History of Patenting and IP Management - The case of Japan[1][2]

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Contents:

1 Outline

This paper addresses historical developments in the organization and management of Intellectual Property (IP) resources and activities in large Japanese corporations. Special attention will be paid to what can be called a patent culture in those corporations. Such corporate patent cultures have developed during a long period of time in connection with a process of catching up with the West as described in Granstrand (1999) and they were considerably strengthened in connection with a US initiated emergence of a pro-patent era internationally from the 1980s onwards. Increases in IP resources and various developments in IP organization and management in large Japanese corporations then took place, spurred not the least by the

[1] This article is an adaption and extension of material in Granstrand (1999), especially Chapter 2, 5 and 8.

[2] The editorial assistance of Jacob Moos is gratefully acknowledged.

outbreak of ”patent wars”, notably with large US corporations in the 1980s – 1990s as part of what has been referred to as the pro-patent era. Patent wars escalated in the following decades, especially in the electronics and mobile communications area, involving besides US and Japanese companies, large and small, also Korean and Chinese companies as well as European companies, who started to sue each other in a patent war with ultimately no clear national “frontiers”.[3]

Accordingly, IP resources increased substantially in Japan and elsewhere, and the IP organizations became upgraded, more centralized, more comprehensive, and moreover received increased attention by top management, technology management and business management. Apparently Japan, as a result of a successful catch-up and a pro-patent era, developed still another area of management in which Western companies had much to learn.

This paper finally briefly addresses the possible future development of IP management and the further evolution of corporate management. With the increasing role of intellectual property and intellectual capital and the further emergence of what we can call intellectual capitalism (see Granstrand (1999)), it is conceivable that some form of distributed intellectual capital management or knowledge management will develop, engulfing IP management.

2 Historical overview of world wide and Japanese patenting

> We have looked to see what nations are the greatest, so that we can be like them. We asked ourselves ”What is it that makes the United States such a great nation?” We investigated and found that it was patents, and we will have patents.
>
> K. Takahashi First Director General of Japan Patent Office (JPO), appointed 1885

The patent system is one of the world’s oldest economic institutions and its history can be subdivided into eras as illustrated in Table 1, where possible future eras are indicated as well. (The patent system in a global patent era might conceivably for instance be subjected to international disruption and even abolishment, at least partially.) As seen in Table 1 the patent system as we know it essentially originated in Europe and then diffused around the world. As far as we know no patent like systems appeared independently elsewhere, like in China or India or in any primitive societies, although more general IP notions as secrets and identity marks and symbols did.

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[3] The use of terms like ’war’ may appear as populist, but in fact military language and analogies may to some extent serve as useful metaphors in competitive and adversary contexts, and has in fact considerably influenced management language and thinking in general, as has sports language.

Table 1 Eras in the history of patents and intellectual property (IP)

Era	Characteristics
1. Non-patent era Ancient cultures (Egypt, Greece etc.)	Emergence of science separated from technology. Emergence of cultural and industrial arts. Secrecy and symbols emerging as recognized IP. No patent-like rights or institutions for technical inventions.
2. Pre-patent era Middle ages to Renaissance	Emergence of universities. Secrecy, copyright and symbols (artisan trademarks/names) as dominant IP, also collectively organized. Emerging schemes to grant privileges and remunerate disclosure. Extensions of mining laws to inventions.
3. National patent era Late 15th to late 18th century	Breakthrough of natural sciences. Local codifications of patent laws (Venice 1474, England 1623 etc.). Regulation of privileges. Conscious stimulation of technical progress at national level, linked to economic policies (e.g. mercantilistic).
4. Multinational patent era Late 18th to late 19th century	Emergence of modern nation-states. Industrialization. Continued international diffusion of the patent system. Local anti-patent movements. Emerging international patent relations (e.g. disputes).
5. International patent era Late 19th to late 20th century	Emerging industrial and military R&D. International coordination of IP (Paris Convention 1883, World Intellectual Property Organization (WIPO) 1970, Patent Cooperation Treaty (PCT) 1970, European Patent Convention (EPC) 1973 and establishment of the European Patent Office (EPO) 1977, etc.). Separate IP regimes in socialist countries and less-developed countries..
6. The pro-patent and emerging IC era Late 20th century to ?	Intellectual capital (IC) surpasses physical capital for many entities. Agreement on Trade-Related Aspects of IPRs (TRIPS) and establishment of the World Trade Organization (WTO) 1995. Intensified international competition. Global activism for IP from industrial countries, especially from the USA, together with IP reform work. Almost worldwide adoption of the patent system. Increased international patenting. Increased criticism of the patent system.
7. The global patent and IP/IC era ? to ?	Global IP-system reforms. Global harmonization and integration of IP. Emergence of supra-national and global patents, IP offices and clearing procedures or international disruption, partial abolishment and institutional substitution? ?

In the era since industrialization took off in Europe, Japan like no other major country, has swung from extreme isolationism under the Tokugawa military rule to extensive international engagement. The turning point was the proclamation in 1868 of the Meiji restoration (or rather ”renovation” in Japanese). Although Japan’s transformation and techno-economic achievements since World War II are remarkable indeed, the pendulum’s momentum and pace of change were probably higher a century earlier. The long preceding period of isolationism, which lasted for more than two centuries, probably also paved the way for its contrary movement to some extent. The foundations of many current practices in Japan were in fact laid in the decades after Meiji (e.g. wearing Western suits, competing fiercely in industry). Japan’s willingness and ability to absorb foreign things without being culturally subdued have been remarkably high ever since. This has indeed been the case regarding foreign technology. While the Tokugawa dynasty tried to perpetuate its power by preserving the status quo – including forbidding technical innovations – the absorption, development and control of new technologies are at the heart of modern Japan’s policies for establishment of her power and economic security in the world economic order. Thus, the course of isolationism and technological stagnation has been reversed with Meiji as a turning point. To a considerable extent, new technologies also brought about the Meiji restoration. The superiority of US military technologies, dramatically demonstrated by Commodore Perry when his naval ship prompted Japan to open up in 1852, had a profound effect on Japanese leaders, just as the superiority of US military and industrial technology had on the formation of Japanese post-war policies.

Japan, with her scarcity of natural resources, has centered her economic development around intellectual resources (intellectual capital), especially in science and technology. Thus, in the Ministry of International Trade and Industry (MITI) vision of the ”Strategy for Trade and Industry” in the 1980s, it was proclaimed that Japan should now establish herself as a Technological State, having succeeded in establishing herself first as a trading nation and later on as an industrial nation. Japan has become a symbol of what some authors label ”techno-nationalism” (for this concept, see Nelson and Rosenberg 1993, p.3, and also Ostry and Nelson 1995).

