

SCIENTIFIC RESEARCH METHODOLOGIES AND TECHNIQUES

Unit 11: INTELLECTUAL PROPERTY RIGHTS

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1. CONCEPTS

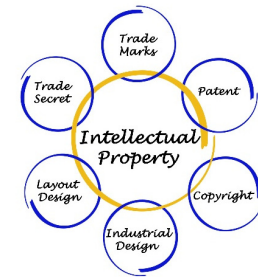
Intellectual property: Encompasses all tangible and intangible products of human mind: ideas, inventions, technologies, artworks, music and literature, that are intangible when first created, but that may become valuable in tangible form as products

*Intellectual property refers to **creations of the mind**: inventions, literary and artistic works, and symbols, names, images, and designs used in commerce.*
WIPO

Intellectual property rights (IPR) - rights granted to creators and owners of works that are the result of human intellectual creativity.

These works can be in the industrial, scientific, literary or artistic domains, thereby providing an incentive for the author or inventor to develop and share the information rather than keep it secret.

These include: { Patent
Utility model
Trademark
Copyright
Design model
Etc.



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A discovery is not an invention.

A **discovery** is a matter of observation and cognition of nature; an **invention** corresponds to something new that has not previously been provided for in nature.

e.g. H.C. Ørsted *discovered* the electromagnetic field; the electric motor was *invented*.

Inventions are new solutions to technical problems.

These new solutions are **ideas** and can be protected as such. Protection granted to the inventor (e.g. Patent) is protection against any use of the invention without authorization of the owner.

Copyright protects only the **form of expression of ideas**, not the ideas themselves.

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- IPRs as financial incentives
- Justified when the creator's investment is costly and highly risky
- Considered in the developed world as catalysts for economic development and modernization
 - encourage innovation
 - economic and cultural enrichment
- Prevention of problems due to piracy and counterfeiting (health sector)
- Natural and human right (author's moral right)

Balance between incentives to future production and the preservation of the public domain ?

E-commerce raises a number of legal issues regarding the validity, legal effect and enforceability of transactions, privacy, security, protection of ideas, brands of goods and services in an on-line environment etc.

Developed vs developing countries?

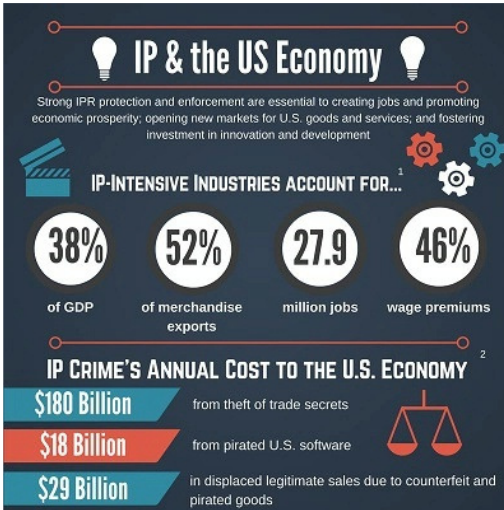
Peer-to-peer communication techniques have made difficult the definition of what is an *on-line private user*
→ issues of balance between individual liberty and free non-market exchange values versus commercial distribution rights

2. PROTECTION MECHANISMS

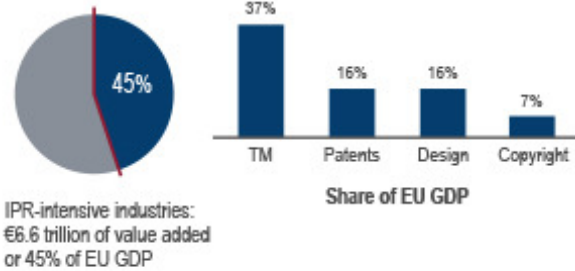


Protection vs enforcement ?

Is it important?



Contribution to EU GDP



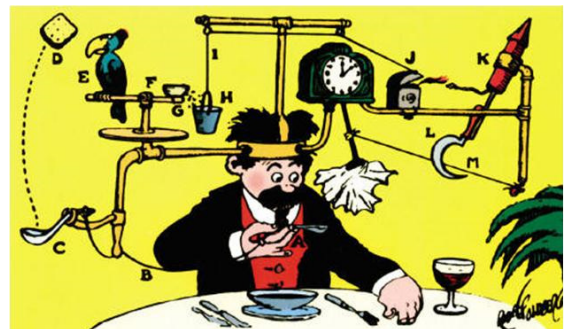
<https://www.epo.org/en/news-events/news/intellectual-property-rights-strongly-benefit-european-economy-epo-euipo-study>

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1 Industrial property:

- inventions (patents)
- trademarks
- industrial designs
- geographic indications of source

Duration: generally ~ 20 years



2 Copyright (or authors rights):

- literary and artistic works such as novels, poems and plays, films, musical works
- artistic works such as drawings, paintings, photographs and sculptures, and architectural designs.

Duration: life of autor + 50 years (approx.)

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Protection of inventions that solved an existing “technical” problem.

New solutions are, in essence, **ideas** and are protected as such.

Discovering something that already exists in nature, e.g. a previously unknown plant variety, is not an invention. The process for extraction of a new substance from a plant maybe an invention. WIPO



Patents are intended to provide **incentives to individuals**, offering them recognition for their creativity and material reward for their marketable inventions ... **if** it is exploited !



"I tried reinventing myself, but someone already has the patent."

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Conditions of patentability:

- *Industrial Applicability (utility).* The invention must be of practical use, or capable of some kind of industrial application.
- *Novelty.* It must show some new characteristic that is not known in the body of existing knowledge (referred to as **prior art**) in its technical field.
- *Inventive step (non-obviousness).* It must show an inventive step that could not be deduced by a person with average knowledge of the technical field.
- *Patentable subject matter.* The invention must fall within the scope of patentable subject matter as defined by national law. This varies from one country to another. Many countries exclude from patentability such subject matter as scientific theories, mathematical methods, plant or animal varieties, discoveries of natural substances, methods for medical treatment (as opposed to medical products), and any invention where prevention of its commercial exploitation is necessary to protect public order, good morals or public health.

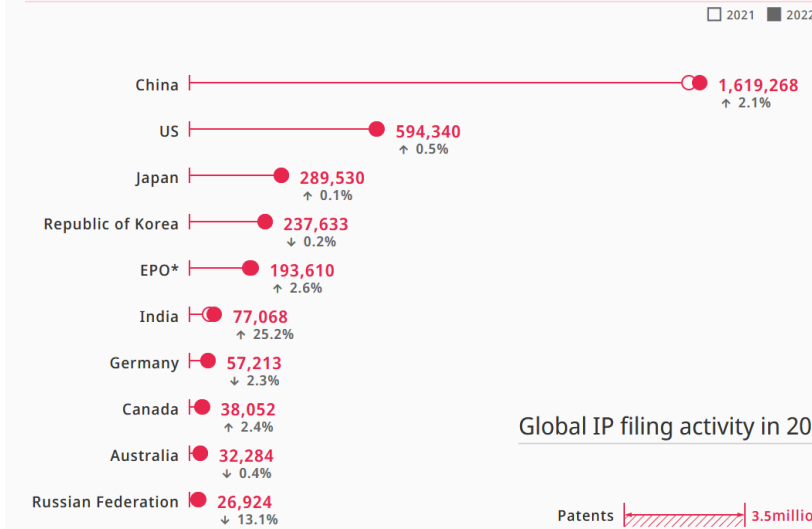
Conditions are not the same in every country ...



www.wipo.int

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Where was patent activity highest?

