the strategic readiness of intangible assets*, 02 *HARVARD BUSINESS REVIEW* 52-63 (2004).

68) See Wurzer/Kaiser, *Patente, Produkte und Profite*, 03 *HARVARD BUSINESS MANAGER* 23-35 (2006); RIVETTE/KLINE, *REMBRANDT IN THE ATTIC* 8-10 (Boston, Mass.: 2000).

69) DAVIS/HARRISON, *EDISON IN THE BOARDROOM* 73 (New York et al.: 2001); BOSWORTH/WEBSTER, *THE MANAGEMENT OF INTELLECTUAL PROPERTY* 111-248 (Cheltenham: 2006); Ernst, *Patent applications and subsequent changes of performance: evidence from time-series cross-section analyses on the firm level*, 30 *Research Policy* 143-157 (2001).

70) *The Economist Intelligence Unit: The value of knowledge*, *THE ECONOMIST* 5 (London: 2007); PWC, *UK INTELLECTUAL PROPERTY SURVEY* 1-8 (London: 2003).

demand for the systematic management of these assets.⁷¹⁾ The essential aspect of managing the company's intangible assets must be to systematically increase the success through investment in IP and the realization of the economic potential thereof.⁷²⁾

The orientation towards increasing value, as discussed in the previous section, leads to IP management focusing on optimizing the appropriation of innovation returns.⁷³⁾ This approach is characterized in particular in that the systematic realization of the economic potential of IP is possible only by access to sufficient and suitable complementary factors.⁷⁴⁾ Company assets are created only through the optimal interaction of exploitation strategy, complementary factors and intellectual property.⁷⁵⁾ This is why the value of IP is dependent on its respective context of complementary factors and the exploitation strategy.⁷⁶⁾ Since the adding of value in the knowledge economy runs along the basic mechanism via various separated subsystems, communication and the application of interdisciplinary approaches and methods in IP management is vital. In other words, the IP manager should be able for example both, to describe to financial investors the IP-based competitive position of the company and to report to the management the present economic value of the intellectual property. To sum up, the essential characteristics for the management of IP are as follows:

- The aim of IP management is to systematically increase the success of

71) Lev, *Sharpening the Intangibles Edge*, 6 HARVARD BUSINESS REVIEW 109-116 (2004); AL-ALI, COMPREHENSIVE INTELLECTUAL CAPITAL MANAGEMENT 7 (Hoboken, NJ: 2003).

72) See PETRUSSON, INTELLECTUAL PROPERTY & ENTREPRENEURSHIP, CREATING WEALTH IN AN INTELLECTUAL VALUE CHAIN 1-3 (Göteborg: 2004); WURZER/REINHARDT, BEWERTUNG TECHNISCHER SCHUTZRECHTE 36 paragraphs 122 (Köln et al.: 2006).

73) See PITKETHLY, WIPO, COMMERCIALIZATION OF INTELLECTUAL ASSETS; SYKES/KING, VALUATION AND EXPLOITATION OF INTELLECTUAL PROPERTY AND INTANGIBLE ASSETS 1-4 (Hertfordshire: 2003).

74) See Teece, *Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy*, 15 RESEARCH POLICY 285-305 (1986); Pitkethly, *Intellectual property strategy in Japanese and UK companies: patent licensing decisions and learning opportunities*, 30 RESEARCH POLICY 425-442 (2001).

75) Wurzer/Hundertmark, *Value-orientated IP management*, 15 INTELLECTUAL ASSET MANAGEMENT MAGAZINE 33-36 (2006); Iversen/Kaloudis, *IP-valuation as a tool to sustain innovation*, in BOSWORTH/WEBSTER, THE MANAGEMENT OF INTELLECTUAL PROPERTY 251 (Cheltenham: 2006).

76) WURZER/REINHARDT, BEWERTUNG TECHNISCHER SCHUTZRECHTE Chapter 3 paragraphs 397 (Cologne et al.: 2006).

the company, with this aim being incorporated in value-oriented company management.

- In order to achieve the aim, IP management is aimed towards optimizing the appropriation strategies and is thus operationalized.
- To this end, the skills must go beyond the administrative sector of intellectual property and must include access to the necessary complementary factors and the implementation of the appropriation strategies.
- For practical implementation of IP management, interdisciplinary communication and the use of respective approaches are necessary.

In implementing IP management, the specific economy of IP and intangible assets must be taken into account. An uncritical transfer of management concepts relating to tangible or financial assets has in some cases proved to be ineffective. One particular property of intangible assets which is relevant to management is their coupled risk structure. The individual influencing factors on the risks or opportunities of the asset are coupled to one another and lead to a greatly skewed value distribution.⁷⁷⁾ In other words, approximately 90% of the IP rights in a portfolio constitute only approximately 10% of its value, and approximately 90% of the value is represented by approximately 10% of the portfolio. IP management must take account of this specific opportunity and risk distribution in its reporting and controlling structures. Further economic properties which fundamentally distinguish IP management from the management of financial and tangible assets are the non-rivalry in consumption and the scalability of exploitation.⁷⁸⁾ In other words, the economic potential of intangible assets can be realized simultaneously in various use forms (e.g. internal production and the issuing of licenses) and the degree of exploitation thereof is not limited by the asset itself.⁷⁹⁾

77) Harhoff/Scherer/Vopel, *Citations, family size, opposition and the value of patent rights*, 32 RESEARCH POLICY 1343-1363 (2003); LEV, *INTANGIBLES, MANAGEMENT, MEASUREMENT, AND REPORTING* 38 (Washington, D.C.: 2001).