It is to be expected that a nation lacking natural resources but aspiring to modernize will sooner or later emphasize intellectual resources and their property protection as indigenous S&T achievements start to become relatively more important. Concomitant with Japan’s techno-economic developments since the Meiji restoration has been the introduction and development of an IPR system, including a patent system, patterned on Western systems. An excellent account of these developments is given in Rahn (1983). A chronology is given in Table 2. One may note the early introduction of an Intellectual Property Right (IPR) system and the continual developments of it in compliance with international legal developments as well as with domestic industrial developments. Certain asymmetries with other countries have been

kept from time to time in order to favour domestic industry and its build-up of a technology base. However, a large number of licensing contracts were signed after World War II, which in retrospect proved to be a considerable bargain for the Japanese (by some called ”the greatest bargain ever”).

The IPR system in Japan came into extensive use in the post-war period as one of the general means in the national and corporate innovation systems for catching up and forging ahead. This was accomplished through the analysis of existing patents, licensing in and improving imported technologies, mostly through many small improvements that were readily and extensively patented. Throughout this process, patent managerial skills, resources and methods (for example patent mapping method for navigating in densely patented technological areas) were continually developed. Also, Japan has in various governmental and private ways supported the ongoing international harmonization of IPR laws. However, while one may say that large parts of Japan’s industry have become leaders in patenting and IP management, Japan has not been a leader in developing the basic IPR legal framework.

Table 2 Chronology of the evolution of the Japanese IPR system until 1980

Year(s)	IPR-related event
1603-1868	The Tokugawa period with military rule and feudal system under the Tokugawa family.
1633	Adoption of a policy of national seclusion.
1718	The proclamation of a new law, which forbade ”new things”, i.e. technical innovations (Shinkihatto no ofuregaki – ”Ordinance Prohibiting Innovations”).
1852	Commodore Perry visits Japan, leading to the re-opening of the country.
1867	Yukichi Fukuzawa[1)] reported on the existence of patent laws in the US and Europe.
1868	Proclamation by Emperor Meiji of the modernization of Japan (Meiji ishin – ”Meiji Renovation”).
1871	Promulgation of the first Japanese Patent Law. Failed in the absence of applications for a whole year and was abrogated.
1884	Promulgation of the first Japanese trademark law.
1885	Promulgation of the Patent Monopoly Ordinance, modeled on American and French law, after extensive preparations by Korekiyo Takahashi (who later on served as Finance Minister (twice) and Prime Minister). However, foreigners were barred from obtaining patent rights.
1885	Establishment of the Japanese Patent Office. K. Takahashi became its first Director General.
1886	1384 applications were filed and 205 patents granted.
1888	Improved patent and trademark laws replaced the first ordinances. Promulgation of a design ordinance, modeled on English law.
1899	Japan became a member of the Paris Convention for the Protection of Industrial Property which had come into force in 1883. Foreigners became admitted to the Japanese industrial property system.
1905	Enactment of a Utility Model Law, inspired by German law.
1909	Revision of the four industrial property laws: the Patent Law, the Utility Model Law, the Design Law and the Trademark Law. A new section on employee inventions stated that the patent right belonged to the employer.
1921	Grand-scale revision of IPR laws, introducing novelties, such as first-to-file priority instead of the first-to-invent priority, employee ownership of patent rights instead of employer ownership, and an opposition system.
1935	Law for the Prevention of Unfair Competition entered into force, together with the ratified Hague revision from 1925 of the Paris Convention.
1938	Establishment of Japan Patent Association, an organization of leading Japanese companies.
1950	”Foreign Investment Law” and the ”Foreign Exchange and Foreign Trade Control Law” were enforced to regulate technology imports and foreign exchange for the reconstruction and renovation of Japanese industry. A period of substantial technology imports started, mainly from the USA, but also from Europe.

1958	Japan becomes the leading country in terms of number of patents and utility model applications filed per year. (A position retained since, at least up until 2013.)
1960	Enactment of revised IPR laws. Special injunction and damages as remedies for infringement were introduced.
1971	Revision of the Patent Law, allowing seven years for the request for examination and laying-open of the application.
1974	Liberalization of technology imports.
1976	Adoption of the product patent and the multiple claims system (although allowing only dependent sub-claims).
1978	Japan acceded to the PCT, and JPO became one of the international searching authorities under the PCT.

Sources: Compiled from Doi (1980), Rahn (1983), with the assistance of A. Mifune and K. Norichika.
Notes:
1) See a 10 000-yen bill from the 1990s for his picture.

Around the turn of the millennium Japan had amassed substantial financial resources by world standards and also controlled considerable physical resources through foreign direct investments, foreign holdings and other means. Still she was more dependent upon her intellectual capital (including goodwill and ”relational capital” in relations with her neighbours) than most countries and regions of the world. IP has also become recognized as an issue of economic security at the national level in the same way it has been recognized as an issue of corporate economic security in several large corporations.

The developments in the IPR systems and IPR relations between Japan and the USA are summarized in Table 3. In the 1980s, patent-related trade friction between the USA and Japan grew to what some observers later termed a ”patent war”. The following citation illustrates the kind of patent and litigation strategies advocated by a major newspaper in the ”patent war”.

> What should our attitude be towards the raging patent war between Japan and the U.S.? First, in the light of the history of patent wars, there is no alternative but to fight patent with patent. Needed in this process are expediting technological development, establishing as many patents as possible and securing cross-licensing contracts to offset patent royalty payments. To these ends, joint technological development may be considered by leading manufacturers of this country, the U.S. and Europe. ...
>
> Second, in its patent wars with the U.S., Japanese industry should openly seek court decisions on the rights and wrongs of each case and avoid out-of-court settlements as much as possible. ...
>
> Third, the Japanese government should strive to reconcile institutional differences in patent applications that exist among Japan, the U.S. and Europe. ...
>
> Editorial, Mainichi Daily News
>
> March 31, 1992 (excerpts)

It is particularly noteworthy that the editorial above advocates the avoidance of out-of-court settlements, which traditionally have been the preferred mode of patent conflict resolution in Japanese industry for cultural reasons. To some extent Japanese corporations became reactively litigious and aggressive in court (with the aid of US lawyers). Goals were set up in some cases to win patent disputes with US companies in order to win demonstration effects, prestige and self-confidence. All in all, however, the warfare aspect was a bit overplayed by the popular press and gradually the feelings of animosity declined somewhat after a peak in the early 1990s.

