Chapter 1

From Intellectual Property to Intellectual Capitalism

Chapter contents:

1.1 Introduction

Undoubtedly you are now reading the beginning of this book. Hopefully you have started to read it with the curiosity to see whether you will learn something, making it worthwhile to continue reading. In other words, you are now judging whether your private intellectual capital will be increased sufficiently to justify your reading effort, given the alternative to read or do something else. You would probably not use such words, and you would probably protest if you were described as an intellectual capitalist just because you were considering investment in a book. Nevertheless, the underlying notion of personal value from knowledge and learning is presumably at hand. There is nothing new or special in that notion. What, then, is new or special about the concepts of intellectual capital, intellectual capitalists and intellectual capitalism? The following citation is sobering in the current vogueness of these concepts:

> 'The present state of the nations is the result of the accumulation of all discoveries, inventions, improvements, perfections and exertions of all generations which have lived before us: they form the intellectual capital of the present human race, and every separate nation is productive only in the proportion in which it has known how to appropriate those attainments of former generations and to increase them by its own acquirements.'
>
> (List 1841, p. 113 as cited in Freeman and Soete 1997, pp. 296-297.)

1.2 Purpose

The broad purpose of the book is to present thoughts and ideas about a general, global transition into what can be called intellectual capitalism, some elements of which have always been with us. The more narrow purpose is to present a study of intellectual property and its economics and management in large, technology-based corporations. Technology-based corporations can be seen as perhaps the most important drivers of intellectual capitalism, although not the only ones. Regarding intellectual property much is known about the USA but

less about Japan. However, Japan is in fact on the frontier with respect to the management of intellectual property. Being poor in natural resources, Japan also has had every reason to develop her intellectual capital base, which she has been doing with surprising speed and effect.

This book is also a serious attempt to raise and merge the various interests in intellectual property and capital among managers, economists, engineers, and lawyers – practitioners as well as students and scholars. As a consequence of this ambition, interdisciplinary breadth and understanding has been preferred to disciplinary depth. A better interdisciplinary understanding of intellectual property and capital is deeply needed as the interests in this topic rapidly grow in various directions and quarters. Hopefully, this book can contribute to building bridges between different disciplines and contribute to our joint understanding of this complex issue. Besides presenting research results in an accessible way, the book therefore also paints on a broad canvas, giving the history and fundamentals of the field, as well as a textbook introduction to it. Basic concepts and terminology, like technology, intellectual property and intellectual capital, are dealt with in various places, starting in Section 2.2, and a glossary is provided at the end.

1.3 Background

Undoubtedly we are now in an on-going transition to a more knowledge-based society, or information society, as shown by many indicators and recognized by many authors. We spend an increasing share of our lives on learning. Products and services have become increasingly information-intensive, firms have become increasingly dependent upon competencies of diverse kinds, and investments increasingly have become intangible in character and so forth. This has been going on for a long time, but it seems that the decades surrounding the new millennium are a turning point in the sense that information, knowledge – whatever we want to call it – is becoming dominant by various measures.

This transition is not due to chance or some outside force or major event but instead it is the historical consequence of cumulative learning by generations of individuals and the willingness of Mother Nature to reveal herself to inquirers. Of course many factors may give twists and turns to this collective learning process, but essentially it is an irreversible process of accumulation, apart from major catastrophe, that will continue until limits of some kind – physical, economic, behavioral – are reached. So far, there is actually nothing new or surprising about this, and in fact this point should be emphasized. We have been aware of this evolutionary process for a long time. Naturally, the emphasis given to its various features and factors could differ. In this work, the role of the economic, management and technology factors will be emphasized.

