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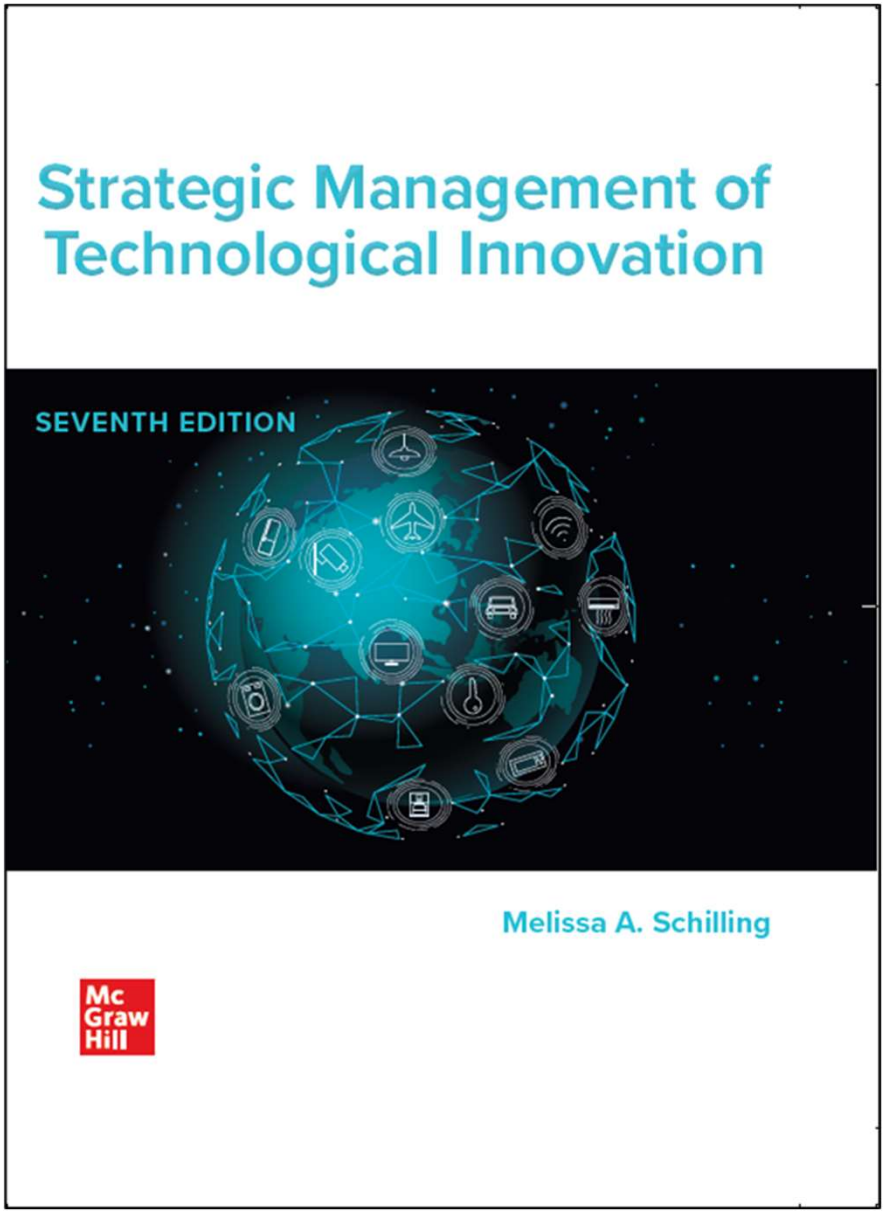
Chapter 9

Protecting Innovation

Strategic Management of Technological Innovation, 7th Edition
Melissa A. Schilling



The Patent Battle Over CRISPR-Cas9 Gene Editing [1]

In 2012, Jennifer Doudna and Emmanuelle Charpentier filed a patent for CRISPR-Cas9, a revolutionary method of gene editing for which they jointly received a Nobel Prize in 2020.

A few months later, however, another team led by Feng Zhang filed a patent detailing how to apply CRISPR-Cas9 to multi-celled organisms (like humans!). Since the most valuable applications of CRISPR-Cas9 were anticipated to be for multi-celled organisms, this latter patent sparked a feud between the teams.

In the US, a trial concluded that Doudna and Charpentier held the rights to CRISPR-Cas9 for single celled organisms only and that Zhang held the rights for CRISPR-Cas9 for multi-celled organisms. Canada followed the US decision. The European Patent Office, however, awarded the rights of applying CRISPR-Cas9 to both single-celled and multi-celled organisms to Doudna and Charpentier.

The patent battle was delaying advances in medical interventions utilizing the technology so many hoped the two camps would agree to pool their patents.

The Patent Battle Over CRISPR-Cas9 Gene Editing [2]

Discussion Questions:

1. What do you think are some of the challenges with awarding patents based on “first to invent”?
2. What are the pros and cons of Doudna-Charpentier and Zhang pooling their CRISPR-Cas9 patents to make it easier for others to license them?
3. What are some of the potential implications of the fact that the European Patent Office made a different decision about the patent battle than the U.S. Patent and Trademark Office?
4. Do you think patents on a revolutionary technology with medical applications helps to foster the development of lifesaving treatments or slows it down?

Overview

Firms must decide **whether** and **how** to protect their technological innovations.

Protecting innovation helps a firm retain control over it and appropriate the rents from it.

However, sometimes **not** protecting a technology is to the firm's advantage – it may encourage others to support the technology and increase its likelihood of becoming dominant.

