



AGÊNCIA NACIONAL
DE INOVAÇÃO

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Benchmark TTO best indicators Best practices and indicators for a TTO

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INTRODUCTION

One of the most widely shared views in current economic thinking is that the creation and dissemination of new knowledge underpinning innovation is an important driver of economic growth. As a key producer of knowledge in the economy and society, the university's role in supporting economic growth and development is increasingly acknowledged: universities are now viewed as economic agents that engage with several stakeholders in order to deliver economic benefits, producing knowledge in cooperation with the rest of the ecosystem.

Universities face a choice in deciding whether their Technology Transfer Office (TTO) should be part of the University's administration, or a separate company or a mix between them. They must decide how they will measure their success and what indicators should be used.

We must think that good people can make any system work and bad people can make any system fail. Nevertheless, some systems are better than others. Whichever system is adopted the TTO must always remember its role within the University. The TTO is wholly dependent upon the willingness of researchers to engage, support from university staff, and should adopt a philosophy of supporting researchers who want to be involved. We must not transform good researchers into bad entrepreneurs. This is the very big mistake of many systems.

The TTO is that part of the university responsible for commercializing university IP through the core activities of: attracting invention; patenting and other forms of protection; licensing; spin-off company formation; material sales; managing seed funds, etc. The TTO may also incorporate a function that helps researchers sell their core skills to research and their time as expert consultants. The TTO must be separated from the Research Office, which will typically support university researchers in identifying research funding and manage contractual relationships with funders.

This paper tries to describe the issues and considers the pros and cons of the indicators to be used to measure real results and questionnaires to be applied by any kind of TTO or KTO, whether a part of the public or private structure subsidiary company model or any other kind of mix model. This will be the real measure of their success. In practice, KT indicators that have been adopted internationally are diverse and range far wider than the traditional measures of patenting, licensing, number of spinoffs and revenue. In many countries they extend over different channels of industry engagement and move beyond industry to search other "non-academic" users. The recommendations in this report take this into account, whilst striving to present a limited set of core indicators.

GENERAL SITUATION IN PORTUGAL

Although we have made this previous research for Spanish academic institutions, now it is the turn of Portugal. In our practical view, we consider desirable to compare our common magnitudes in the doing business international ranking which may apport and general view of how are positioned our respective countries in general and then we can go down to the basic aim of what we want and what we can do as regards our academic institutions (public and private) and how we can get into the best ranking practices in the world.

What we are going to measure at this point for both countries are several points concerning business and innovation regulations and structures, such as:

- **Starting a business** Procedures, time, cost and paid-in minimum capital to start a limited liability company
- **Dealing with construction permits** Procedures, time and cost to complete all formalities to build a warehouse and the quality control and safety mechanisms in the construction permitting system
- **Getting electricity** Procedures, time and cost to get connected to the electrical grid, and the reliability of the electricity supply and the transparency of tariffs
- **Registering property** Procedures, time and cost to transfer a property and the quality of the land administration system
- **Getting credit** Movable collateral laws and credit information systems
- **Protecting minority investors** Minority shareholders' rights in related-party transactions and in corporate governance
- **Paying taxes** Payments, time, total tax and contribution rate for a firm to comply with all tax regulations as well as post-filing processes
- **Trading across borders** Time and cost to export the product of comparative advantage and import auto parts.
- **Enforcing contracts** Time and cost to resolve a commercial dispute and the quality of judicial processes
- **Resolving insolvency** Time, cost, outcome and recovery rate for a commercial insolvency and the strength of the legal framework for insolvency
Employing workers Flexibility in employment regulation and redundancy cost

DOING BUSINESS WB SPAIN AND PORTUGAL

•	Temas	Clasificación DB	2017	2018	2019	2020-22	SPAIN	PORTUGAL
•	GLOBAL		34	33	28		30	39
•	Starting a business		78	82	86		97	63
•	Dealing with construction permits		97	101	123		79	60
•	Getting electricity		78	74	42		55	52
•	Registering property	49	48	53		59	35	
•	Getting credit		52	59	68		80	119
•	Protecting minority investors		44	29	24		28	61
•	Paying taxes		79	60	34		35	43
•	Trading across borders		1	1	1		1	1
•	Enforcing contracts		39	39	26		26	38
•	Resolving insolvency	23	25	19		18	15	
•	-----							
•	GLOBAL INNOVACION							
•	Scientific Research		10	10	10		14	30
•	Innovation patented	27	27	28		21	35	
•	Innovation in market	44	44	40		30	31	