Does a knowledge-society have to be capitalistic in some sense? Not necessarily. There is a widespread notion in the West and the East that knowledge by and large is and should be a publicly accessible good. Knowledge has properties that make it difficult to privatize in the same way as physical goods. Nevertheless, knowledge and information have been subjected to private control or restrictions in various ways historically, with or without capitalism. A good example is military information. Indeed, it will be argued in this work that various factors strengthen the possibility to control knowledge and information for private gain by individuals and groups, including firms. This occurs to such an extent that in the course of the accumulation of knowledge a kind of knowledge based capitalism emerges, or intellectual capitalism in the terminology proposed here. Firms and their management capabilities play an important role in this process, as does international competition and technology. In particular, information and communication technologies play a decisive role. Legal institutions and national interests also play a key role. After the downfall of the Soviet Union and the politico-economic system associated with it, traditional capitalist economic institutions such as markets, firms and private property rights have become dominant in the world since the 1990s. Moreover, the frontiers of capitalism – geographic and legal – are being advanced without any strong, competing economic ideology at present.

In summary we may point to the following background trends of general relevance: a) growth and accumulation of science and technology (S&T) that is offering economic benefits but at the same time becoming increasingly complex, diversified and expensive and controlled by private firms, especially large ones; b) relative shifting of material (physical) to immaterial (non-physical) sources of economic growth; c) strengthening of capitalism as an ideology and deployed economic order. d) internationalization and globalization; e) emergence of a multi-polar world that is politically, economically and managerially increasingly complex and f) emergence on a large scale of new information and communication technologies, referred to here as infocom technologies or ICTs for short.

1.4 Introduction to Intellectual Property

One specific economic institution, even older than capitalist industrial society itself, is the system of intellectual property rights (IPRs), covering not only patents but also trademarks, trade secrets, copyrights, designs and artistic works. The intellectual property rights system has historically not been considered a strong and important element of traditional capitalism. However, in the 1980s, the patent system became significantly strengthened in the USA and a so-called “pro-patent” era emerged for various reasons, one being the concern that US industry had difficulties in protecting and exploiting its R&D investments in view of the competitive successes of several Asian economies, Japan in particular. This development can be seen as an important symptom of the transition towards intellectual capitalism, and it has focused wide attention upon patents, intellectual property rights and intellectual capital matters in general (see IVA 1993).

1.4.1 The “Pro-Patent Era”

In order for a capitalistic economic system to operate properly, it is of decisive importance that markets for labor, capital, products, services, etc. are functioning. However, markets for

ideas, knowledge, information and intellectual products in general have difficulties to function in principle (see further Chapter 2). It is basically very difficult to sell an idea without disclosing it in a way that others can essentially use it without paying properly. From society's point of view, an underinvestment in creative work and knowledge production may then result, since creators and innovators do not get sufficiently rewarded by profits from selling their creations on the market. To compensate for the deficient functioning of such markets, technology markets in particular, a system of intellectual property rights (with patents, trademarks, trade secrets, copyrights, design rights, etc.) has been created by society.

Patents are granted as a temporary monopoly right which function as an incentive both for disclosure of technical information and for investments in generating and diffusing marketable technical inventions – granted then as an attempt to improve the efficiency of the capitalist economic system (see further Chapter 3)[1]. Alternative government policy measures for similar purposes may work more one-sidedly, e.g. public technology procurement that strengthens demand, or R&D tax deduction schemes that reduce the cost of supplying R&D. Such policy measures are usually nationally oriented and may have strong or weak effects. Until the 1980s, the patent system had been considered by industry to have weak economic effects on a broad average (chemicals and pharmaceuticals being one exception), resulting in weak management attention. In 1982 a new court (CAFC), specialized in patents, was created in the USA. At roughly the same time, but by and large for independent reasons, US antitrust policies changed in favor of strengthening the enforcement of patent rights. In parallel, US industry and US politicians started to push forcefully for a general strengthening of the IP system. A new era thus emerged, referred to as the "pro-patent era", for various reasons and with far-reaching consequences (see further Chapters 2 and 5).