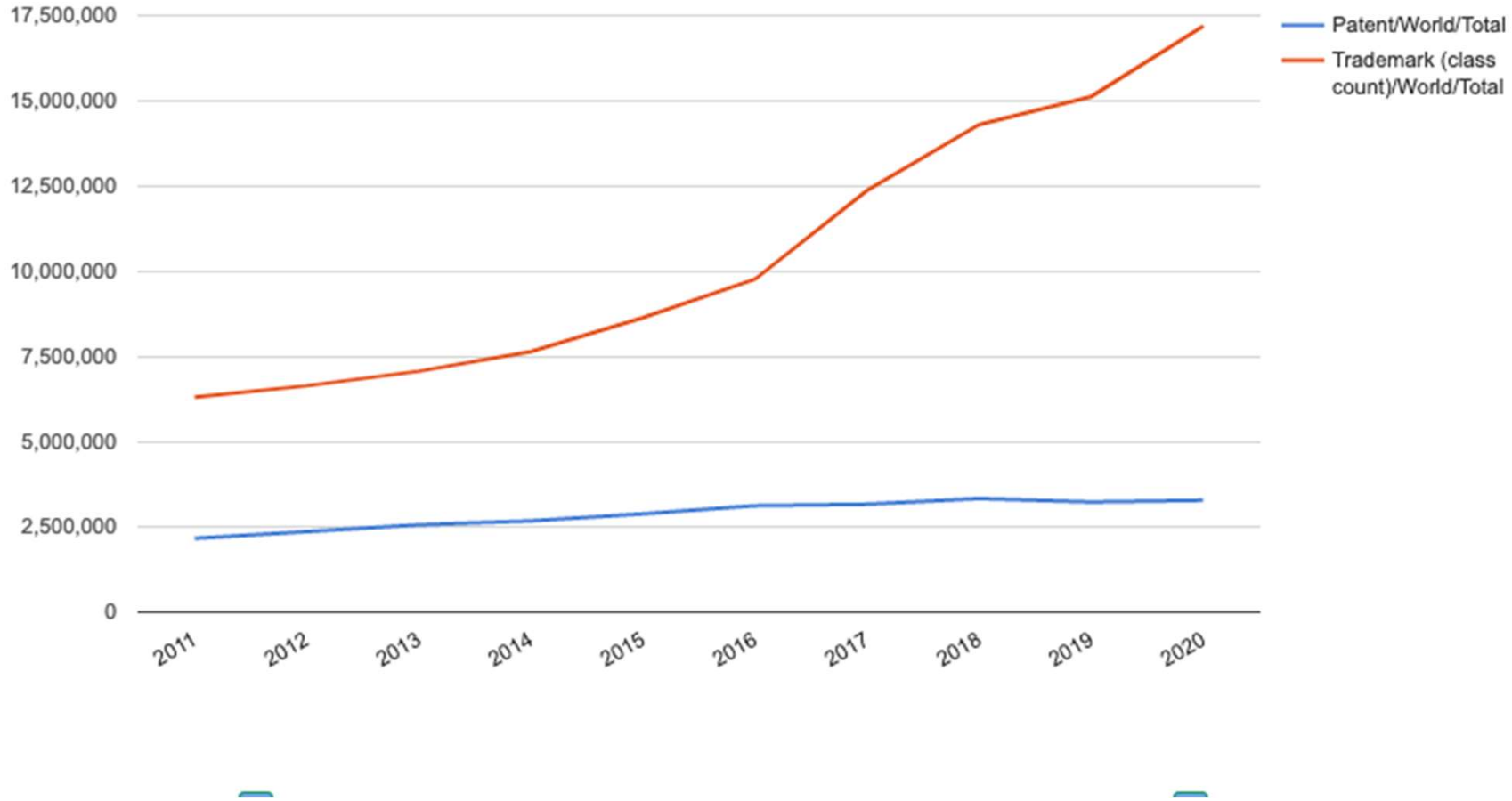
Appropriability

Appropriability: The degree to which a firm is able to capture the rents from its innovation.

Appropriability is determined by how easily or quickly competitors can copy the innovation.

- Some innovations are inherently difficult to copy (tacit, socially complex, etc.)
- Firms may also attempt to protect innovations through patents, trademarks, copyrights or trade secrets.
- Patents, trademarks and copyrights each protect different things.

Total patent and trademark applications worldwide



https://www3.wipo.int/ipstats/keyLineChart

Patent categories

Patents: rights granted by the government that excludes others from producing, using, or selling an invention.

Must be **useful**, **novel**, and **not be obvious**.

- **Utility patents** protect new and useful processes, machines, manufactured items or combination of materials.
- **Design patents** protect original and ornamental designs for manufactured items.
- **Plant patents** protect distinct new varieties of plants.

In 1998, many software algorithms became eligible for patent protection.