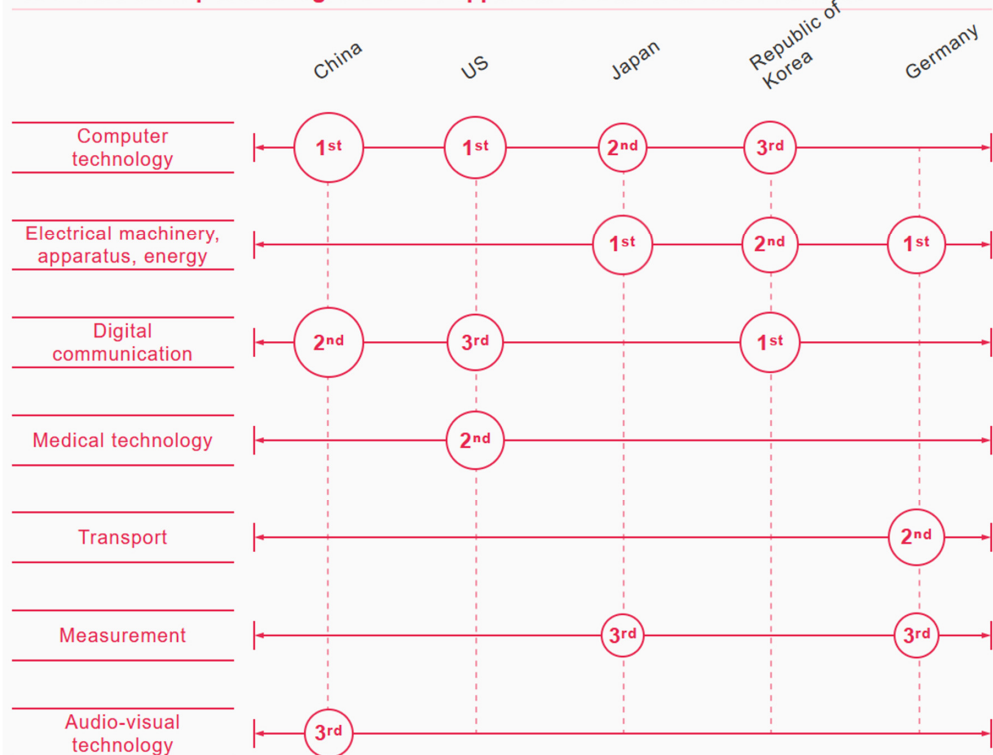


Global IP filing activity in 2022



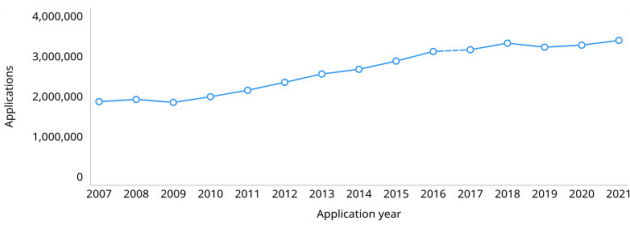
<https://www.wipo.int/en/ipfactsandfigures/patents>

What were the top technologies for PCT applications from different countries?

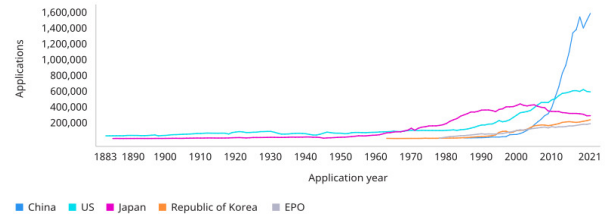


Patent applications filed worldwide grew by 3.6% in 2021

1.1. Patent applications worldwide, 2007-2021



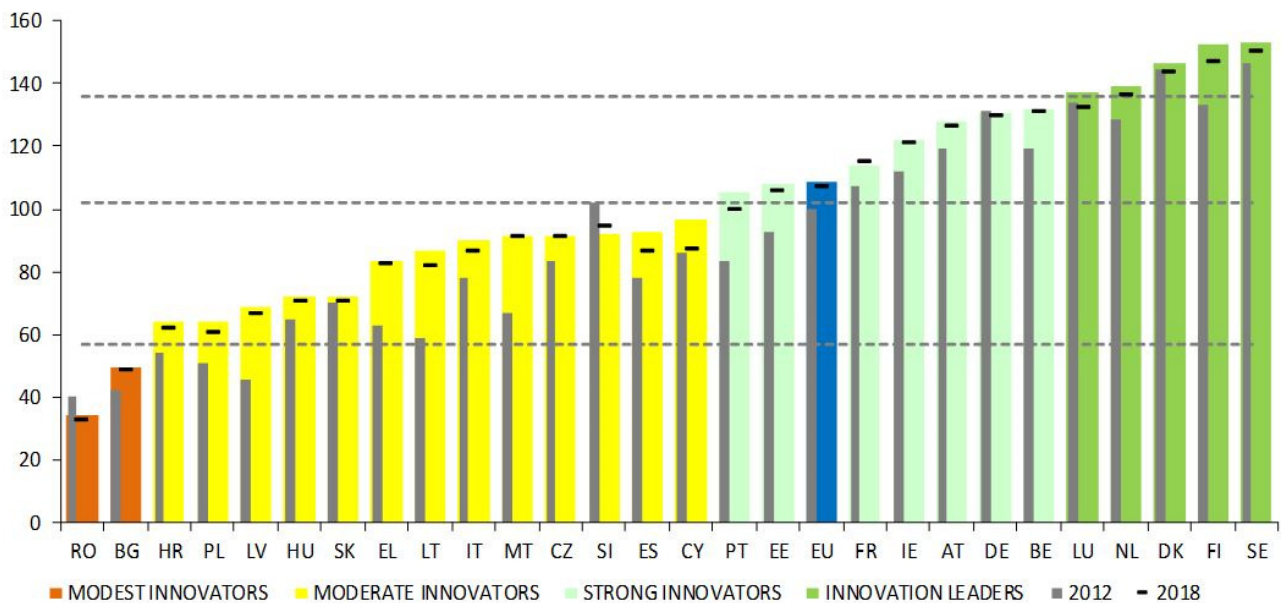
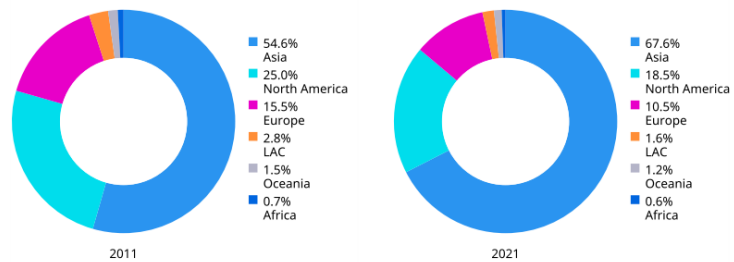
Trend in patent applications for the top five offices, 1883-2021



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Two-thirds of patent filings activity worldwide took place in Asia