[1] More specifically, patents constitute law-enforceable, restricted exclusive rights that are granted to inventors when their applications are approved by national patent offices. Patents are granted for any technical invention that is novel to the world, non-obvious to someone skilled in the relevant art, and prospectively useful or at least not considered harmful to society. Patents are granted in exchange for disclosure by the inventor of information sufficient to enable others to imitate the invention in principle (see further Chapter 3), plus administration fees.

The economics and management of intellectual property on the whole (thus including patents, trademarks, trade secrets, copyrights, etc.) have then changed considerably since the early 1980s. Both the use and abuse of the patent and litigation systems increased, and prompted the eruption in the mid-to-late 1980s of what some people referred to as “patent wars,” notably between the USA and Japan.

The importance of patents as a means for a company to exploit new technologies has increased, as have the resources companies devote to IP protection. Patenting and licensing have become more strategically managed, including a shift to more offensive rather than defensive patenting (see further Chapters 6 and 7). Several US and many Japanese companies have been particularly active in building up patent portfolios and cumulating skills in using the patent system, including using patent information for technology and competitor intelligence (see further Chapters 7, 8 and 9). Table 1.1 shows how Japanese large corporations have consistently dominated the list of top ten corporations in terms of the number of US patents granted.

Table 1.1 The top ten corporations in terms of number of US patents granted

(Source: Compiled from USPTO statistics)

Rank	1987	No.	1989	No.	1992	No.	1995	No.	1997	No.
1	Canon	847	Hitachi	1053	Toshiba	1156	IBM	1383	IBM	1742
2	Hitachi	845	Toshiba	961	Hitachi	1139	Canon	1087	Canon	1381
3	Toshiba	823	Canon	949	Mitsubishi El.	959	Motorola	1012	NEC	1101
4	General El.	779	Fuji Photo	884	General El.	923	NEC	1005	Motorola	1065
5	US Philips	687	General El.	818	EastmanKodak	887	Mitsubishi El.	973	Mitsubishi El.	925
6	Westinghouse	652	Mitsubishi El.	767	General Mot.	863	Toshiba	969	Hitachi	922
7	IBM	591	US Philips	745	Canon	828	Hitachi	910	Fujitsu	909
8	Siemens	539	Siemens	656	Fuji Photo	742	Matsushita El.	854	Toshiba	891
9	Mitsubishi El.	518	IBM	623	IBM	680	EastmanKodak	772	Sony	867
10	RCA	504	EastmanKodak	589	Motorola	631	General El.	758	EastmanKodak	795

For the years shown, the highest ranked corporations on the aggregate in descending order are Canon, Hitachi, Toshiba, IBM and Mitsubishi Electric. The European corporations Philips and Siemens have dropped out entirely. IBM has made the most remarkable comeback, and Motorola and NEC have entered the top.

1.4.2 The Rising Value of Intellectual Property

During the emergence of the pro-patent era of the 1980s, the economic value of patents increased in various ways. The probability of winning a court case as a patent holder increased, as did the patent damage claims. From being a relatively minor business issue on average, patents started to gain significance. Table 1.2 gives an illustration of this.

Table 1.2 Largest patent infringement damages in the USA (up to 1995)

Patent right holder [1] (nationality, size)	Damages[2] (MUSD)	Infringer (nationality, size)	Year	Remarks
Litton (US, large)	$ 1,200	Honeywell (US, large)	1995	A
Polaroid Corp. (US, large)	$ 873.2	Eastman Kodak (US, large)	1991	B
Alpex Computer Corp. (US, small)	$ 253	Nintendo (Japan, large)	1994	C
Smith International, Inc. (US, medium)	$ 204	Hughes Tool Co. (US, large)	1986	D
Honeywell (US, large)	$ 166	Minolta (Japan, large)	1994	E
Stac Electronics (US, small)	$ 120	Microsoft (US, large)	1994	F
Hughes Aircraft (US, large)	$ 114	United States	1994	G
3M (US, large)	$ 106	Johnson & Johnson (US, large)	1991	H
Lubrizol I Corp. (US, large)	$ 86	Exxon Corp. (US, large)	1988	I
Pfizer, Inc. (US, large)	$ 55.8	International Rectifier (US, large)	1983	J
Shiley, Inc. (US, large)	$ 44.8	Bentley Labs (US, large)	1985	K
Jan R. Coyle (US, individual)	$ 43	Sega Corp. (Japan, large)	1992	L
B&H Manufacturing (US, medium)	$ 36.5	Owens-Illinois Glass (US, large)	1991	M
Syntex (US, medium)	$ 36.5	Paragon Optical (US, medium)	1987	N
Trans-World Manufacturing (US, medium)	$ 31.3	Dura Corp & Kiddie (US, medium)	1986	O