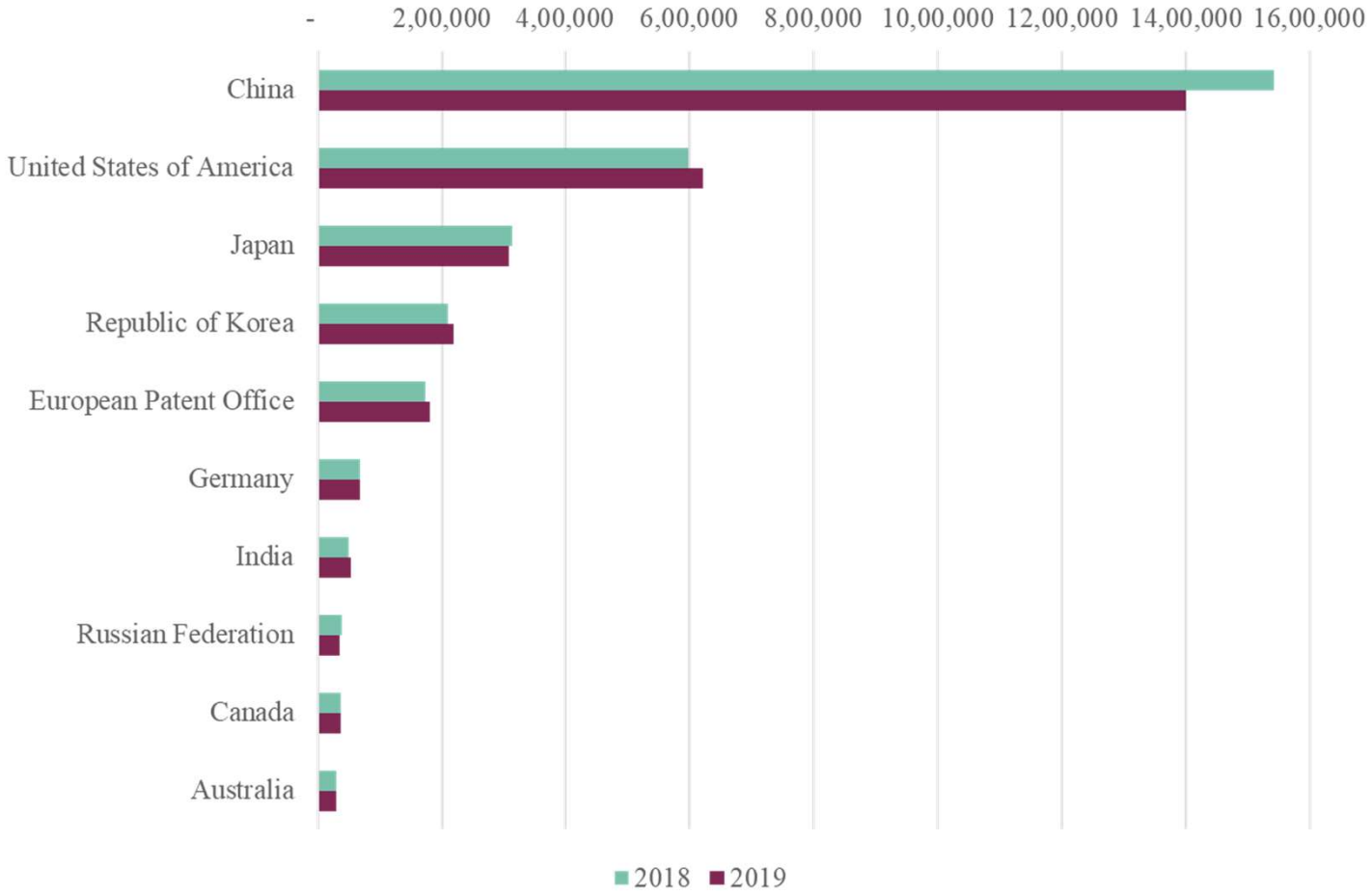
Patent Laws

Countries have their own laws regarding patent protection. Some treaties seek to harmonize these laws.

- **Paris Convention for the Protection of Industrial Property (march 2021).**
  - Foreign nationals can apply for the same patent rights in each member country as that country's own citizens.
  - Provides right of "priority" – once inventor has applied for protection in one member country, they can (within certain time period) apply for protection in others and be treated as if they had applied on same date as first application.
- **Patent Cooperation Treaty (PCT) - 1970.**
  - Inventor can apply for patent in a single PCT receiving office and reserve right to apply in more than 100 countries for up to 2 ½ years. Establishes date of application in all member countries simultaneously. Also makes results of patent process more uniform.

Patents – some data

Total Patent Applications, 2018-2019, WIPO Statistics Database.