78) LEV, *INTANGIBLES, MANAGEMENT, MEASUREMENT, AND REPORTING* 21 (Washington, D.C.: 2001).

79) Wurzer/Hundertmark, *Value-orientated IP management*, 15 INTELLECTUAL ASSET MANAGEMENT MAGAZINE 33-36 (2006).

This set of properties means that the value-oriented management of IP is a fundamentally new challenge against the background of an interdisciplinary basic mechanism for adding value in the knowledge economy. The requirements placed on training for mastering the set tasks can be derived from this characterization of IP management.

IV. Requirements Placed on Training in IP Management

Based on what has been stated above it is clear that the challenge of IP management is not a cumulative further development of the legal system of industrial property protection, but that the knowledge economy requires experts for achieving tangible value of intangible assets. Various universities are meeting this demand from industry by providing new training courses.⁸⁰⁾ However, due to the disciplinary compartmentalization of the academic teaching, it is still difficult to provide interdisciplinary training: "Intellectual property lawyers need to know more about business, and business men and economists need to know more about intellectual property. Unfortunately, the education which both groups receive tends to be compartmentalised, so that most students are only partially equipped when they enter upon their careers."⁸¹⁾

Training in IP management is therefore in practice always postponed until after a first degree has been completed. The existing IP management training courses are designed as postgraduate courses and therefore take account of this existing training structure. The requirement spectrum presented above shows the significant demand for true interdisciplinarity in training. This goes beyond simply using tools or methods from the respective other disciplines. In order to operate successfully along the basic mechanism for generating wealth in the knowledge economy, it is necessary to understand the respective subsystems, in particular the communication and thought structures thereof. It is therefore not the mere use of tools that is required, but rather the

80) <http://www.cip.chalmers.se>; <http://www.miplc.de>; <http://www.ceipi.edu>; <http://www.ipacademy.com.sg>.

81) Kingstan, *Unlocking the Potential of Intellectual Property*, in *ECONOMICS, LAW AND INTELLECTUAL PROPERTY* 327 (Granstrand ed., London et al.: 2003).

interdisciplinary integration of knowledge from various disciplines. A “knowledge worker” as defined by *Drucker*⁸²⁾ therefore has to be capable of systematically increasing the value of the intangible assets of the company.

The range of interdisciplinary knowledge, methods and necessary tools for successfully mastering the tasks set in IP management will develop on an increasingly concrete basis in the coming years. From the present perspective, as discussed above, it appears to be particularly relevant to take account of a basis which builds on legal, economic and management-based knowledge. The core terms for the most important fields of IP management are therefore: strategy, decision-making, implementation, organization, management and business development. From the present point of view of optimizing appropriation strategies, these functions appear to correlate particularly well with success. With the further analysis of individual cases and broader empirical studies, the success factors will be able to be specified in more detail. However, IP management remains a practical field of activity on a global basis, and the economic foundation is just as important as close contact to obtain practical experience, in the same way as for the management discipline in general: “Management is not a discipline which should draw its impulses only or primarily from theoretical research. The complementary nature of inductive experience-based knowledge and deductive research-based knowledge could significantly move the discipline forward.”⁸³⁾

V. IP Management as an Emergent Phenomenon: Challenge and Opportunity

The knowledge economy offers special opportunities for the future. Asia as a region can also benefit from the economic changes by evolving from an industry- and production-based economy to a knowledge-based economy. The important thing is to accept that these changes are associated with fundamental adaptation processes in the economic context of valuable assets in companies. The global challenge becomes greater due to the “invisibility” of

82) DRUCKER, WHAT IS MANAGEMENT? 229 (3rd ed., 2001, Munich: 2001).

83) Simon, *foreword*, in DRUCKER, WHAT IS MANAGEMENT? 11 (3rd ed., 2001).

the assets, from their fundamentally different economic behavior compared to tangible or financial assets, and from the intrinsic multidisciplinary of adding value due to the various independent subsystems in the basic mechanism of the knowledge economy. The reaction of companies to these changes is to develop complex appropriation strategies in order to generate an economic advantage from the investment in new knowledge.

In conclusion, this new field of work can be defined as the main content of IP management. It is not a sub-discipline of any of the disciplines concerned, but rather is a new, emergent phenomenon as defined by Luhmann, i.e. the appearance of a qualitatively new order, the properties of which cannot be fully explained based on the properties of the substructure or the specialist disciplines involved. The direct result of this is the opportunity to explain the management of IP not through a “rearview mirror” as a continuation of what is already known, but rather to present it as something which is fundamentally new and open and future-oriented.⁸⁴⁾

84) POSTMAN, *AMUSING OURSELVES TO DEATH, WITH REFERENCE TO MCLUHAN 106* (17th ed., Frankfurt/M., 2006).