Notes:

1) Courts have increasingly ruled in favor of the patent right holder during the past 15 years. A patent right holder's probability of winning an infringement lawsuit in the USA has increased from 30% prior to 1982 to 89% after 1982 (see Sirilla et al. 1992).

2) Excluding legal fees. These typically run between 0.5–5 MSEK with some extreme cases like Texas Instruments, believed to have spent over 10 MSEK in its litigation over DRAMs, involving 347 lawyers and 29 law firms. TI's Japanese opponents were believed to have spent nearly 100 MSEK in preparing their defense (The American Lawyer, March 1992, p.56).

Remarks:

A. Following the jury's verdict awarding Litton $1.2 billion in Aug. 1993, Honeywell filed a motion to set aside the jury's verdict, which was granted by Judge Mariana Pfaelzer on Jan. 4, 1995. Litton v. Honeywell, CV-90-4823 MRP (C.D. Calif. 1995). Thus, Honeywell prevailed in spite of the jury's verdict.

B. Polaroid Corp. v. Eastman Kodak, 17 USPQ2d 1711 (1991). The total cost for Kodak is higher since Kodak also paid voluntary damages to customers, in addition to the damages awarded to Polaroid.

C. Alpex Computer Corp. v. Nintendo, 86 Civ. 1749 (SDNY: 1994).

D. Smith International, Inc. v. Hughes Tool Co., 229 USPQ 81 (1986).

E. Honeywell v. Minolta. The Nikkei Weekly, Sept., 5, 1994, p. 1.

F. Stac Electronics v. Microsoft. Legal Times, Am. Lawyer Newspaper Group, Dec. 19, 1994, p. 11.

G. Hughes v. US. Corporate Legal Times, Oct. 1994, p. 1.
The article states that this may be the largest patent infringement judgment against the US government.

H. 3M v. Johnson & Johnson, 22 USPQ2d 1401 (1991).

I. This case settled out of court. Research & Development, Dec. 1988, vol. 30, No. 12, p. 16.

J. Pfizer, Inc. v. International Rectifier Corp., 218 USPQ 586 (1983).

K. Shiley, Inc. v. Bentley Laboratories, Inc., 225 USPQ 1013 (1985).

L. Article states this is one of the largest patent infringement awards for a single individual. A federal jury in Los Angeles had awarded Mr. Coyle $ 33 million in damages, but Sega settled for the higher amount because the court found the infringement was intentional and the award could have been trebled. The National Law Journal, August 10, 1992, p. 1.

M. B&H Manufacturing Inc. v. Owens-Illinois Glass Container, Inc., 22 USPQ2d 1551 (1991).

N. Syntex, Inc. v. Paragon Optical, Inc. (& Wilsa, Inc.), 7 USPQ2d 1001 (1987).

O. Trans-World Manufacturing Co., Inc. v. Dura Corp. and Kiddie, 229 USPQ 525 (1986).

Not only patents have increased in value and sometimes reached astonishingly high levels. Table 1.3 gives examples of how high monetary values are also attached to trademarks.[2] Although the valuations are very uncertain, the table still illustrates the possible magnitude of intellectual capital in the form of trademarks. As seen from the table the total value of the eight highest valued trademarks in 1992 amounts to 132 BUSD, which is in the range of GDP for a small country. As noted in the table trademark values typically increase if not mis-managed. The value of know-how, trade secrets and knowledge in form of human capital in general is also difficult to measure, but as we shall see in section 1.5 and further in Chapter 10 there are indications that such values have increased as well.