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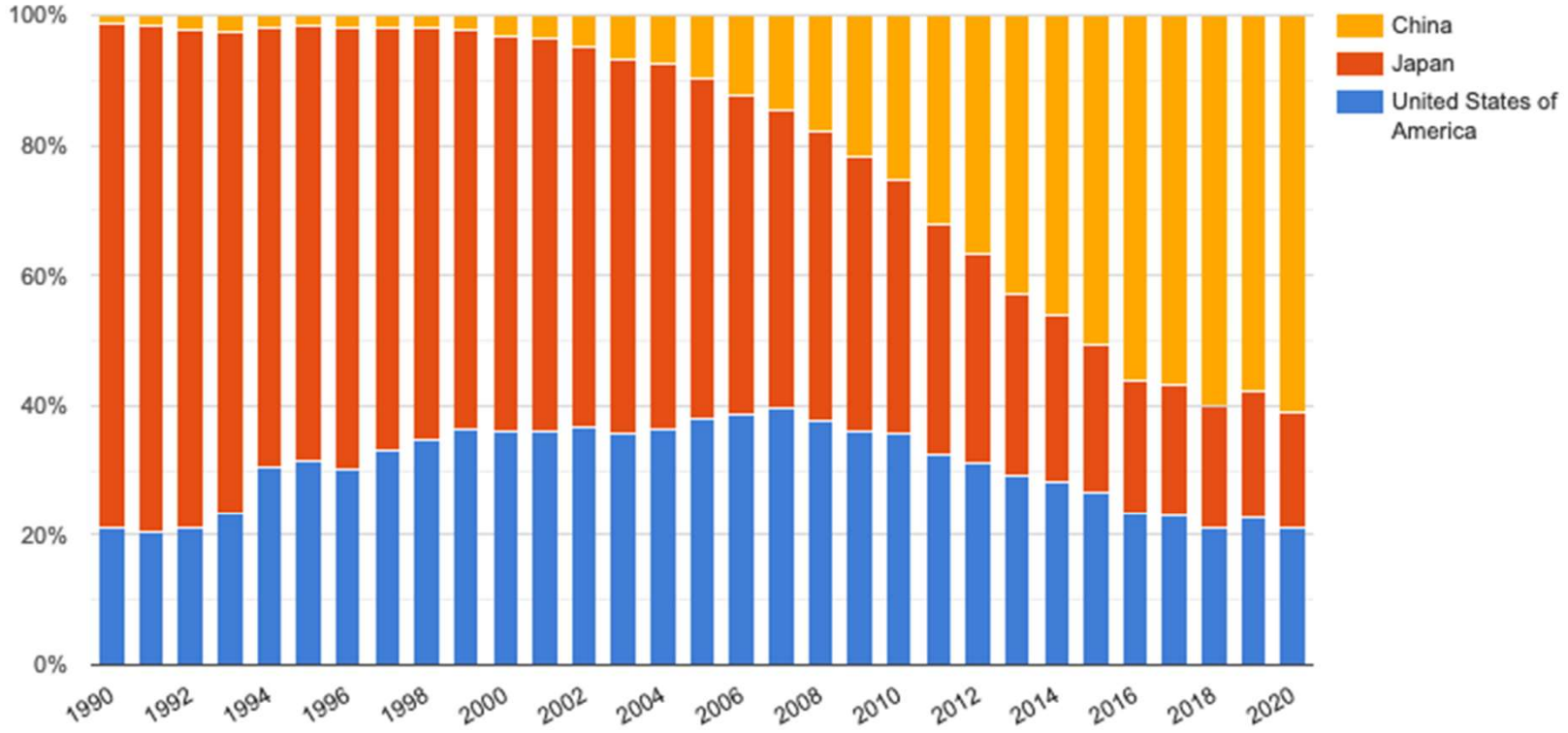
Patent applications – Star countries

Supplementary video
https://www.wipo.int/multimedia-video/en/pressroom/services_top10_2021.mp4



https://www3.wipo.int/ipstats/index.htm?tab=patent

What is patented?

Annex 4: International applications by field of technology (PCT System)

	Technical Field	2019	2020	2021	Share (%)	Growth (%)
I	**Electrical engineering**					
1	Electrical machinery, apparatus, energy	17,194	17,367	18,224	6.9	4.9
2	Audio-visual technology	8,900	11,534	10,837	4.1	-6.0
3	Telecommunications	5,861	6,445	6,371	2.4	-1.1
4	Digital communication	19,050	22,078	23,603	9.0	6.9
5	Basic communication processes	1,554	1,610	1,647	0.6	2.3
6	Computer technology	21,496	24,343	26,092	9.9	7.2
7	IT methods for management	5,747	5,891	5,298	2.0	-10.1
8	Semiconductors	8,048	8,862	8,346	3.2	-5.8
II	**Instruments**					
9	Optics	8,018	8,371	7,919	3.0	-5.4
10	Measurement	11,451	12,704	12,152	4.6	-4.3
11	Analysis of biological materials	1,917	2,062	2,149	0.8	4.2
12	Control	5,363	5,457	5,182	2.0	-5.0
13	Medical technology	16,916	17,500	18,552	7.1	6.0
III	**Chemistry**					
14	Organic fine chemistry	5,888	6,351	6,150	2.3	-3.2
15	Biotechnology	7,404	7,985	8,745	3.3	9.5
16	Pharmaceuticals	9,785	10,767	12,147	4.6	12.8
17	Macromolecular chemistry, polymers	4,425	4,656	4,478	1.7	-3.8
18	Food chemistry	2,214	2,384	2,467	0.9	3.5
19	Basic materials chemistry	5,589	5,712	5,482	2.1	-4.0
20	Materials, metallurgy	4,417	4,685	4,313	1.6	-7.9
21	Surface technology, coating	3,852	4,014	3,834	1.5	-4.5
22	Micro-structural and nano-technology	390	456	439	0.2	-3.7
23	Chemical engineering	5,074	5,285	5,225	2.0	-1.1
24	Environmental technology	2,705	3,020	2,769	1.1	-8.3
IV	**Mechanical engineering**					
25	Handling	5,954	6,413	6,256	2.4	-2.4
26	Machine tools	4,300	4,315	4,307	1.6	-0.2
27	Engines, pumps, turbines	5,366	5,123	4,441	1.7	-13.3
28	Textile and paper machines	2,769	2,952	2,622	1.0	-11.2
29	Other special machines	7,236	7,483	7,232	2.7	-3.4
30	Thermal processes and apparatus	4,085	4,306	3,926	1.5	-8.8
31	Mechanical elements	5,952	5,847	5,160	2.0	-11.7
32	Transport	11,227	11,290	10,110	3.8	-10.5
V	**Other fields**					
33	Furniture, games	4,625	4,718	4,491	1.7	-4.8
34	Other consumer goods	5,445	6,044	5,840	2.2	-3.4
35	Civil engineering	6,387	6,502	6,317	2.4	-2.8

Note: For confidentiality reasons, data are based on published applications and on the publication date.

Computer technology (9.9% of total) accounted for the largest share of published PCT applications, followed by digital communication (9%), medical technology (7.1%), electrical machinery (6.9%), and measurement (4.6%)

Six of the top 10 technology fields recorded growth in 2021, with pharmaceuticals (+12.8%) reporting the fastest rate of growth, followed by biotechnology (+9.5%), computer technology (7.2%) and digital communication (+6.9%).