Table 3 Chronology of the evolution of the IPR system in Japan and the US (1980-1995)

	Japan	USA
1980		▫US Copyright Law amended ▫Chakrabarty case (microorganism patent)[1)]
1981		▫Diehr case (computer program)[2)]
1982		▫CAFC[3)] established
1983		▫Patent Commissioners' trilateral
1984	▫JPO "paperless project" initiated	
1985	▫Maskwork Law enacted ▫Copyright Law amended (computer program)	▫WIPO Harmonization conference ▫USITC litigations increased
1986	▫TI semiconductor patent litigation initiated USITC[4)] ▫Kilby patent granted[5)]	▫GATT TRIPS started
1987	▫Patent Law amended (refined multiple claims system introduced)	
1988		▫US Trade Act (Special 301) ▫US Tariff Act 337 amended
1989	▫Copyright Law amended (fair use)	▫Japan on Watch List of Special 301
1990	▫Unfair Competition Protecting Law amended (trade secret)	
1991	▫Trademark Law amended (new service mark registration system introduced)	
1992	▫Honeywell won patent litigation against Minolta	▫US Patent Law reform report
1993	▫Patent Law and Utility Model Law amended; ▫Unfair Competition Protecting Law amended	▫GATT TRIPS completed
1994		▫US-Japan Patent Commissioners' understanding signed

Source: Mr. K. Norichika and the author.
Notes:
1) The patentability of a bacteria genetically engineered by A.M. Chakrabarty was finally decided by US Supreme Court, overruling USPO's rejection of the patent application. This decision opened the possibility to grant patents for living organisms.
2) A US Supreme Court decision, which through its interpretation by USPO opened the possibility to grant patents to computer software.
3) CAFC = Court of Appeals for the Federal Circuit.
4) Texas Instruments claimed eight Japanese and one Korean company infringed on 10 of their patents for DRAMs (see Warshofsky 1994).
5) In 1961, Texas Instruments had filed the patent in Japan for the integrated circuit, called the "Kilby patent" after its inventor Jack Kilby. JPO required the application to be divided into several parts, the first of which was granted in 1977.

3 IP resources

The level of IP resources in Japanese corporations has been considerably higher than in most Western corporations, as has the output in terms of patent applications (see Granstrand (1999)). As mentioned, the IP resource levels have also increased during the 1980s, as have the numbers of patent applications. Table 4 gives some examples of top IP spenders among Japanese large corporations in different sectors.

As seen from Table 4, the electrical corporations top the list regarding the total number of patent employees. The electrical industry was also the first and hardest hit by the patent wars and therefore reacted early by building up in-house resources. In terms of the ratio of patent employees to total employees, Canon was leading. However, it must be kept in mind that the degree of outsourcing and centralization of IP resources and Research and Development (R&D) varies among the corporations. The degree of consolidation also varies. The figures for the total number of employees, total sales and total R&D are self-reported in the questionnaires complemented with officially reported figures.

Table 4 Japanese corporations with most patent employees (in 1991)

Corporation	Patent employees[1)] R&D	Total employees[3)] sales	Pat.empl./ Tot. sales (%)[4)]	Total (MUSD)[2)]	Total (MUSD)[2)]	R&D/ (%)
empl.						
Electrical:						
Toshiba Corp.	370	162 000	0.23	2 390	35 507	6.7
Canon Group	350	62 700	0.56	830	14 053	5.9
Matsushita Electric Co. Ltd	340	210 848	0.16	2887	49 619	5.8
Hitachi Ltd.	330	324 292	0.10	3 690	58 173	6.3
Fujitsu Ltd.	210	155 779	0.13	2 947	25 880	11.4
Sony Corp.	200	110 000	0.18	1 504	27 068	5.6
Mechanical:						
Honda Motor Co., Ltd.	150	85 500	0.18	1 459	32 342	4.5
Toyota Motor Corp.	130	102 423	0.13	3 233	74 099	4.4
Chemical:						
Asahi Chemical Ind.	70	27 018	0.26	300	9 785	3.4
Mitsubishi Kasei Corp.	70	17 000	0.41	379	9 479	4.0

Source: Questionnaire survey by the author and colleagues. Corporate annual reports.
Notes:

1) Number of persons working more than half time with patenting activities according to questionnaire. See note 4.
2) Consolidated data, including majority owned subsidiaries worldwide. Conversion rate used is 1USD = 133JPY.
3) Consolidated employee data.
4) Hitachi, Honda, Toyota, and Asahi reported non-consolidated data. It is therefore possible that the number of patent employees may be greater than shown due to additional staff in majority owned subsidiaries not reported. This would produce higher patent employee ratios for these companies.

Table 5 then shows the general picture of patent and R&D resources in the sample. A few observations in relation to Table 5 are noteworthy. First, total patenting costs have grown considerably between 1987 and 1991, more than sales and R&D. However, the growth of in-house patenting staff is much less, except for the electrical industry which has been a forerunner in building up IP resources in the 1980s. The lower overall growth of in-house patent employees compared to the growth of patenting expenditures is probably primarily due to growth in foreign applications, but it could also be due to a growth lag that reflects both a temporary peak in work load and bottlenecks in more long-term build-up of IP resources that lead in turn to the growth in outsourcing. It could also be due to circumstances specific to the mechanical corporations, which show the largest difference in growth ratios for patent engineers and in-house patent costs.

Patent employees in Japanese large corporations are predominantly engineers, few are economists and lawyers. The main strategy in building up in-house competence has been to ”convert” engineers to patent specialists, as is also indicated by the growth in percentage of engineers in patenting. There are, moreover, significant differences across industries in the degree of centralization of patent employees.

The chemical corporations were found to be most centralized and the electrical corporations least centralized, although with a strong trend towards centralization among the latter. On average, patenting is also more centralized than R&D and engineering.[4] For example, about 20 per cent of IP personnel are located at corporate headquarters in Toshiba, while the other 80 per cent work in various operations departments in the corporation. For engineers in general at Toshiba, about 19 000 have at least a Bachelor’s degree or the equivalent, and of these only 10 per cent work in corporate laboratories, while 10 per cent work in development laboratories and the remaining 80 per cent in various other operations departments.

A final observation is that on average ”patent intensity” in terms of the ratio of patent costs to R&D costs is still fairly low, i.e. around 2.3 per cent, which by the way is less than half the average R&D intensity, i.e. the ratio of R&D costs to sales. However, some companies like Toshiba have a patent/R&D cost ratio around 10 per cent.[5]

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[4] A similar result was found in Etemad and Dulude (1987) as well for a sample of large European, Japanese and US MNCs.

[5] A study by the author of 10 US large corporations (GE, ITT, Xerox, Pfizer, Motorola, 3M, Honeywell, Control Data, RCA, and Zenith) in 1985 showed a patent-to-R&D cost ratio in the range 1–3%. However, the ratio of number of patent applications per R&D dollar has been over ten times higher in Japan relative to the USA in leading chemical, electrical, and mechanical corporations.