As the values associated to the market exploitation of intellectual properties increase, the need to foster and manage the development of these creations as well as protect their rights on an international market grows proportionately. In response to the realization of the importance of intellectual property in today's global market, different strategies have been deployed in order to reap the benefits. However, individuals, corporations, nations, and society all have different goals regarding IP. The value of intellectual property is indisputable in the context of the present IPR system and capitalist market, but who should benefit from this value and what are the most effective methods to do so? Maybe the system should be changed or abolished, but what would take its place? This book will elaborate on these very issues.

[2] A similar list of the most highly valued patents in the world is not readily available. Such a list would most likely include the patents behind the top selling pharmaceuticals. The best selling pharmaceutical worldwide in 1997 was the ulcer drug Losec, developed and patented by the pharmaceutical company Astra in 1978. Astra management has estimated the (discounted to 1978) value of the basic patent to fall in the range 15–30 BUSD, that is of the same magnitude as the most highly valued brand names.

Table 1.3 World's most highly valued trademarks[1)]

Source: Financial World (1993, 1996)

Rank	Trademark	1992 Value (BUSD)	Rank	1995 Value (BUSD)
1	Marlboro	39.47	1	44.6
2	Coca-Cola	33.45	2	43.4
3	Intel	17.81	10	10.5
4	Kellogg	9.68	7	11.4
5	Nescafe	9.17	9	10.5
6	Budweiser	8.24	8	14
7	Pepsi-Cola	7.50	14	8.9
8	Gillette	7.15	11	10.3

Notes:

[1)] Valuation of trademarks may be done in several, mostly subjective ways, all of which produce uncertain results. (For an overview, see Aaker 1996. See also chapter 7). The astounding magnitudes of trademark values do not result from valuation errors although the precise figures in the table may be in error. Trademarks may be kept valid permanently, and their value is built up over time through various means, primarily through advertising and positive exposure to consumers. They are thereby subjected to increasing returns or cumulative advantages, although volatile. Thus old, consistently well-managed trademarks for consumer mass markets could be expected to accumulate the highest values. This is also shown in the table although there are exceptions like Intel, being a relatively young company with a component product. The volatility as well as the consistency of value rankings are also shown in the table. The dominance of US trademarks is noteworthy. The most valuable Japanese trademark is Sony, valued to 8.8 BUSD in 1995, and thereby ranking 15.

1.5 The Emergence of Intellectual Capitalism

Intellectual capital has always existed. Individuals and groups have been able to differentiate themselves from their neighbors or their enemies using their superior intellect since the beginning of time. No doubt that some cavemen were better at hunting, fighting, or drawing on the walls, and these qualities surely imparted prestige that differentiated them from the others. No doubt that the Inca tribes of South America were surprised when their bronze arrowheads bounced off the steel breastplates of their Spanish visitors. The “Blitzkrieg” and the Atom bomb used in World War II were deadly combinations of both strategy and technology employed to substitute for sheer numbers and equipment. Size of a population matters but within limits. Technology and intellectual capital allows one to do more with less. It is only natural that modern corporations have now found that intellectual capital can be used as leverage in the marketplace. Advances in knowledge have always made life easier, now they also make work more profitable. Today’s companies trade brawn for brains and value information over infrastructure as they face down global competition.

The accumulation and use of intellectual capital has led to the creation of intellectual capitalism as a viable economic system that displaces the dependency on traditional tangible fixed assets as a means for commercial success. The days when land, factories, machines, natural resources, and unskilled labor ruled the valley like giant dinosaurs have given way to the knowledge warrior, nimble and unencumbered by the dead weight of corporate equity. Now corporations and nations, such as Japan, who also lack the sheer physical resources to overwhelm their competition, have turned to the use of intellectual capital (IC) as a means to win the marketplace. These corporate intellectual capitalists (e.g. Microsoft, Coca-Cola, Intel, Astra, Merck, Canon, Sony, etc.) are able to create enormous market value based primarily on their intangible assets, which includes corporate know-how, customer loyalty, distribution networks, intellectual property, etc.