Pandemic effect!

Year 2021 data from WIPO: https://www.wipo.int/export/sites/www/pressroom/en/documents/pr_2022_886_annexes.pdf#page=4

Top patenting companies

Annex 2: Top PCT applicants

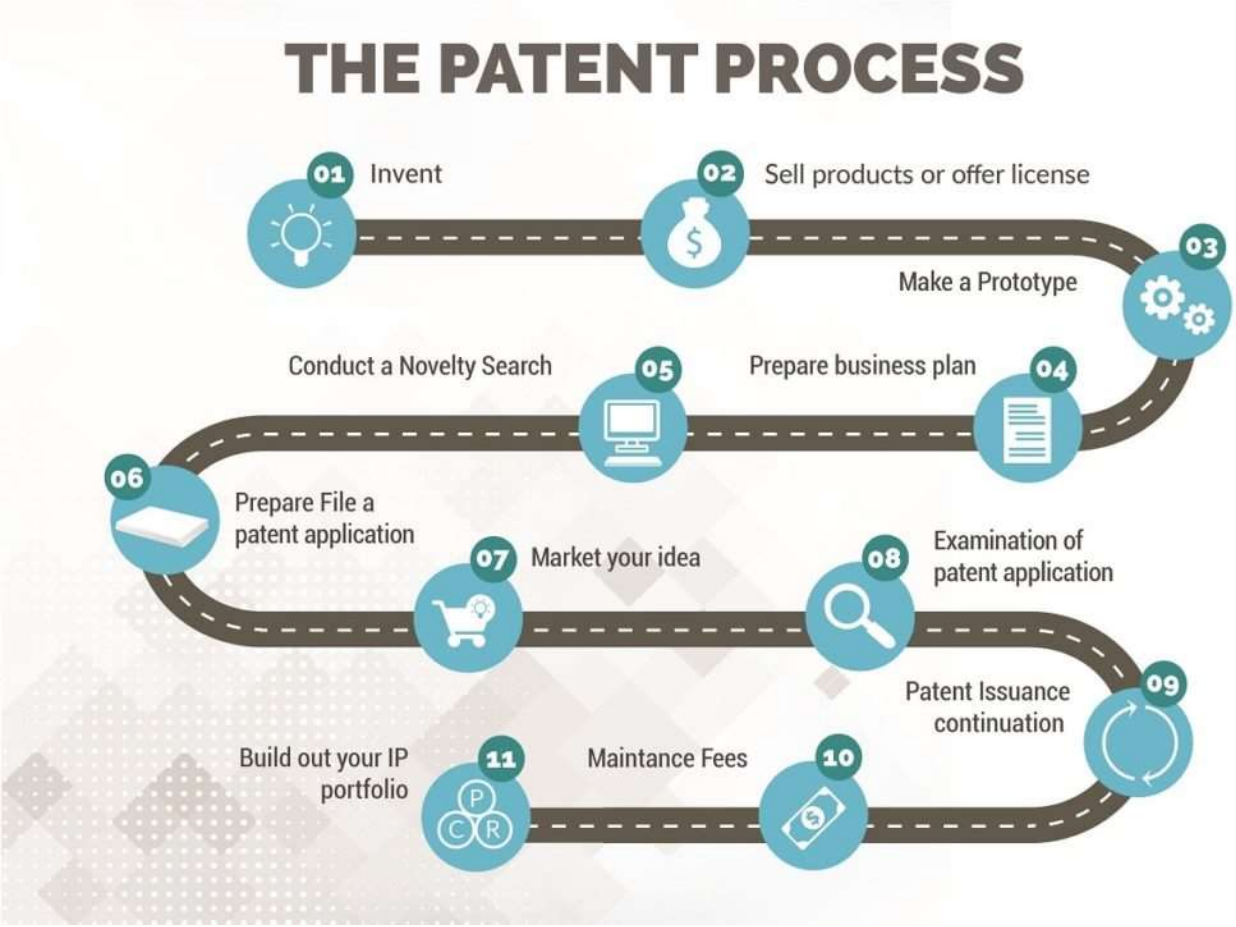
2021 overall position in PCT ranking	Position changed in overall PCT ranking	Applicant's Name	Origin	2020	2021
1	0	HUAWEI TECHNOLOGIES CO., LTD.	China	5,464	6,952
2	3	QUALCOMM INCORPORATED	U.S.	2,173	3,931
3	-1	SAMSUNG ELECTRONICS CO., LTD.	Republic of Korea	3,093	3,041
4	0	LG ELECTRONICS INC.	Republic of Korea	2,759	2,885
5	-2	MITSUBISHI ELECTRIC CORPORATION	Japan	2,810	2,673
6	2	GUANG DONG OPPO MOBILE TELECOMMUNICATIONS CORP., LTD	China	1,801	2,208
7	0	BOE TECHNOLOGY GROUP CO.,LTD	China	1,892	1,980
8	-2	TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)	Sweden	1,989	1,877
9	0	SONY GROUP CORPORATION	Japan	1,793	1,789
10	0	PANASONIC INTELLECTUAL PROPERTY MANAGEMENT CO., LTD.	Japan	1,611	1,741

https://www.wipo.int/export/sites/www/pressroom/en/documents/pr_2022_886_annexes.pdf#page=2