Table 5 Patent and R&D resources in Japanese large corporations

(Code) Question	Chemical (n=9)	Electrical (n=10)	Mechanical (n=5)	Total (n=24)
(A1a) Total sales globally in 1991 (MUSD)	6 341	33 096	30 791	22 582
Growth ratio 1991/1987	1.31	1.43	1.45	1.42
(A2a) Total number of employees in 1991[1)]	13 906	153 056	60 771	81 649
Growth ratio 1991/1987[2)]	1.23	1.15	1.03	1.14
(B1) Total R&D expenditures worldwide in 1991 (MUSD)	255	1 984	1 285	1 190
Growth ratio 1991/1987	1.38	1.56	1.50	1.53
(E7) Cost of in-house patenting department activities and purchased services in 1991 (MUSD)	8.0	51.5	22.4	27.0
Growth ratio 1991/1987	1.63	1.35	1.17	1.43
(E6a) Number of persons working more than half-time with patenting activities in the company in 1991	40.8	217.2	94.8	121.6
Growth ratio 1991/1987	1.04	1.35	1.01	1.23
thereof:				
(E6b) Percentage engineers 1991	83.8	62.6	76.8	74.0
Growth ratio 1991/1987	1.01	0.96	1.05	1.00
(E6c) Percentage lawyers 1991	4.9	6.3	2.2	4.9
Growth ratio 1991/1987	0.86	1.58	0.73	1.11
(E6d) Percentage working in central/corporate headquarters 1991	75.0	37.6	46.2	54.1
Growth ratio 1991/1987	1.00	1.10	0.95	1.02
Key resource ratios:				
(E6a/A2a) Percentage patent workers in the company 1991[2)]	0.32	0.17	0.22	0.18
(E7/B1) Patent cost/R&D cost 1991 (%)	3.1	2.6	1.7	2.3
(B1/A1a) R&D/sales 1991 (%)	4.0	6.0	4.2	5.3

Notes:

1) The figures for the chemical and mechanical sectors are underestimated due to the inclusion of non-consolidated company employee data.
2) Ratios are based solely on reported employee data from company questionnaires.

4 IP organization

4.1 Patent and IP organization and management in large Japanese corporations

The patent organizations in large Japanese corporations in the 1990s have a number of common features that clearly distinguish them from the traditional patent organization in large Western corporations.

IP resources

The resources devoted to IP activities are not just slightly larger, they are often larger by a magnitude.

Centralized IP department

Responsibilities for patenting and other IP matters have been integrated and centralized into a comprehensive IP department at corporate level. In fact, all 24 corporations in the sample had a centralized patent department with corporate-wide responsibilities for patent coordination, headed by one central corporate patent manager. Usually, this department had similar responsibilities for other IP matters as well; there was an organizational trend showing evolution from a patent department to an IP department and from a patent manager to an IP manager.

Status of the IP department

The status and power of the patent and IP department has risen. Questions about patents and related matters were regularly discussed at company board meetings in most of the corporations, and often the IP manager reported directly to the CEO. The career paths to top management positions often have resided substantially in R&D with involvement in IP matters, and several Japanese CEOs were strongly IP-oriented. The IP department was thus of strategic concern under pro-active management, not just a reactive service department. Consequently, there was a need for sustainable in-house competence on a substantial level and scale. Still, much patent work was outsourced.

Clearing-house

Substantial emphasis and resources were devoted to having the patent department serve as an active clearing-house for technical information, with activities for technology scanning internally and externally, patent mapping, patent clearance, dissemination etc. Sometimes,

technology intelligence was conducted in special subsidiaries as well. Such information-related activities are clearly important but in Western companies they have been difficult to maintain, coordinate and link to decision-making. Often the Western patent department has scanned and disseminated patent information without adding much value for the user, and without much follow-up and feedback (cf. Granstrand (1999), Chapter 9). Japanese firms also experience difficulties like these, but they tackle them in more determined and systematic ways.

Integration of IP and R&D

Good working relations between the patent department and R&D were emphasized. This is a natural concern in Western firms as well, however the Japanese patent department was usually more powerful than a reactive service department purely under the aegis of R&D. Patenting people were regularly involved in the early stages of R&D, not casually called in at too late a stage as has often been the case in Western companies. Patent management operated proactively rather than reactively responding to requests from business and R&D operations and was expected to take sufficient initiative in order to secure viable patent positions in various business and technology areas. Needless to say, that is not an easy task as business divisions become increasingly independent. In general, corporate patent management in Japan had more power than their Western counterparts.

To illustrate, in one corporation a review of patent positions was regularly undertaken at an early stage of entering a business and/or technology area. If the review showed an unfavourable ”jungle” of patents, the IP manager had the clout to hold up the project until some kind of patent clearance (through e.g. licensing) had been undertaken. However, more common than vetoing, an IP manager had the possibility to bring such a situation to the attention of higher management.

Patent (IP) culture

The Japanese patent organization was immersed in what can be called a patent culture in the corporation. This is an important feature that will be dealt with in the next section.

5 Patent management and patent culture

Japanese industry, and large corporations in particular, have developed a general pro-patent orientation over many years. This orientation could best be described as a patent culture residing within and between companies.[6] The patent culture did not develop as a result of a grand design but was instead part and parcel of a catch-up process that started after World War II and was further strengthened after the emergence of the pro-patent era in the 1980s. That is not to say that managerial action cannot influence the formation of a culture in business, such as a patent culture. The early efforts of Mr. Takahashi, at the national level, are one example of such action. The efforts in the 1980s and 90s of Mr. Saba, former CEO and Chairman of Toshiba, and Mr. Yamaji, former CEO and vice Chairman of Canon provide other more recent examples.

The question is to what extent a patent culture can be fostered by managerial action in a corporation. A more general question is how a corporate culture in general could be formed. Japanese corporations are renowned for having built strong corporate cultures by various means. Needless to say, a well-functioning culture of some sort could be an effective vehicle for coordinated, purposeful action, and as such, could work as an efficiency-enhancing control mechanism. At the same time a culture could become a barrier to change. Moreover, in society as well as in large corporations, there is a fair amount of cultural diversity with several subcultures that may clash with one another, for example engineering subcultures oriented around engineering disciplines such as mechanical and electronic engineering or chemical engineering and bio-engineering.[7]

Thus there is a need for management to consider how to influence cultural formation and change. General managerial instruments that are mentioned in the management literature as useful in bringing about cultural formation and change are: strategy and policy formation, recruitment, promotion, restructuring of communications through organization and location, and campaigns of various sorts. There are also less tangible managerial actions representing elements at a fundamental level within a culture, such as actions that influence language and values, create symbols and rituals, integrate company life with social life and leisure activities, take on social responsibilities, strengthen ideologies, nurture common myths, and create implicit incentive and penalty structures. The importance of company leaders as role models who live as they preach is also extremely important.