1.3. Patent applications by region, 2011 and 2021



https://ec.europa.eu/commission/presscorner/detail/en/IP_20_1158

Map showing the geographic coverage of European patents as of 1 October 2022

■ Member states (39)

- Albania
- Austria
- Belgium
- Bulgaria
- Croatia
- Cyprus
- Czech Republic
- Denmark
- Estonia
- Finland
- France
- Germany
- Greece
- Hungary
- Iceland
- Ireland
- Italy
- Latvia
- Liechtenstein
- Lithuania
- Luxembourg
- Malta
- Monaco
- Montenegro
- Netherlands
- North Macedonia
- Norway
- Poland
- Portugal
- Romania
- San Marino
- Serbia
- Slovakia
- Slovenia
- Spain
- Sweden
- Switzerland
- Turkey
- United Kingdom

■ Extension states (1)

- Bosnia and Herzegovina

■ Validation states (4)

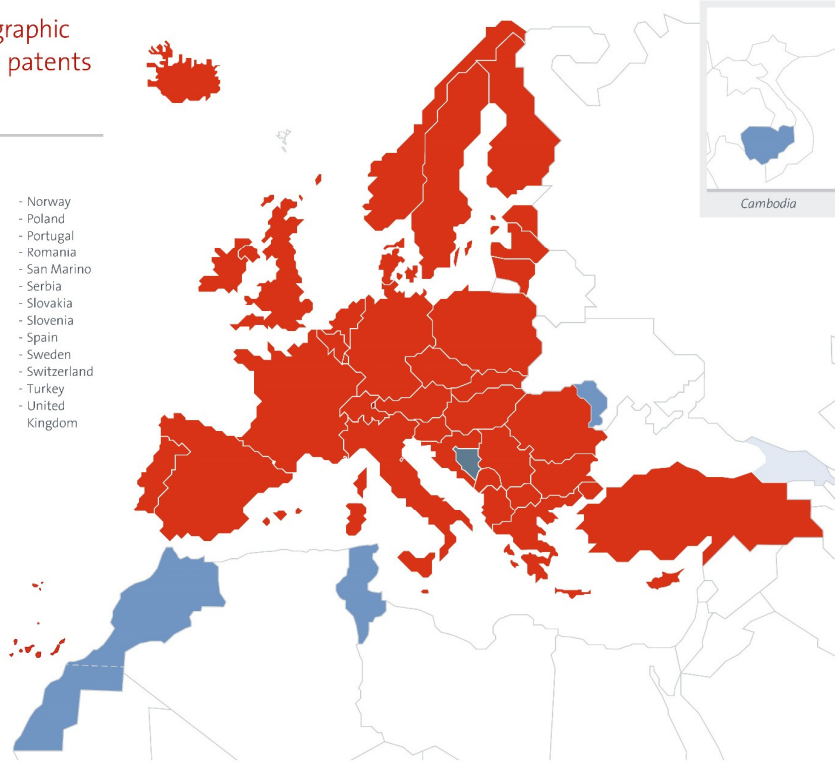
Agreement in force

- Cambodia
- Republic of Moldova
- Morocco
- Tunisia

■ Future validation states (1)

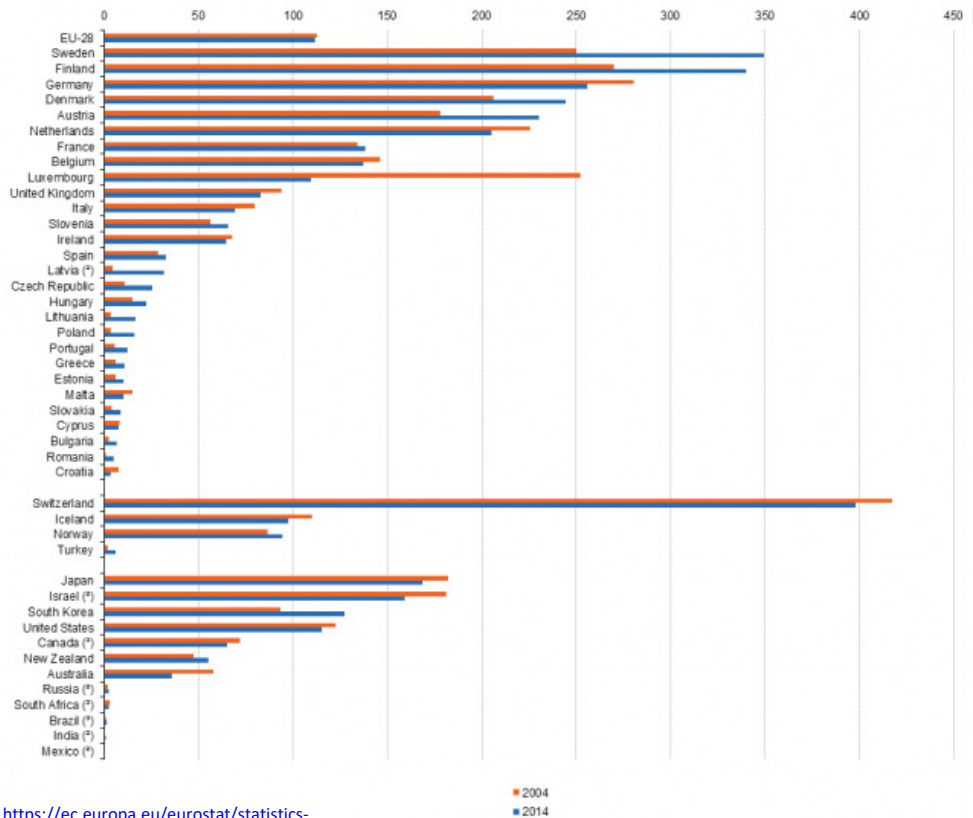
Agreement signed but not in force yet

- Georgia



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EPO applications



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[https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Patent applications to the EPO, 2004 and 2014 \(%C2%B9\) \(per million inhabitants\) YB16.png](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Patent applications to the EPO, 2004 and 2014 (%C2%B9) (per million inhabitants) YB16.png)

NEWS · 18 JANUARY 2018

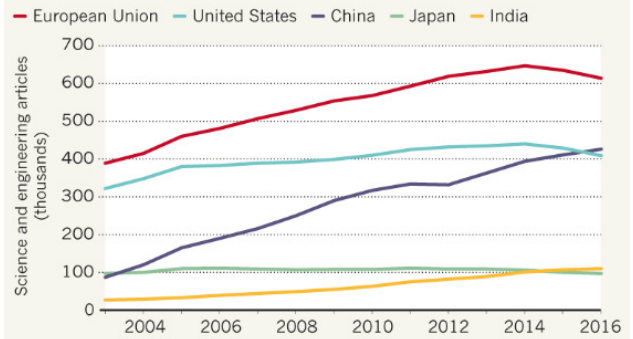
China declared world's largest producer of scientific articles

Report shows increasing international competition, but suggests that United States remains a scientific powerhouse.

(if we don't consider EU)

SHIFTING LANDSCAPE

China has surged to become the world's largest producer of scientific research articles, according to an analysis by the US National Science Foundation. But the United States still outpaces China when it comes to articles that are in the top 1% cited.



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Patents enforcement ...



NEWS & ANALYSIS

Apple sued by NYU doctor who claims patent on Watch's irregular heartbeat monitoring tech

Atrial fibrillation method is used in the Apple Watch to detect irregular heartbeat.