The patenting journey

Supplementary video

https://youtu.be/kmvAeCL0IHQ



Patent Strategies

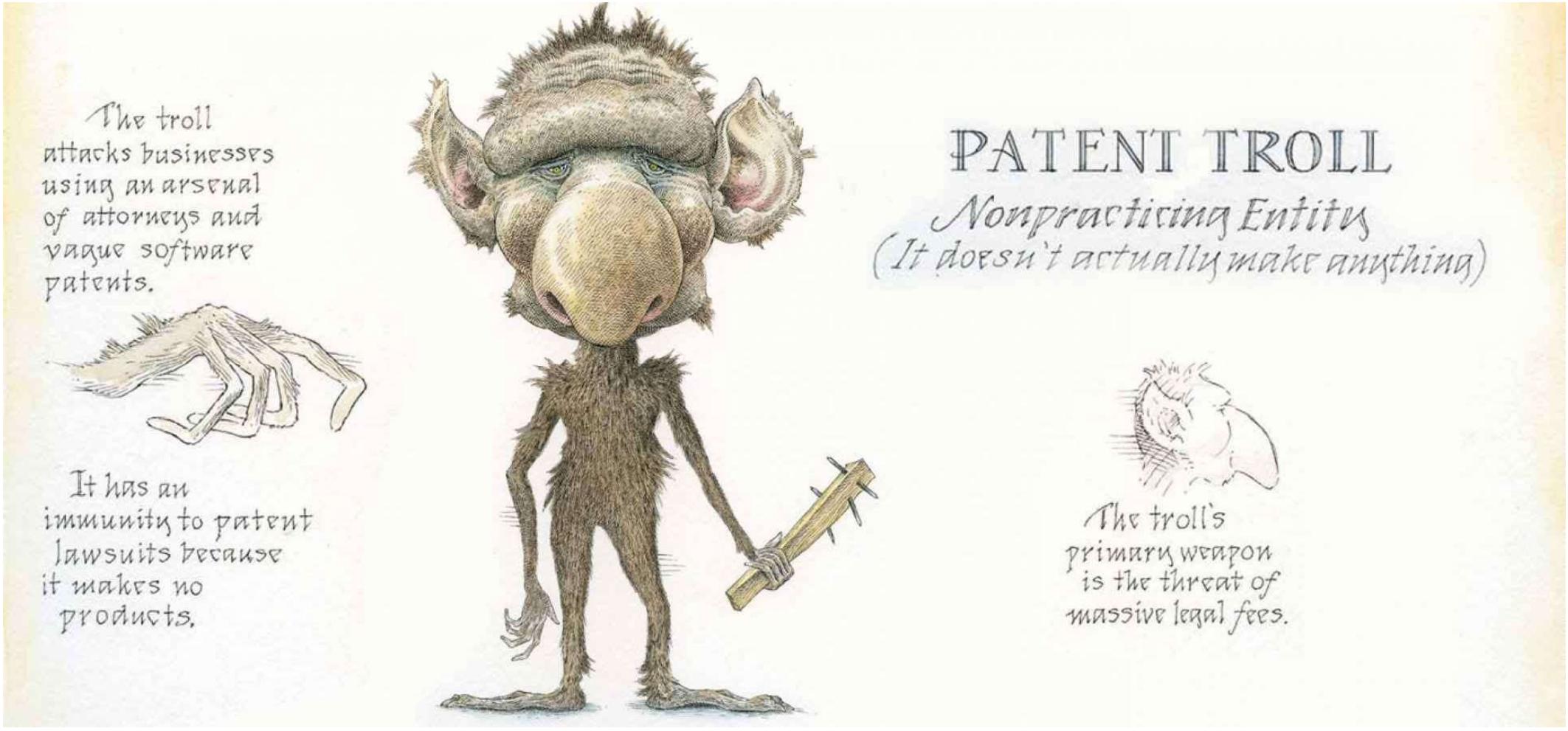
It is typical to assume that an inventor seeks a patent because they desire to make and **sell the invention** themselves.

However, inventors and firms may monetize patents in a range of different ways, including **licensing** the technology to others, or **selling the patent rights** to another firm that can better utilize the technology.

Sometimes firms seek patents just to **limit the options of competitors**

Patent trolling

Sometimes firms seek patents just to earn revenues through aggressive patent lawsuits. These actions are sometimes referred to as "**patent trolling**." Apple claims to be the #1 target for patent trolls, having faced nearly 100 lawsuits between 2011 and 2014.

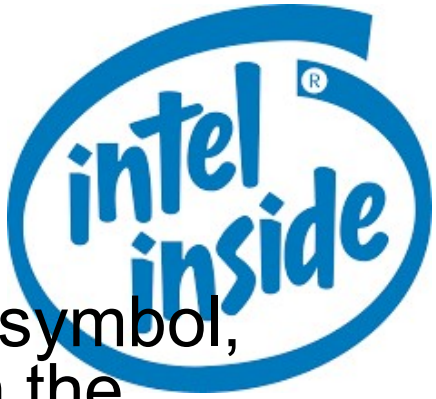


Patent thickets

Dense webs of “patent thickets” can make it hard for firms to compete, and stifle innovation.

- Firms sometimes buy bundles of patents just to create a “war chest” to defend themselves from lawsuits by offering a credible threat of retaliation.
- For example, in 2011, the bankrupt Nortel auctioned off its massive patent portfolio. A consortium called **Rockstar Bidco** that included Microsoft, Apple, RIM, Sony, and Ericsson, won the auction for $4.5 billion, beating out Google which bid $4.4 billion. Google subsequently bought 1,030 IBM patents that covered a range of technologies. These patents were not necessary for Google's business directly; rather they provided a retaliation threat to others that might attack them through patent suits.