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[6] The concept of culture has come into popular use – and misuse – in management in the last few decades. Despite a certain vagueness and tendency to use culture as a catch-all concept, it will be used here since it captures some important, if yet evasive, features in organizations such as norms, values, beliefs and preferred problem solving approaches .

[7] A subculture is simply ”a culture within a culture”.

These are all general elements in fostering a culture in a corporation, and it is in the nature of things that an exhaustive listing of elements cannot be made and that many elements are intangible, requiring much managerial sophistication. When it comes to building a corporate patent culture that was found in the large Japanese corporations studied, the elements become more specific. Some of these elements, as observed, are dealt with below, in no particular order.

Top management involvement in patenting and IP

Top management involvement is indeed a necessary but insufficient condition. It is typical for most Japanese corporations to have top management involved in technology and R&D. Many corporations, too, have had a preference for technologists as CEOs, although there are corporations such as Toshiba that prefer a succession of technologists and commercialists as CEOs. In either case they are almost always members of top management with an appreciation of patenting matters, often having direct personal experience. Some top managers make it a habit to ask questions about the patent situation during business presentations, and some also make it a habit to visit labs and discuss, among other things, patenting in more casual ways. It is important to show concern and at the same time refrain from letting obsolete or otherwise insufficient technical knowledge or one's own pet ideas misguide R&D.

Patenting and IP as a common concern for all engineers

Although specialists are always needed for patent work, it is considered important not to consider patenting primarily a specialist function but to make patenting a common concern for all engineers. Training courses, job rotation and career paths with at least an early stint in a patent department are valuable, together with the other measures described below.

Patent policies and strategies integrated in business models and plans

Without a requirement that makes patenting and IP a regular and specified item on the agenda of business plans, business managers will easily neglect the IP situation or let IP strategies become too generalized and watered down. Integration of business and IP aspects is not only a matter of thinking hard and coming up with cunning ideas but is also a matter of two-way communication with some integration of business language and IP language. "What is our unique competence in this business?" is a common question in business analysis. The equally important, but less commonly used IP–related question is "How can we protect our unique competence in this business?"

Clear patent objectives

Clear, quantified objectives for patenting were common among the Japanese corporations in the study. An example is given by Hitachi, which had the objective of increasing the number of strategic patents by 25 per year, as described in Granstrand (1999). There are many arguments against quantifying objectives, and often patenting people produces such arguments. One argument is that quantified objectives are said to stimulate quantity rather than quality of patents and foster unfruitful competition. On the other hand, quantification focuses attention and provides clear yardsticks for rewards and penalties, as well as for improvements. The arguments for quantifying objectives appear to be stronger when building a patent culture. Such objectives then function as symbols and provide a basis for habitual behaviour, even rituals, such as ”Kamikaze research”, which describes the patenting frenzy in Japanese companies at the end of the budget year in order to meet quotas. Such behaviour could be seen as going too far, but nevertheless is part of the patent culture.

Clear patenting incentives for R&D personnel and organizational units

The issue of how to reward inventive work by individuals, teams and units is a very important and fundamental question in both Japanese and Western firms. This is a complex issue that could be elaborated at great length. Without doing so here, one can just point to the clear and fairly strong reward schemes employed by Japanese firms, often developed without the adversarial relationship between the firm and the inventor that easily develops in Western firms. The following citation is in contrast with the top management view, not uncommon in Western firms, that R&D people basically are salaried for doing inventive work.

> We try to encourage the view that the company’s value to society lies in developing new technology. We also try to provide a corporate environment where thought and originality are rewarded.
>
> We give annual cash awards to the employee who has applied for the most patents that year and to those who have developed patents or software of an outstanding nature.
>
> Keizo Yamaji
>
> Former CEO, Canon Group

Fostering of behavioural attitudes and norms

Fostering of behavioural attitudes, norms, habits and standards conducive both to technology protection by patents and secrecy and to technology intelligence can be done in various ways. For example, certain reading and writing habits of engineers can be encouraged, as in Canon. A citation by Dr. Yamaji from the 1990s may again illustrate:

> I encourage our researchers to read patent specifications rather than academic theses and to write patent applications rather than technical reports. I also tell them to make virtual experiments (”Gedanken” experiments) in order to have them apply for more and more patents, so that we can be prepared for the era to come when only some companies, strong in patents, will cooperate with each other and survive.
>
> Keizo Yamaji
>
> Former CEO, Canon Group

Canon, as well as other companies, also tries to encourage writing habits by aligning the reporting on R&D work to the norms and standards used in patent documents. In this way, patent application work is facilitated while thinking in patent terms is encouraged.

Speaking, listening and observation habits of engineers, salesmen, managers etc. could also be influenced for protection and intelligence purposes, although extreme behaviour in this regard may be counter-productive in other respects.

Visible organizational means

Tangible and intangible means for building a patent culture have to complement each other. Examples of visible organizational means besides the ordinary patent organization are patent promotion centres, patent liaison officers distributed in the organization, corporate-wide patent campaigns, patenting prizes, and patent strategy seminars.

Language, methodology and philosophy

A common language is central to any culture. One way to foster a professional language for a patent culture is to develop concepts and tools and employ them in a methodology for analysis and in communication, which could be further turned into a philosophy. The patent-mapping methodology described in Granstrand (1999) was developed in Japan by JPO initially and then improved over time by large corporations. It has been a useful methodology for several purposes in itself, but at the same time it has contributed to building a patent culture through its influences on language, analytical perspective, conceptualization and communication.

Finally, it must be emphasized that corporate patent cultures are embedded in and reinforced by an overarching industrial and national culture, conducive to patenting, inventions, intelligence, and so on. There is a wide range of institutional arrangements for this with government agencies and initiatives, legislation, associations, institutes etc. The historical dimension is important and Table 2 gives some features of it for Japan. The large Japanese corporations as a whole play an increasingly important role. The corporate IP managers know each other well and are part of various ”old boy networks” (to use a Western term). The Japan

Patent Association (JPA) is a good example of an organization primarily catering to the interests of large corporations since long ago.[8]

6 IP organization at Toshiba Corporation

Toshiba is one of the leading Japanese corporations in the IP field, with top rankings in terms of e.g. number of patent applications and patent employees. Thus, it is natural to look at the history, organization and management of IP in Toshiba in greater detail.