One rough way to look at the level of intangible assets or intellectual capital in firms is

to compare their tangible assets or equity with the market value[3] of the company. Table 1.4 indicates that each of the ten most valued companies in the world possesses more intangible or intellectual capital than tangible capital. Calculating the market-to-book ratio[4] for each company gives a rough indication which companies are highly reliant on their intellectual capital. Those companies with very high ratios of intangible to tangible capital could be called pure IC (intellectual capital) companies while those with intermediate values are hybrid IC companies. There are indications that the IC component of corporate assets is increasing in absolute as well as in relative terms (see further Section 10.3).

Taking the comparisons one step further, we can look at the ratio between intangible assets and the number of employees. Not only do Microsoft and Coca-Cola produce high profits and tremendous market value with very little physical capital investment, but they do so also with a relatively small number of employees. This is consistent with the view that IC to varying degrees is more than just human capital. Personnel is not necessarily a company's largest asset, not even for an IC company.

The top IC companies in Table 1.4 are very R&D intensive, except for Coca-Cola. One should moreover note that intellectual capitalism also penetrates companies such as Shell,

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[3] Market values are collective subjective measurements based on continuously changing external valuations of a company's stock. According to our rough formulation, a short run reduction in market value translates to a reduction in intangible assets or intellectual capital as equity is fixed in the short run. This is not an accurate depiction of reality as the amount of intellectual capital becomes too dependent on factors such as the volatility and well-functioning of financial markets. Thus these calculations provide only rough estimates for comparative purposes.

[4] Market-to-book ratios were calculated simply by dividing the market value by the company's equity. Such a ratio is related to Tobin's q-value, which is the ratio of the market value of a firm's assets to the replacement costs of the firm's assets, where it is customary to calculate replacement costs only for tangible assets. Measuring intellectual capital in this way should be treated with much caution since it depends on the well-functioning of both financial markets and accounting procedures. In fact, measuring intellectual capital as the difference between market value and book value means measuring a residual that contains more than what we would like to call intellectual capital, as well as components of IC may enter into the book value. As measurement techniques develop this residual will be disentangled, just as the original measurement of technology as a residual has developed,(see Griliches 1996). For an overview of studies of market values and intangible capital especially R&D, see Hall (1998).

which are traditionally looked upon as raw material based but are becoming increasingly technology based. IC can be created and leveraged in many different ways. The technology-based firm (TBF) is a special type of an IC firm that uses R&D as a main vehicle to reap the rewards of knowledge. Increasingly, these companies invest more in technology and other intangible assets than in physical assets. In Kodama's words (Kodama, 1994), Japanese TBF's (Hitachi, NEC, Canon, Toshiba, etc.) are no longer primarily in manufacturing industries but are instead in primarily development companies in R&D industries. Viewing what we can call the Kodama ratios in Table 1.4, one can see which firms are oriented more towards research than manufacturing or other capital-intensive activities. Effective management of intellectual property, especially patenting and trade secrets, is very important to the survival of these technology-based firms. This type of firm will be discussed theoretically in Chapter 4 and empirically in Chapters 5 through 9.

The world's large TBF's today control the lion share of the world's technology as generators and cumulators of technology.[5] Technology in turn could be considered a main, if not the main, driver of intellectual capitalism. Particularly, new information and communication technologies speed up the transition to intellectual capitalism. There are moreover no signs of vanishing technological and business opportunities. Mother Nature continues to reveal herself but to a new breed of intellectual explorers and capitalists and at an increasing cost. The roots of knowledge may be bitter but the fruits are sweet.