Trademarks



Trademarks and Service Marks: a word, phrase, symbol, design, or other indicator that is used to distinguish the source of goods form one party from goods of another (for example, Nike “swoosh” symbol).

- Rights to trademark are established in legitimate use of mark; do not require registration.
- However, marks must be registered before suit can be brought over use of the mark.
- Registration can also be used to establish international rights over trademark.

Two treaties simplify registration of trademarks in multiple countries: **Madrid Agreement Concerning the International Registration of Marks**, and the **Madrid Protocol**. Countries that adhere to either or both are in **Madrid Union**.

Trademarks – Top applicants

Supplementary video

https://www.wipo.int/multimedia-video/en/pressroom/madrid_figures_1990_2021.mp4

Annex 6: Top Madrid applicants

2021 Ranking	Position Changed	Applicant's Name	Origin	2020	2021
1	4	L'OREAL	France	116	171
2	2	ADP GAUSELMANN GMBH	Germany	123	120
3	8	GLAXO GROUP LIMITED	U.K.	64	110
4	-2	HUAWEI TECHNOLOGIES CO., LTD.	China	197	98
5	-4	NOVARTIS AG	Switzerland	233	94
6	1	EURO GAMES TECHNOLOGY LTD.	Bulgaria	84	93
7	1	APPLE INC.	U.S.	80	92
8	6	HENKEL AG & CO KGAA	Germany	60	90
9	-6	SHISEIDO COMPANY, LTD	Japan	133	89
10	-1	SYNGENTA CROP PROTECTION AG	Switzerland	78	85

https://www.wipo.int/export/sites/www/pressroom/en/documents/pr_2022_886_annexes.pdf#page=6

L'Oreal brands portfolio

Copyrights

Copyright: a form of protection granted to works of authorship.

Copyright prohibits others from:

- Reproducing the work in copies or phonorecords.
- Preparing derivative works based on the work.
- Distributing copies or phonorecords for sale, rental, or lease.
- Performing the work publicly.
- Displaying the work publicly.

Work that is not fixed in tangible form is not eligible.

“Doctrine of fair use” stipulates that others can typically use copyrighted material for purposes such as criticism, new reporting, teaching research, etc.

Copyright for works created after 1978 have protection for author’s life plus 70 years. Before 1978, it was only 28 years from the time it was secured.

Copyrights protection around the world

- Copyright law varies from country to country.
- However, the **Berne Union for the Protection of Literary and Artistic Property** (“Berne Convention”) specifies a minimum level of protection for member countries.
- Berne convention also eliminates differential rights to citizens versus foreign nationals.

To sum up

	Trademark	Patent	Copyright
What's legally protected?	A **word, phrase, design**, or a combination that identifies your goods or services, distinguishes them from the goods or services of others, and indicates the source of your goods or services.	Technical **inventions**, such as chemical compositions like pharmaceutical drugs, mechanical processes like complex machinery, or machine designs that are new, unique, and usable in some type of industry.	Artistic, literary, or intellectually **created works**, such as novels, music, movies, software code, photographs, and paintings that are original and exist in a tangible medium, such as paper, canvas, film, or digital format.
What's an example?	Coca-Cola® for soft drinks	A new type of hybrid engine	Song lyrics to “Let It Go” from "Frozen"
What are the benefits of federal protection?	Protects the trademark from being registered by others without permission and helps you prevent others from using a trademark that is similar to yours with related goods or services.	Safeguards inventions and processes from other parties copying, making, using, or selling the invention without the inventor's consent.	Protects your exclusive right to reproduce, distribute, and perform or display the created work, and prevents other people from copying or exploiting the creation without the copyright holder's permission.

Trade Secrets

Trade Secret: information that belongs to a business that is generally unknown to others.

Firm can protect proprietary product or process as trade secret **without disclosing** detailed information that would be required in patent.

Enables broad class of assets and activities to be protectable.

To qualify:

- Information must not be generally known or ascertainable.
- Information must offer a distinctive advantage to the firm that is contingent upon its secrecy.
- Trade secret holder must exercise reasonable measures to protect its secrecy.

The secret formulas

Supplementary Video

Short video on:

Innovation Strategy: Intellectual Property.

https://youtu.be/0Bb8MAF9EPg

The Effectiveness and Use of Protection Mechanisms [1]

In some industries, legal protection mechanisms are more effective than others.

- For example, in pharmaceutical patents are powerful; in electronics they might be easily invented around.

It is notoriously difficult to protect manufacturing processes and techniques.

In some situations, diffusing a technology may be more valuable than protecting it.

However, once control is relinquished it is difficult to reclaim.