<https://www.firstpost.com/tag/patent-infringement>

The need to go to court ...



NEWS & ANALYSIS

Huawei demands \$1 billion from Verizon for licensing its patented technology

Huawei has long been known for defending itself against U.S. patent infringement claims.



NEWS & ANALYSIS

Apple has lost \$145.1 million to WiLan Inc in a patent infringement case

It was determined that Apple iPhones infringed two WiLan patents relating to wireless technology.

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Patents and scientific research?



“Manuel Jalon Corominas is the man who 50 years ago in 1956 patented the wringing mechanism for a mop. Of course, mops had existed before, the first patent was taken out by an Afro-American (he was black & his parents were slaves) Thomas Stewart in 1893.

But Stewart had overlooked the problem of "dirty water". Manuel Jalon Corominas solved that by inventing the "one piece wringer" which included a bucket and side attachment to wring a wet mop and offer whomever did the mopping an opportunity to change the water. This revolutionised mopping”.

<http://www.indymedia.ie/article/77333>

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Are these mutually exclusive?

Patent AND Publish

BUT ... Get the sequence right!

Patent THEN Publish

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Utility model – a title for protection of technically less complex inventions or for inventions that have a short commercial life.

Similar to the patent, but usually has a shorter term (often 6 or 10 years) and less stringent patentability requirements
 ... More suited to what may be considered as "incremental inventions"
 ... Particularly suited for SMEs that make "minor" improvements to, and adaptations of, existing products.

Examples:

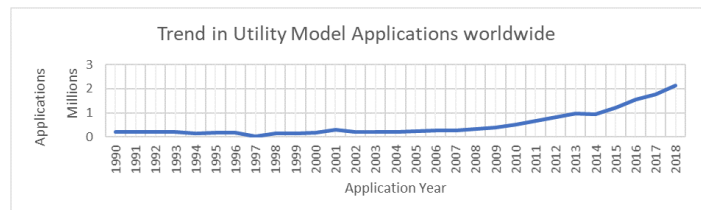
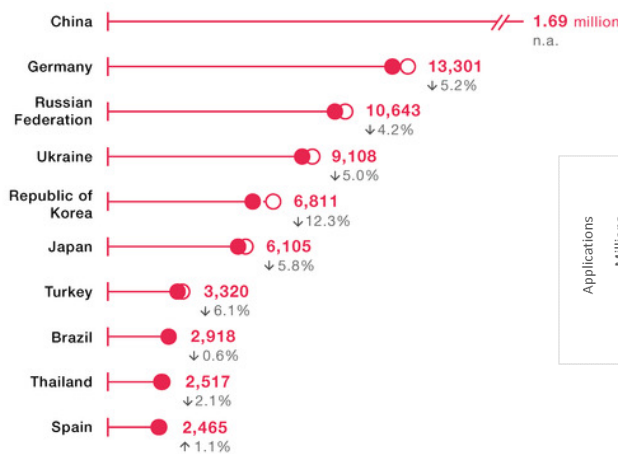
Devices having a **short life cycle**, embodying a creative idea applicable to the shape, structure or other technological aspects of a product, while typically showing potential for early implementation and marketing – **examples** could include an improved device capable of reducing the amount of water used to flush a toilet or, a bottle cork remover capable of faster operation than known devices



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The IP office of China received 1.69 million utility model applications

11. Utility model applications for the top 10 offices



LEGEND
 ○ 2016 ● 2017

n.a. indicates not available. China's 2017 data are not comparable with its previous year's data due to a change in how this office counts the applications it receives. For this reason it is not possible to report China's 2017 growth rate.

Source: WIPO Statistics Database, September 2018.

https://commons.wikimedia.org/wiki/File:11_Utility_model_applications_for_the_top_10_offices.png

Some countries use other terms: "short patent", "utility certificate", ...

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Where can Utility Models be Acquired?

Currently, only 97 countries out of 192 ones grant patents for utility models:

Argentina, the United Arab Emirates, Albania, Armenia, Austria, Angola, the Republic of Azerbaijan, Burkina Faso, Bulgaria, Bahrain, Benin, Brazil, Botswana, the Republic of Belarus, Belize, Belgium, the Central African Republic, Congo, Côte d'Ivoire, Chile, Cameroon, China, Colombia, Costa Rica, Cuba, the Czech Republic, Germany, Djibouti, Denmark, the Dominican Republic, Ecuador, Estonia, Egypt, Spain, Finland, Gabon, Georgia, Ghana, Gambia, Guinea, Equatorial Guinea, Guatemala, Guinea-Bissau, Honduras, Hungary, Japan, Kenya, Kirghizia, Cambodia, the Comoro Islands, the Democratic People's Republic of Korea, the Republic of Korea, the Republic of Kazakhstan, Liberia, Lesotho, Mali, Mauritania, Malawi, Mexico, Mozambique, Namibia, Niger, Nicaragua, Oman, Panama, Peru, the Philippines, Poland, Portugal, Romania, the Russian Federation, Rwanda, Sudan, Slovakia, Sierra Leone, Senegal, the Democratic Republic of Sao Tome and Principe, El Salvador, Swaziland, the Republic of Chad, Togo, Tajikistan, East Timor, Tanzania, the Ukraine, Uganda, Uzbekistan, Zambia, Zimbabwe, France, Italy, Ireland, Ethiopia, Greece, the Netherlands, the Republic of Moldova, Trinidad and Tobago, Turkey.

Utility models only offer protection in the territories it is applied for

<https://zuykov.com/en/about/articles/what-countries-there-are-utility-models-and-what-c/>

https://ipo.org/wp-content/uploads/2013/03/Utility_Model_protection.pdf

Industrial designs – the ornamental or esthetic creations determining the **appearance** of industrial products



This right is granted to protect the original, **ornamental and non-functional features** of a product that result from a design activity.

Designs may be protected if:

- they are *novel*, that is if no identical design has been made available to the public;
- they have *individual character*, that is the "informed user" would find it different from other designs which are available to the public.



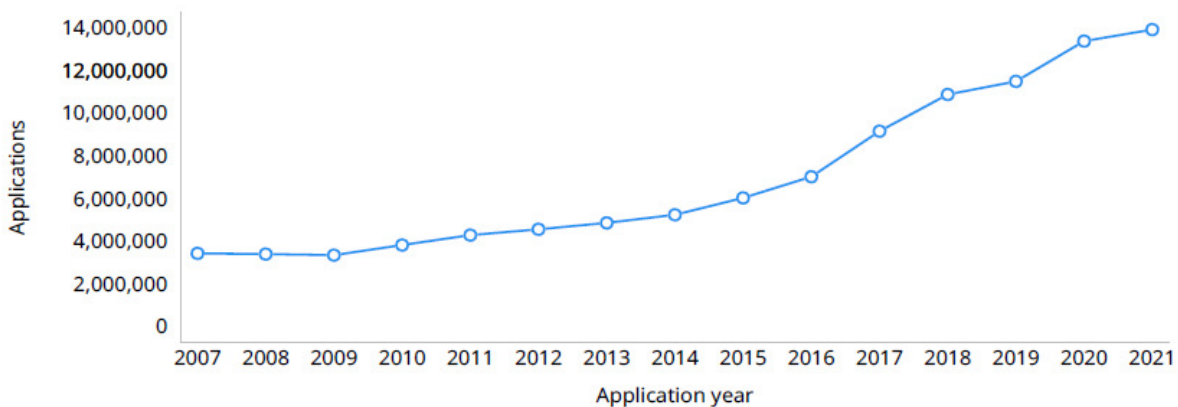
Trademark – a sign, or combination of signs, that distinguishes the goods or services of one enterprise from those of another



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An estimated 13.9 million trademark applications were filed worldwide in 2021

2.1. Trademark applications worldwide, 2007–2021



Source: Figure B1.