Hopefully, that will hold true for this book as well.

[5] See Patel and Pavitt (1995). Their control of the world's science is also increasing.

Table 1.4 Intellectual capital in the world's most valued companies[1)]

Company	Market Value[2)]	Profit Margin[3)]	Equity	Intellectual Capital[4)]	MTB ratio[5)]	Sales	R&D[7)]	R&D Intensity	IC per Employee	Kodama ratio[6)]
General Electric	222 748	12.3%	34 438	188 310	6.5	90 840	1 891	2.1%	0.9	0.23
Royal Dutch/Shell	191 002	8.9%	76 639	114 363	2.5	171 657	701	0.4%	1.1	0.06
Microsoft Corp	159 660	46.8%	10 777	148 883	14.8	11 358	1 925	16.9%	6.7	3.86
Exxon Corp	157 970	9.3%	43 660	114 310	3.6	137 242	529	0.4%	1.4	0.07
Coca-Cola	151 288	32.1%	7 311	143 977	20.7	18 868	NA	NA	4.8	NA
Intel Corp	150 838	42.5%	19 295	131 543	7.8	25 070	2 347	9.4%	2.1	0.52
Nippon T&T	146 139	5.9%	43 068	103 071	3.4	71 143	2 649	3.7%	0.4	0.11
Merck	120 757	27.3%	12 614	108 143	9.6	23 637	1 684	7.1%	2.0	1.16
Toyota Motor Co.	116 585	5.8%	45 781	70 804	2.5	98 741	3 200	3.2%	0.7	0.68
Novartis	104 468	26.5%	22 432	82 036	4.7	26 098	3 091	11.8%	0.9	2.40

Notes:

1) All monetary values are in MUSD. Company information was found in their respective 1997 annual reports.

2) Source: Financial Times (1997)

3) Gross profit before taxes

4) For the basis of comparison, the market value of intangible assets has been set equal to the company's intellectual capital as a first approximation. For related approaches, see e.g. Sveiby (1989, 1997) and Stewart (1997).

5) The Market-to-book ratio was calculated by dividing the company's market value by its equity.

6) The Kodama ratio was calculated by dividing a company's R&D expenditures by its capital investments (accounted for outside R&D).

7) R&D figures for Coca-Cola are confidential, as is the recipe.

1.6 Book Outline

This book is geared to a general public with an interest in intellectual property and its wider context of capitalism. Three groups of readers should be most concerned – practitioners in industry and government, scholars in academia, and students of engineering, management, law and economics. As this is a large and heterogeneous audience, the chapters will be of varying appeal to different types of readers.

Chapter 1 has described a fundamental shift of the overall economic system towards what can be called intellectual capitalism. The topic of patents and intellectual property has then been placed in that context. Various indicators of intellectual capitalism and the rising value of intellectual capital have also been presented, and more along these lines will be presented in Chapter 10. The book is outlined below and the next section describes the research basis of the book.

Chapter 2 gives as broad as possible an overview of the history and philosophy of IP, which is relevant for academics and for all those interested in more fundamental issues. The chapter is also important for the general discussion in the final chapter.

Chapter 3 provides an introduction to the IP field, mainly for non-specialist practitioners and students, as well as some introductory IP theory, mainly for academics and students.

Chapter 4 establishes, mainly for academics and students, a frame of reference for IP in the technology-based firm, thereby setting the stage for the subsequent empirical chapters. The technology-based firm is also a key actor in intellectual capitalism, and thus the chapter is relevant to the concluding discussion in the final chapter.

Chapter 5 describes the history of the patent system in Japan together with an introduction to contemporary patenting in Japanese industry. The chapter summarizes some of the recognized trends regarding patenting and presents some findings regarding the quantity and quality of Japanese patenting.

Chapters 6 and 7 examine findings at the corporate level regarding technology strategies and IP strategies. These chapters are aimed at practitioners, academics and students with a management and business economics perspective. Empirical results are presented in a detailed and transparent way.