Theory In Action

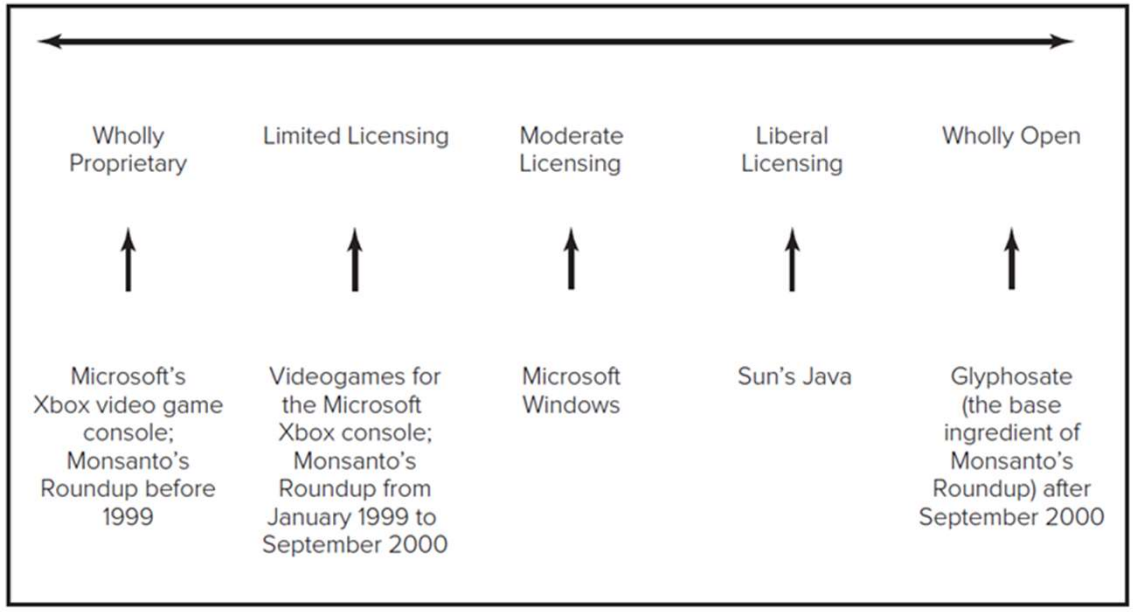
IBM and the Attack of the Clones.

- In 1980, **IBM** was in a hurry to introduce a personal computer (P C). It used off-the-shelf components such as Intel microprocessors an operating system from Microsoft, MS DOS.
- It believed that its proprietary basic input/output system (BIOS) would protect the computer from being copied.
- However, **Compaq** reverse engineered the BIOS in a matter of months without violating the copyright, and quickly introduced a computer that behaved like an IBM computer in every way. Compaq sold a record-breaking 47,000 IBM-compatible computers its first year, and other clones were quick to follow.

The Effectiveness and Use of Protection Mechanisms 2

Wholly Proprietary Systems versus Wholly Open Systems.

- Wholly proprietary systems may be legally produced or augmented only by their developers.
- Wholly open system may be freely accessed, augmented and distributed by anyone.
- Many technologies lie somewhere between these extremes.



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The Effectiveness and Use of Protection Mechanisms 3

Advantages of Protection.

- Proprietary systems offer greater rent appropriability.
- Rents can be used to invest in further development, promotion, and distribution.
- Give the firm control over the evolution of the technology and complements.

Advantages of Diffusion.

- May accrue more rapid adoptions if produced and promoted by multiple firms.
- Technology might be improved by other firms (though external development poses its own risks).

The Effectiveness and Use of Protection Mechanisms 4

Production Capabilities, Marketing Capabilities, and Capital.

- Factors influencing benefits of protection versus diffusion.
  1. Can firm produce the technology at sufficient volume or quality levels?
  2. Are complements important? Are they available in sufficient range and quality? Can the firm afford to develop and produce them itself?
  3. Is there industry opposition against sole source technology?
  4. Can the firm improve the technology well enough and fast enough to compete with others?
  5. How important is it to prevent the technology from being altered in ways that fragment it as a standard?
  6. How valuable is architectural control to the firm? Does it have a major stake in complements for the technology?

Discussion Questions

1. What are the differences between patents, copyrights, and trademarks?
2. Consider a firm that is considering marketing its innovation in multiple countries. What factors should this firm consider in formulating its protection strategy?
3. When will trade secrets be more useful than patents, copyrights or trademarks?
4. Can you identify a situation in which none of the legal protection mechanisms discussed (patents, copyrights, trademarks, trade secrets) will prove useful?
5. Describe a technological innovation not discussed in the chapter and identify where you think it lies on the control continuum between wholly proprietary and wholly open.
6. What factors do you believe influenced the choice of protection strategy used for the innovation identified above? Do you think the strategy was a good choice?

Part Three: Implementing Technological Innovation Strategy

Structuring the firm to improve its likelihood of innovating, its effectiveness at new product development, and its speed of new product development,

Managing new product development processes to maximize fit with customer needs, while simultaneously minimizing development cycle time and controlling development costs,

Composing, structuring, and managing new product development teams to maximize new product development effectiveness,

Crafting a strategy for effectively deploying the innovation into the marketplace, including timing, licensing strategies, pricing strategies, distribution, and marketing.

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Accessibility Content: Text Alternatives for Images

Patents, Trademarks and Copyrights 3 – Text Alternative

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The x axis ranges from 2,00,000 to 16,00,000, with an increment of 2,00,000. The y axis represents the countries. The data for patent applications in 2018 and 2019 in different countries read as follows: China, 15,50,000, 14,00,000. United States, 6,00,000, 6,20,000. Japan, 3,00,000, 2,90,000. Republic of Korea, 2,00,000, 2,10,000. European Patent Office, 1,80,000, 1,85,000. Germany, 50,000, 50,000. India, 40,000, 41,000. Russian Federation, 30,000, 30,100. Canada, 25,000, 25,100. Australia, 24,000, 24,000. Note: All the values are estimated.

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The Effectiveness and Use of Protection Mechanisms 2 – Text Alternative

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Upward arrows from Microsoft's X box video game console; Monsanto's Roundup before 1999, videogames for the Microsoft X box console; Monsanto's roundup from January 1999 to September 2000, Microsoft Windows, Sun's Java, Glyphosate that is the base ingredient of Monsanto's roundup after September 2000 point to wholly Proprietary, Limited Licensing, Moderate Licensing, Liberal Licensing, and Wholly Open respectively. A horizontal arrow lies above it.

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