<https://ec.europa.eu/newsroom/rtd/items/771163/en>

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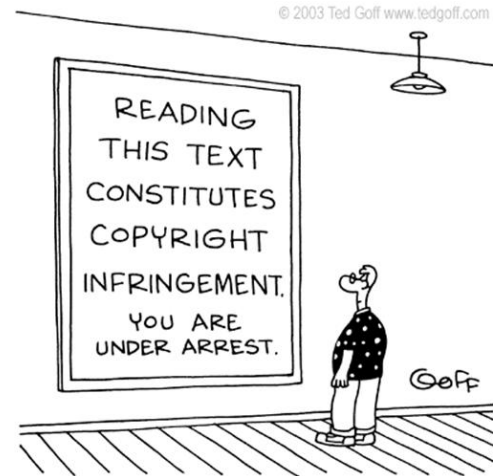
Copyright - a protection related to literary and artistic creations, such as books, music, paintings and sculptures, films and technology-based works such as computer programs and electronic databases.

WIPO

It is **not ideas** but their **expression** that are protected by copyright law.

Copyright owner: The first owner of copyright in a work is the person who created the work.

Copyright emerges with the creation of the work; i.e. no application is needed...



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Works protected by copyright (Berne Convention):

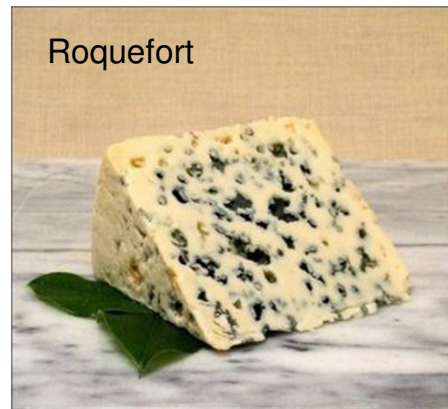
- books, pamphlets and other writings;
- lectures, addresses, sermons;
- dramatic or dramatico-musical works;
- choreographic works and entertainments in dumb show;
- musical compositions with or without words;
- cinematographic works to which are assimilated works expressed by a process analogous to cinematography;
- works of drawing, painting, architecture, sculpture, engraving and lithography;
- photographic works, to which are assimilated works expressed by a process analogous to photography;
- works of applied art; illustrations, maps, plans, sketches and three-dimensional works relative to geography, topography, architecture or science;
- "translations, adaptations, arrangements of music and other alterations of a literary or artistic work, which are to be protected as original works without prejudice to the copyright in the original work."
- "collections of literary or artistic works such as encyclopaedias and anthologies which, by reason of the selection and arrangement of their contents, constitute intellectual creations, are to be protected as such, without prejudice to the copyright in each of the works forming part of such collections."

Other works:

Computer Programs

Multimedia productions

Geographical indication – a sign used on goods that have a specific geographical origin and possess qualities or a reputation that are due to that place of origin.



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Trade secret - a formula, practice, process, design, instrument, pattern, or compilation of information which is not generally known or reasonably ascertainable, by which a business can obtain an economic advantage over competitors or customers.

In some jurisdictions, such secrets are referred to as "confidential information" or "classified information".

Wikipedia

A company can protect its confidential information through non-compete and non-disclosure **contracts with its employees** (within the constraints of employment law, including only restraint that is reasonable in geographic and time scope).



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Bringing it all together IPR Example

Remember: A product may have more than one form of IP protection

- **Patent** - ring pull
- **Confidential information** - recipe, ingredients
- **Trade Mark** – Coca-cola brand
- **Design** - Colour, artwork
- **Copyright** – typographical arrangement of text



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[Weir, 2008]

Example: EC-funded projects

Background

Information which is held by the project partners prior to their accession to the agreement. Includes IP as copyright, patents/ patent applications (filed prior to access to agreement).

Foreground

All results which are generated under the project – whether or not protectable. Such results may include copyrights, design or patent rights, trademarks or others.



Foreground resulting from the project is **owned by the participant generating it**. When foreground is generated jointly (i.e. where the separate parts of some result cannot be attributed to different participants), it will be jointly owned, unless the participants concerned agree on a different solution

Joint owners must agree among themselves on the **allocation and the terms of exercising the ownership** of the foreground. In the absence of such an agreement (or pending its conclusion), a default joint ownership regime applies.

Transfers of ownership of foreground are allowed, though the obligations regarding that foreground must be passed on to the transferee. In principle, as long as the participant concerned is required to grant access rights, notification must be given to the other participants, during which time they have the right to object. However, they may agree in advance that no prior notification is necessary with regard to a specifically identified third party.

Valuable foreground should be protected.

Protection is not mandatory in all cases, though the decision *not to protect foreground should preferably be made in consultation with the other participants*, which may wish to take ownership. If valuable foreground is left unprotected, the Commission may take ownership.

Each participant shall ensure that the foreground it owns is **disseminated** as swiftly as possible. However, any dissemination (including publications or on web-pages) should be delayed until a decision about its possible protection has been made (through IPR or trade secrets). The other participants may object to the dissemination activity if their legitimate interests.



“ IP issues to be considered during grant preparation and project implementation”

“ Specify and agree on central IP arrangements as part of a comprehensive and elaborated Consortium Agreement”

Purpose	Access to background	Access to results
Implementation of the project	Royalty-free, unless otherwise agreed by participants before their accession to the grant agreement	Royalty-free
Exploitation of project results	Subject to agreement, access rights shall be granted under fair and reasonable conditions (which can be royalty-free)	

The “explosion” of availability of digital content has opened a Pandora's box of issues about intellectual property rights.

New protection schemes

New business models

How to make money from something that is (apparently) available for free?

... There are companies making a lot of money selling water !

Fair use

- Allow certain types of copying and use with or without owner consent, e.g., for critical review, teaching
- A debate over access to conference proceedings from organizations like IFIP, IFAC, etc



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3. RIGHTS IDENTIFICATION

Ownership

- Knowledge resulting from a collaborative R&D project is property of contributing partners
- When a piece of knowledge is the result of several contributions (joint ownership), it is important to determine the **level of contribution of each partner**

In this process it is important to distinguish between the **pre-existing knowledge** and the **knowledge generated by the project**.

European Commission definitions:

"**Background**" - is information and knowledge (including inventions, databases, etc.) held by the participants prior to their accession to the grant agreement, as well as any IPR which are needed for carrying out the project or for using foreground.