Table 6 indicates that the organizational history of Toshiba and its R&D and IP resembles, at a very general level, the organizational development in a large Western corporation. The corporation grew, diversified, refocused and internationalized. At the same time, R&D established early as a separate lab, grew, diversified, differentiated into product and process development and research and organized into a mix of centralized/decentralized labs under a technology management structure. At a later stage, R&D became internationalized, a process that began fairly late in Toshiba. The IP organization became established as a patent department at an early stage, also by Western standards. The IP organization has historically been oriented around patenting, which grew and was upgraded in the organization, adopted a centralized/decentralized mix, internationalized, and finally consolidated into one large department with various IP activities that grew up in a diversified way over the years. Thus, developments in the corporate organization shaped, often with some time lag, the developments of the R&D organization, which further shaped the IP organization.

[8] JPA was formed in 1938 by patent attorneys employed in some large corporations including Toshiba. It was originally named Chrysanthemum Feast Club (Chōyō Kai) and was renamed Japan Patent Association (Nihon Tokkyo Kyōkai) in 1959 (Rahn 1983, p. 473).

Table 6 Key historic events in Toshiba's corporate, technology and IP organization

Some key events in corporate organization		Some key events in R&D organization		Some key events in IP organization	
1870	Shibaura Electric established				
1890	Tokyo Electric established (first producing light bulbs)				
		1906	R&D lab established in Shibaura Electric		
				1912	Patent Section est'd
		1918	Matsuda R&D lab established in Tokyo Electric		
		1931	Tsurumi R&D lab established in Shibaura Electric		
1939	Toshiba established as merger of Tokyo Electric and Shibaura Electric				
				1944	Patent Division est'd
1960s	Cooperation with NEC and GE in computers				
		1961	Corporate research lab established		
		1968	Heavy industry research lab established	1968	A decentralized system adopted
		1970	Production engineering lab established		
				1972	Start of trainee education for foreign countries
1976	Adopts GE type of organization (with business portfolio analysis, business units etc.) Decides to focus on electronics and information technology.				
1978	Exit from mainframe computers	1978	Labs in business units established in a 3-level organization under business sector labs and corporate labs		
				1979	Washington Intellectual Property Office ("WIPO") established.
1980s	Promotion of globalization, and E&E strategy (energy & electronics). Later extended to 3E – energy, electronics and environment.	1980s	Various new labs established, e.g. a VLSI lab in 1984. The 'Tokken' system for R&D management established together with the 3-level R&D organization.		
1989	ICTs account for over 50% of sales			1989	Intellectual Property Division established

Source: Material from Mr. Saba, Mr. Takayanaga, Mr. Norichika, Miyazaki (1995), and interviews.

Figure 1 shows the overall Toshiba corporate IP organization in the mid-1990s. One can note that each business group has an integrated IP department or section under the business group management but also a functional administrative management arrangement with the corporate IP division. The latter in turn is at the same staff level as R&D and the design centres.

Figure 2 further shows the inner organization of the IP division, with departments for each major type of IPR, except trade secrets, plus departments for licensing and patent information. Toshiba Techno Center also performs patent analysis but for various reasons is organized separately. Finally, there is a relatively large department for planning and coordination of IP departments in business groups. Thus, the IP division is by and large comprehensive, and represents another stage beyond the ”super patent department” in the study by Taylor and Silberston (1993).

Education in IP, both for IP personnel and engineers corporate-wide, is important in Toshiba, as in any company seriously responding to the pro-patent movement. Table 7 shows Toshiba's patent education system.

Similar, although not identical, IP organizations can be found in other large Japanese corporations, as further illustrated in Granstrand (1999).

Table 7 Toshiba's patent education system (as of 1995)

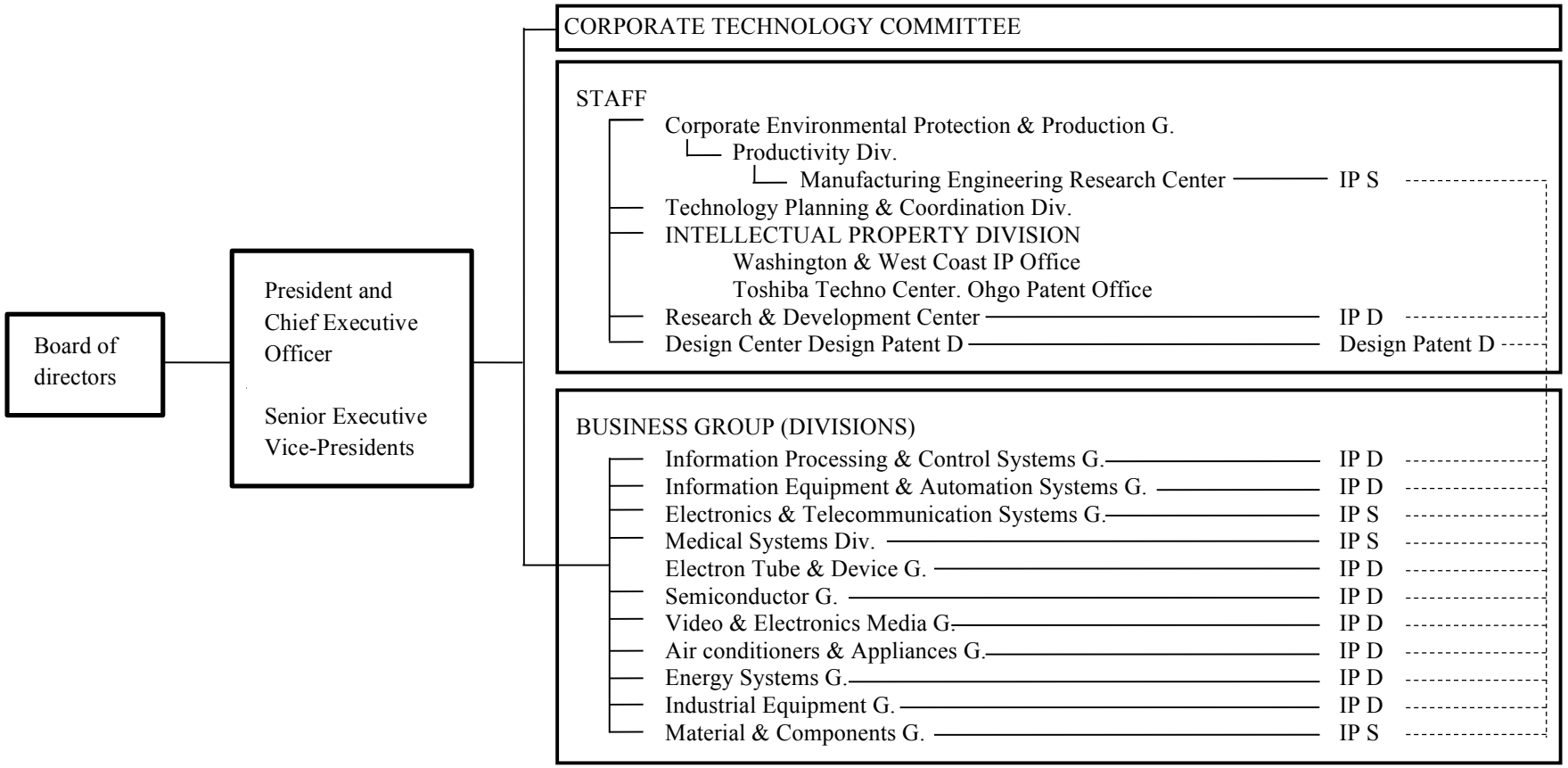
Career stage	IP-related personnel	Engineers
When entering the company	IP generally	IP generally
Introductory education	Basic education First term collective education Second term collective education	Freshman course on business and patent/IP rights
1–3 years	Advanced course Research of precedent cases	Basic knowledge about the patent system Patent surveys Ways to summarize proposals
Mid-level personnel	Selection Drafting specifications in English Patent application management Patent specialty courses System of overseas patent study	Patent review/patent maps Improving the quality of proposals
Deputy managers	Family training [1)] Patent supervision	Family training [1)] Patent supervision
Managers	Family training Patent strategy	Family training Patent management