Chapter 8 looks at IP organizational structure (in contrast to strategy) and IP management from a perspective similar to that in Chapters 6 and 7. The possible evolution of IP management towards a distributed intellectual capital management is explored as well.

Chapter 9 presents how patent information can be used in technology intelligence in general. The patent mapping methods used in Japan are specially illustrated.

Being the final chapter, Chapter 10 returns to the broad perspective introduced in Chapter 1. The earlier findings are discussed in the context of emerging intellectual capitalism as a synthesizing theme. Such a form of capitalism may not prove to be terminal, which justifies some final speculation about the future of intellectual capitalism.

Finally, the appendices give a simple bench-mark illustration, as well as questionnaires, which could be used as a diagnostic instrument. A glossary is also included.

1.7 Research Basis

Various studies over the years have contributed to the research basis of this book. An interview study of technology protection and technology scanning in a dozen large US corporations (e.g. General Electric, Honeywell, ITT, Monsanto, Motorola, 3M, Pfizer, RCA, Xerox) was conducted in 1985–86 and followed up by a similar study in Sweden. However, these studies are not particularly reported here but instead served as background information from which several inputs to later studies were provided.

The original core study for this book is a study of patenting and IP matters for the Royal Swedish Academy of Engineering Sciences (IVA), initiated by the Swedish Patent Office and

conducted in 1992–1993. The study was designed as a general comparison between Sweden and several other countries at the aggregate level and between Sweden and Japan in particular at the corporate level. In addition, four technological areas, which contained major new Swedish technologies with or without domestic technology exploitation, were studied. For these three levels of comparative study – national, corporate, and technology levels – data were collected from international patent statistics, a unique in-depth questionnaire sent to about 50 large Japanese and Swedish multinationals, and case studies of best-practice companies as well as case studies of four technological areas, using interviews. Table 1.5 summarizes the overall design of this study. Details of the survey study and the company case interview study are found in Appendix B and C. The chief results of the comparative study of Sweden and Japan are summarized in IVA (1993).

The material about Japanese IP management was most interesting and a subsequent broader interview based case study of Japanese corporations was conducted in 1994–95. This book mainly draws on the survey and case studies of the Japanese corporations. It is complemented by general material from the USA collected in 1995-96, especially regarding the developments in the USA from the early 1980s onwards as well as the special conditions in Silicon Valley, a frontier in IP related practices.

Table 1.5 Overall design of the main empirical study and purpose of sub-studies

Level of analysis	Data collection method		
	Public patent statistics	Survey questionnaire	Case interviews
1. National	Comparative analysis of rate, volume and quality of patenting in different countries and industries, using available data bases (WPI, EPO, Patolis, USPO, etc.)	-[1)]	-[1)]
2. Corporate	Comparative analysis of rate, volume, composition and quality of corporate patent portfolios in 2x22 major Japanese and Swedish corporations with a sub-sample of matched competitors[2)]	Analysis of IP activities and role of IP inside 25 + 20 large (Japanese and Swedish) corporations sample.[3)] Ca 400 question items	Analysis of best-practice IP management through corporate cases in Japan and Sweden (primarily Canon, Hitachi, Sony, Toshiba, ABB, Astra, Ericsson, Tetra Laval)[4)]
3. Technology	Analysis of major players and patenting activities in each technology case. (2x2 Swedish invention cases with/without domestic exploitation: beta-blockers (Astra), mobile telephony (Telia, Ericsson), ink jet printers (Canon), ferroelectric liquid crystals (Canon))	-[1)]	Analysis of the roles of IP and IP management in exploitation of the technologies for betablockers, mobile telephony, ink jet printers and ferroelectric liquid crystals

Notes:

1) No specific sub-study was designed with this combination of level of analysis and data collection method.

2) The sampling is described in Appendix A.

3) The sampling is described in Appendix B together with the survey questionnaire.

4) The general interview questionnaire is provided in Appendix C.