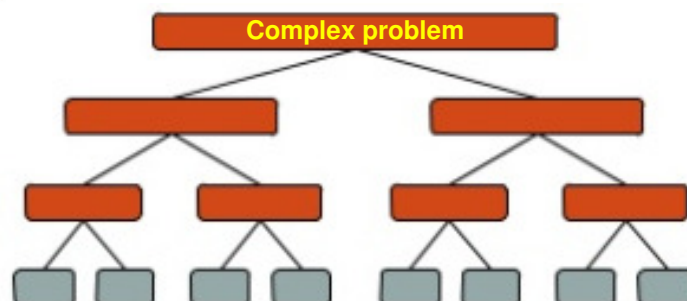
"**Foreground**" - means the results, including information, materials and knowledge, generated in a given project, whether or not they can be protected. It includes IPR, similar forms of protections and unprotected know-how.

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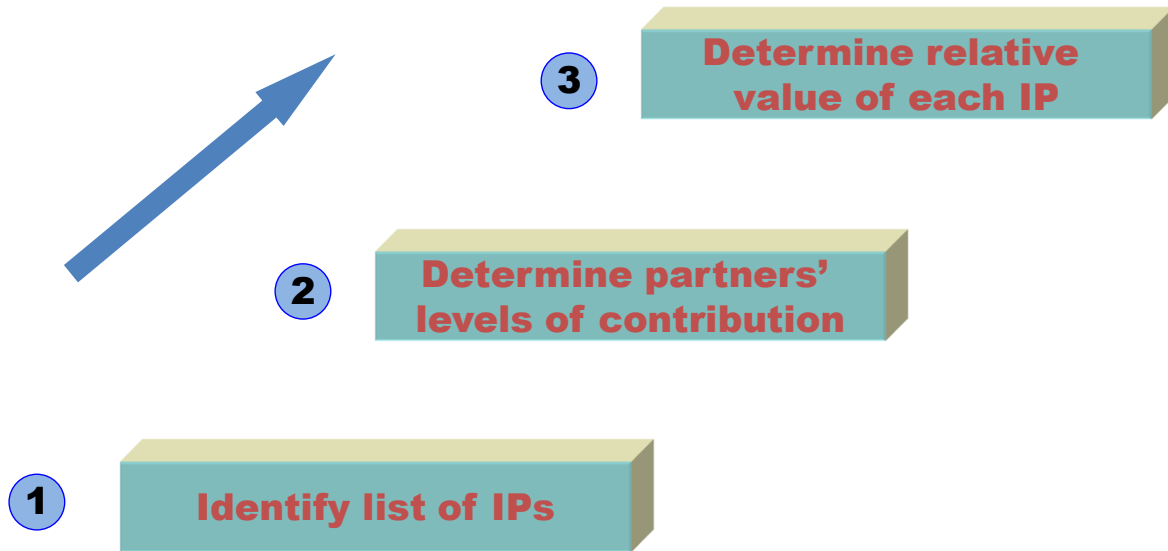
How to identify the amount of IP of each partner in a collaborative project?

... a difficult issue !

The old strategy: "Divide and conquer"



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Some principles:

- The real intellectual **value** of an R&D project lies on the original ideas / architectures / approaches / models and not only on concrete software modules.
- Programming a software module is an activity that can be trivially pursued once a concept / model is specified.
- The long-term **competitive advantage** of companies depends more on the know-how and ideas, than on particular software components that might have a very short life.

IP	Title	Main partner
1	BASIC INTELLECTUAL PROPERTIES	
1.1	"PRODNET" Brand Name & Logo	Partner 5
1.2	RTD Project Management Knowledge	Partner 5
2	ARCHITECTURES AND MODELS	
2.1	PRODNET Basic Architecture	Partner 5
2.2	PRODNET Hierarchical Coordination Architecture	Partner 5
2.3	PRODNET DBP Management	Partner 8
2.4	PRODNET DBP Models	Partner 8
2.5	Workflow-based Services Coordination	Partner 5
2.6	Distributed and Federated Information Management	Partner 6
2.7	Integration STEP / EDI	Partner 2
2.8	PRODNET Communications Infrastructure Architecture	Partner 7
2.9	Partners Search and Selection Architecture	Partner 5
2.10	Imprecise & Incomplete Orders Management	Partner 1
2.11	Socio-organizational recommendations for VE implantation	Partner 5
2.12	Edition and configuration of DBP and related ACF	Partner 8
3	SOFTWARE MODULES	
3.1	PPC	Partner 1
3.2	EDI Module	Partner 2
3.3	STEP Module	Partner 3
3.4	LCM	Partner 5
3.5	DIMS	Partner 6
3.6	PCI	Partner 7
3.7	LCF	Partner 5
3.8	DBPMS	Partner 8

Resources allocated by each partner to the task that produced the IP are **not** a good measure of innovation and intellectual contribution !

SUGGESTED STEPS:

- ① Produce a description of the IP, clearly identifying what it includes
- ② Define a list of contributing items that led to the IP and decide on the relative weight of each of these items
- ③ Determine the contributors and the amount (in percentage) of their contribution to each item
- ④ Elaborate a table calculating the level of contribution of each partner

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IP 2.1 – PRODNET Basic Architecture

Description: The basic architecture includes: 1) division of a node (VE member) in two modules (internal module and PRODNET Cooperation Layer - PCL), 2) basic decomposition of PCL into several components, 3) identification of main information and control flows, and 4) identification of classes of VEs and roles played by each VE component.

Criteria to define levels of contribution:

1. Initial characterization of the problem area. [15%]
2. Definition of the basic solution approach. [20%]
3. Detailed refinement of the architecture approach. [25%]
4. General contributions to the discussion (mostly in technical meetings). [20%]
5. Technical coordination of the architecture development. [15%]

Table of contributions:

		Partner 1	Partner 5	Partner 2	Partner 6	Partner 7	Partner 4	Partner 8	Partner 9
IP2.1- 1	15%	40%	60%						
IP2.1- 2	20%		70%		30%				
IP2.1- 3	30%		25%		25%	25%		25%	
IP2.1- 4	20%	5%	25%	10%	25%	5%	5%	20%	5%
IP2.1- 5	15%		100%						
IP2.1 Level		7.00%	50.50%	2.00%	18.50%	8.50%	1.00%	11.50%	1.00%

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IP 2.5 - Workflow-based Services Coordination

Description: This IP refers to the workflow-based approach for coordination of processes and activities inside PCL. It includes the coordination architecture, specialized workflow engine architecture, structuring of services (taxonomies of core and auxiliary services), control flow mechanisms, services invocation mechanisms, supporting information models, interfacing rules, and a set of examples of workflow plans (designed for demonstrators).

Criteria to define levels of contribution:

1. Contribution to the main concepts. [30 %]
2. Services specification. [25 %]
3. Contributions to the interfacing principles. [20 %]
4. Design of example workflows (demonstrators). [10 %]
5. Technical coordination of activity. [15 %]

Table of contributions:

		Partner 1	Partner 5	Partner 2	Partner 6	Partner 7	Partner 4	Partner 8	Partner 9	Partner 3
IP2.5- 1	30%		90%		10%					
IP2.5- 2	25%		40%	25%		35%				
IP2.5- 3	20%	5%	30%	20%	15%	30%				
IP2.5- 4	10%	10%	15%	10%	15%	10%	10%	10%	10%	10%
IP2.5- 5	15%		100%							
IP2.5 Level		2.0%	59.5%	11.3%	7.5%	15.8%	1.0%	1.0%	1.0%	1.0%

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IP 3.4 – Local Coordination Module

Description: Specification and logical design of the software module for local coordination (workflow-based), including the implementation approach, interfacing rules, supporting information models, illustrative examples (demonstrator-related), assessment of results, and a prototype implementation.