Source: Mr. K. Norichika, Toshiba.

Notes:

1) Training and socializing in off-the-job settings (signs of titles and positions removed, night-time sessions etc.)

Figure 1 Toshiba IP organization (as of 1995)



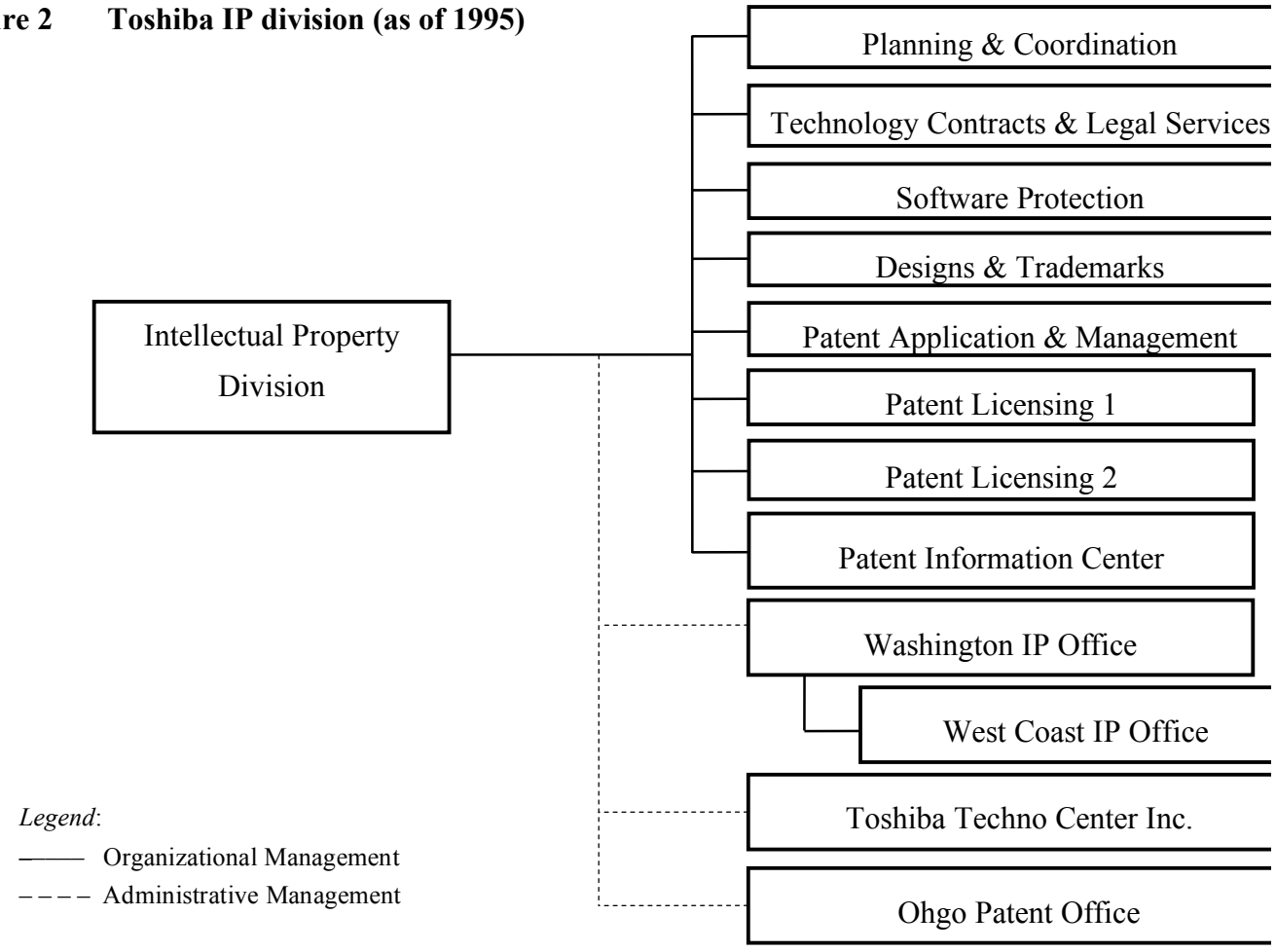
Legend:

IP = Intellectual Property, D = Department, S = Section, G = Group

——— Organizational Management (with direct business line responsibility)

– – – – Administrative Management (with indirect functional staff responsibility)

Figure 2 Toshiba IP division (as of 1995)



7 Summary and conclusions

Partly as a result of a long process of catching up with the West and partly as a response to the pro-patent era emerging in the 1980s and the ”patent wars” – hot as well as cold – with US corporations, large Japanese corporations have developed leading patent management practices and resourceful, comprehensive IP organizations. Apparently patent management is still another example of a management area in which Western corporations have much to learn from Japan.

The patent departments in some of the largest US firms have also evolved substantially since the 1980s. In the wake of the patent wars and the pro-patent era, many Western firms have in fact initiated processes for overhauling their patent organizations. Companies like Ericsson, Google, Microsoft and Nokia have made substantial turnarounds regarding their IP organization, management and business models. The turnarounds in the European companies Ericsson and Nokia were by and large triggered by the IP behavior of US companies but were to some extent subsequently influenced also by IP management in Japanese companies.