Criteria to define levels of contribution:

1. Software specification and design. [20 %]
2. Interfacing specification. [20 %]
3. Example of workflow plans and assessment. [5 %]
4. Prototype development. [40 %]
5. Technical coordination of activity. [15 %]

Table of contributions:

		Partner 1	Partner 5	Partner 2	Partner 6	Partner 7	Partner 4	Partner 8	Partner 9	Partner 3
IP3.4- 1	20%		100%							
IP3.4- 2	20%		40%	15%	20%	25%				
IP3.4- 3	5%	11%	11%	11%	11%	11%	11%	11%	11%	11%
IP3.4- 4	40%		100%							
IP3.4- 5	15%		100%							
IP3.4 Level		0.6%	83.6%	3.6%	4.6%	5.6%	0.6%	0.6%	0.6%	0.6%

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4. IP EXPLOITATION

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PRODNET approach: Exploitation

Although R&D is a very important phase in the innovation process, the post-research phase of transforming the created knowledge into products requires considerable efforts and investments



Productization process:

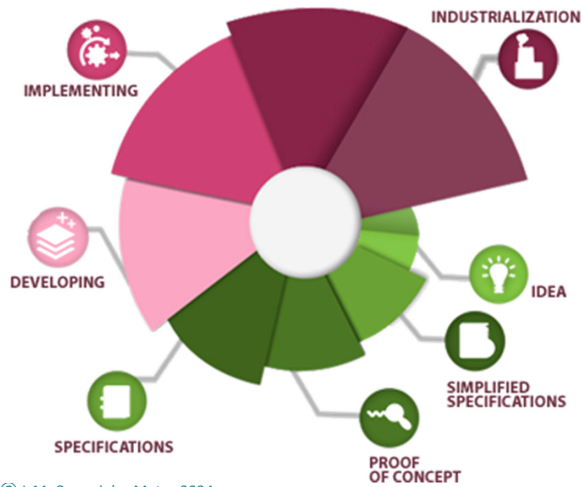
robust re-implementation of components, application of quality procedures and other regulations, documentation development, training materials development, systems integration, marketing planning, etc.

The distribution of benefits has to take into account not only the initial contribution to the IP, but also the role played in the subsequent phases.

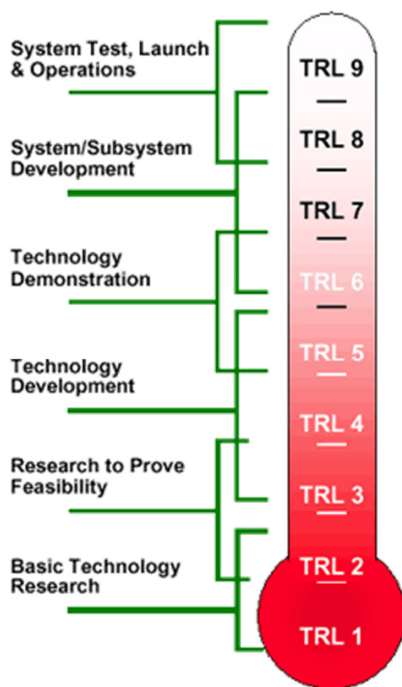
- Identification of roles and responsibilities in the full life cycle of the product (Understanding the value chain)
- Understanding the nature and role of academic institutions vs. industry organizations

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Value Chain Analysis



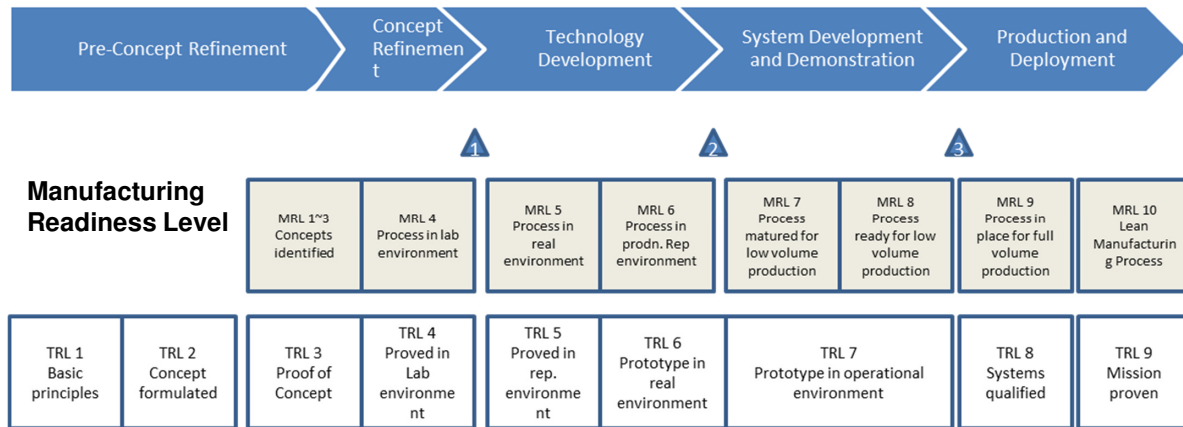
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TRL	DEFINITION
TRL 1	basic principles observed
TRL 2	technology concept formulated
TRL 3	experimental proof of concept
TRL 4	technology validated in lab
TRL 5	technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)
TRL 6	technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)
TRL 7	system prototype demonstration in operational environment
TRL 8	system complete and qualified
TRL 9	actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)

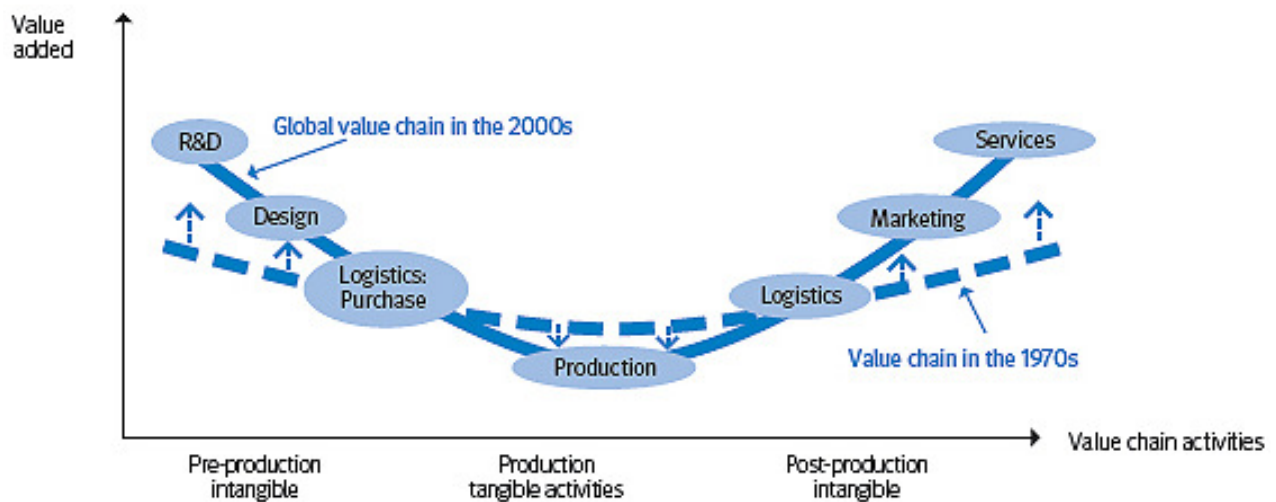
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MRL: Manufacturing Readiness Level



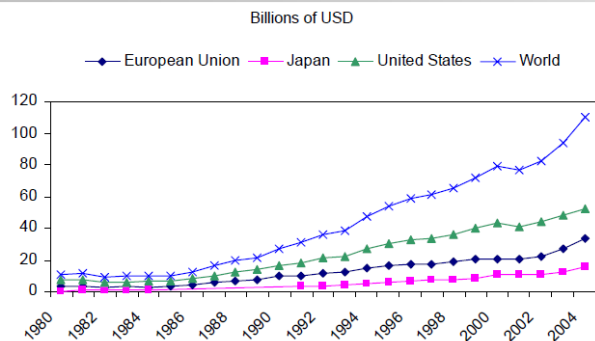
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Where the “value” is: The “smiley curve”

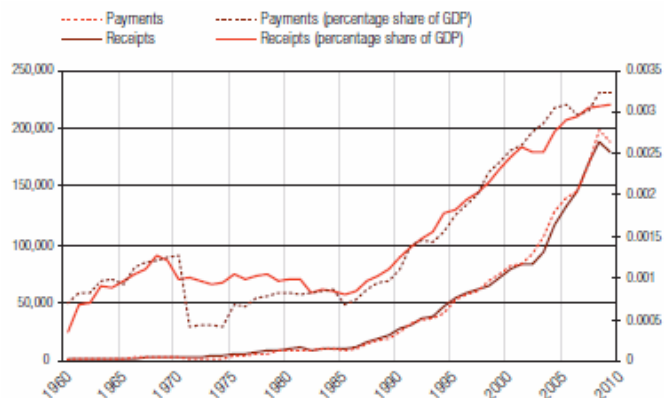


Smiley curve: adapted from “Interconnected Economies Benefiting from Global Value Chains”, OECD 2013

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Source: OECD based on World Bank, World Development Indicators Database, June 2006.
[Kamiyama et al. 2006]



Comparison of the three main quantitative patent valuation approaches

	Cost approach	Income approach	Market approach
Advantages	<ul style="list-style-type: none"> Objective and consistent. Reliability of historic cost data. If a recent acquisition cost of patent exists it is a reliable indicator of value. 	<ul style="list-style-type: none"> Theoretically superior to other approaches as focused on future earnings or cash flow. Consistency can be achieved facilitating comparison across a patent portfolio. Widely accepted and concepts widely understood. 	<ul style="list-style-type: none"> Practical approach which makes use of prices actually paid for comparable assets. Variety of market-based approaches such as comparable companies, comparable transactions or a premium price-earnings-multiple approach allows comparison.
Disadvantages	<ul style="list-style-type: none"> No correlation between expenditure on an asset and its value. Difficult to distinguish between 'normal' operating expenses and patent investment expenditure. Subjective nature of estimate of costs of replacement and some patents may not be replaceable. 	<ul style="list-style-type: none"> Requires subjective cash flow allocation. Translation of theory into practice requires assumptions which are limiting. Relevant information is not always readily accessible from internal reporting systems. 	<ul style="list-style-type: none"> Given the uniqueness of patents, third party arm's length transactions involving similar patents are infrequent. Transactions involving the shares of companies owning patents are more frequent but allocating value between the business and the patent is difficult.
Typical use	<ul style="list-style-type: none"> Only used in limited circumstances (e.g. when the replacement cost can be estimated with a reasonable degree of reliability and confidence). Cost is, however, a relevant benchmark where a patent has recently been acquired. 	<ul style="list-style-type: none"> Primary valuation methodology and the most widely used where information of an appropriate quality can be obtained. The limiting nature of the assumptions needs to be understood and where possible scenario analysis should be performed. 	<ul style="list-style-type: none"> Extremely important indicator of value, if information on recent transactions involving patents exists. However, in practice sufficient information is rarely disclosed and this methodology is used as a cross check on other more theoretical methodologies.

Example: University of Aberdeen, UK

1. By law (e.g. the Patents Act (1977) and the Copyright, Designs and Patents Act (1988)) the University owns the intellectual property rights (IPR) generated by its employees, provided that these are developed in the course of their normal duties. This applies to all employees, and in the case of registered students is covered under the policy for student IP.

The University has a policy to reward and encourage employees to bring forward new inventions and developments and to share with them, and the Colleges, the proceeds of exploitation. This policy is reflected within this document.

6. Net income from licensing or sale of technology (i.e. after all IP protection and exploitation costs have been met) is **shared 1/3 to the inventor(s)** (employees or students who have assigned their intellectual property rights to the University), 1/3 to the Colleges(s) and 1/3 to be retained centrally for strategic purposes. The inventor's share may be taken as a personal reward, in which case it is subject to income tax and additional National Insurance payments, or it can be put into a nominated discretionary account according to the normal University procedures for discretionary funds.

Example: University of Ulster, UK

Staff Incentives and Benefits

- Revenue division from royalty licences
 - Inventors – 5% gross annual revenue
 - Costs incurred are then deducted
 - Net revenue (up to £25k) is divided as follows

Inventors	50%
Research Inst / School	30%
Office of Innovation	20%
 - Net revenue (over £25k) is divided as follows

Inventors	33%
Research Inst / School	34%
Office of Innovation	33%
- Equity Participation in joint ventures and spin-outs
- Career progression
- Can lead to further collaborative research projects

IRIS

Innovation Research &
Impact Strategy Office



Innovation Research and Impact Strategy – IRIS

Vision

At IRIS - Innovation, Research & Impact Strategy Office – we believe that research & development at Academia is the cornerstone of Innovation.

Mission

IRIS mission is to offer strategic and integrated support in all key areas of innovation management to make a reality the valorisation of knowledge and commercialization of Academia-based technologies.

<https://www.novaidfct.pt/iris/>

<https://sites.fct.unl.pt/ria>

Further references

Camarinha-Matos, L.M.; Afsarmanesh, H. (2000). **A systematic approach to IPR definition in cooperative projects**. In Proceedings of PRO-VE 2000 – 2nd IFIP Working Conference on Infrastructures for Virtual Enterprises, Kluwer Academic Publishers, ISBN 0-7923-7205-0, pp.465-476, Florianopolis, Brazil, 4-6 Dec 2000.

https://www.researchgate.net/publication/221511671_A_Systematic_Approach_to_IPR_Definition_in_Cooperative_Projects

Kamiyama, S.; Sheehan, J.; Martinez, C. (2006). VALUATION AND EXPLOITATION OF INTELLECTUAL PROPERTY STI WORKING PAPER 2006/5 Statistical Analysis of Science, Technology and Industry, OECD,

https://www.researchgate.net/publication/5206043_Valuation_and_Exploitation_of_Intellectual_Property

WIPO – What is Intellectual Property?

<https://www.wipo.int/about-ip/en/>

European Commission - **Your Guide to IP in Horizon 2020**

<https://op.europa.eu/en/publication-detail/-/publication/e20da012-ec16-11e9-9c4e-01aa75ed71a1/language-en/format-PDF/source-164620712>