Taylor and Silberston (1973), being one of the very few systematic studies of patent organizations in industry, identified four types or stages. In relation to these, the patent organization in large Japanese corporations represents a quite different fifth type, as summarized in Table 8. A hypothetical sixth type is also described. Needless to say the different types do not have to follow upon each other, and the table certainly does not suggest that the future IC firm will be or should be organized around the patent department.

Table 8 The evolution of the corporate patent organization.

Type	Characteristics
1	Headed by part-time technology manager plus outside patent agents. [1)]
2	Full-time patent manager with small staff plus outside patent agents.
3	Specialized patent manager with a corporate patent department and liaison people in business divisions.
4	"Super patent dept." (35 – 50 persons). Separate licensing dept. [2)]
5	Comprehensive IP dept. (50 – 500 persons) of Japanese type. Patent culture. [3)]
6?	Extended IP organization? (E.g. for technology acquisition and exploitation, open innovation, technology intelligence, technology planning, information management, idea generation, competence development, litigation management.)
(Future scenario)	Merging with distributed Intellectual Capital Management. ?

Source: Adapted from Granstrand (1999).

Notes:

1) Outside patent agents are used in all types but their relative importance is largest in types 1 and 2.
2) This is the fourth and most advanced type identified in the study of UK firms by Taylor and Silberston (1973).
3) Comprehensive IP departments of this size can also be found in some leading Western firms. For example, IBM reportedly in 1989 had 240 professional employees linked to its Intellectual Property Law Department. However, in contrast to large Japanese IP departments, IBM's was much more internationalized (with about 30 locations globally and circa 10% of the patent professionals located in Japan) and decentralized (with only about 5% working in corporate headquarters) and lawyer intensive (with circa 60% being US lawyers). Cf. Table 4 above.

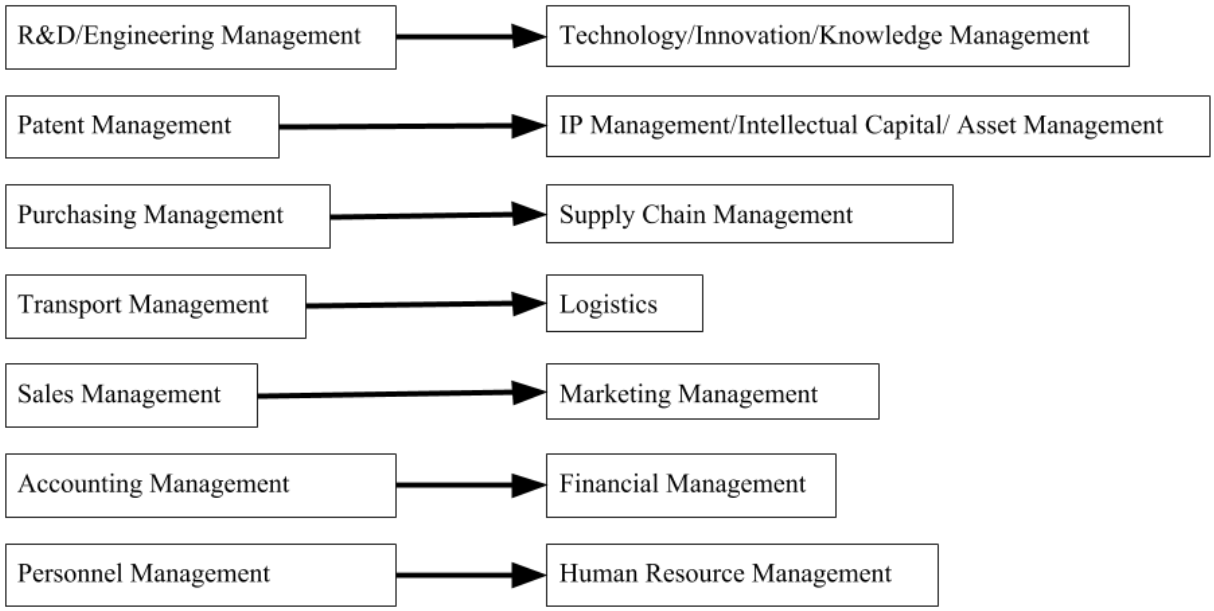
Many large Japanese corporations could also be said to possess a patent culture, which can be characterized as having: top management involvement in patenting and IP; patenting and IP as a common concern for all engineers; patent policies and strategies integrated in business plans; clear patent objectives; clear patenting incentives for R&D personnel and organizational units; behavioural attitudes and norms conducive to technology protection and technology intelligence; visible organizational means to promote attention to patenting; and special language, methodology and philosophy.

Patent organizations have also developed in many companies in the West during the pro-patent era, although to a lesser extent on average than in Japan. In general, the patent department has moved from being a small, reactive service department, often with low status and narrow operative tasks decoupled from the business and top management, towards a larger proactive organization with more comprehensive IP responsibilities, more status and power, more commercially oriented, more strategic concern and more interaction with technology management, business management and top management. In addition to having grown, diversified and become more integrated in the corporation, the IP organization has also become internationalized as the R&D organization has internationalized.

Further developments in IP management and organization are conceivable. As the role of intellectual capital, comprising IPRs, human capital and other intangibles become more important in firms, intellectual capital management, encompassing IP management, might develop in various ways. The IP organization may be further extended in terms of resources, tasks and responsibilities, and there are a number of arguments for different types of extensions. The IP organization may also become subordinate to a type of distributed management of intellectual capital, signifying a reorientation of the whole company organization towards its intellectual capital, somewhat analogous to the total quality management movement.

Developments like these in the area of IP management are similar to developments in other management areas, as exemplified in Figure 8. Admittedly many managerial developments – or management innovations if one wishes – are more nominal than real and could rather be referred to as management fashions and fads, of which there are many for various reasons (promotion of consultancy services, careers, images etc.). Nevertheless, language changes may be taken as indicators of more deep-running changes in perspectives. For example, R&D connotes an activity or a process, while technology and innovations are nouns or objects, as is intellectual property. Managing processes is different from managing objects. Objects are more amenable to be viewed as discrete assets, which could valued and traded, paving the way for a more market and finance oriented perspective in management. This is in fact a more deep-running managerial development in Figure 8, implying that technology and IP management has increasingly to interact with technology and IP markets.

Figure 8 Management Developments in General - Examples



Note:
Production/manufacturing management has developed significantly over the years as well (lean production, Kanban, Kaizen etc.) but without nominal change, not even with the advent of new infocom based industries, which by and large have adopted old industrial language to facilitate conceptualizations.

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