RESUME 2015-2022 (=18)

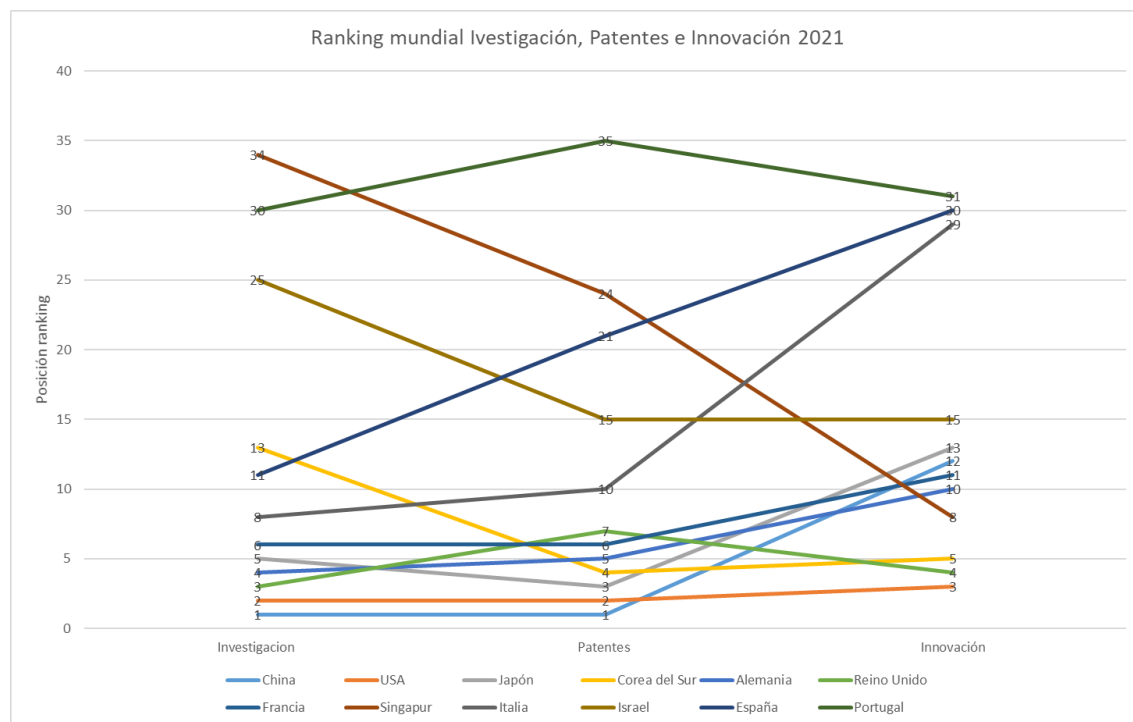
•		SPAIN OCDE	GER	USA	
•	Time (years)	3,5 ^{*****}	2,7	2,5	1,5
•	Cost (%G/PIB)	0,6 ^{*****}	1,2	2	3%
•	Profit Rate publication	0,0	0,6	0,3	1%
•	Patent Rate (% publica)	0,7 ^{*****}	5% 6	10/100	
•	Profit Rate (+100K\$ / patent)	0,01 ^{*****}	3%	5	10
•	Big deal Rate (+1M\$ "")	0,0 ^{*****}	0,3%	0,5	1%

DOING BUSINESS WB SPAIN AND PORTUGAL

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Global innovation rank GII 2022

Country	GII	Institutions	Human capital research	Infrastructure	Market sophistication	Business sophistication	Knowledge and technology outputs	Creative outputs
Switzerland	1	2	4	4	8	7	1	1
United States	2	13	9	19	1	3	3	12
Sweden	3	19	3	1	13	1	2	8
United Kingdom	4	24	6	8	5	22	8	3
Netherlands	5	4	14	14	18	10	5	10
...								
Italy	28	58	28	26	35	33	16	16
Spain	29	38	26	16	30	32	27	28
Czech Republic	30	43	33	20	76	28	17	37
UAE	31	6	17	7	23	26	59	45
Portugal	32	47	22	39	42	34	35	25
Slovenia	33	37	25	24	68	29	26	56
Hungary	34	48	37	35	67	30	23	46
Bulgary	35	67	68	34	62	40	30	23

	Output rank	Input rank	Income Region	GDP, PPP\$ (bn)	GDP per capita, PPP\$
SPAIN 28	26	28	High 46.7	1,984.0	42,075
PORTUGAL 32	31	32	High 10.2	376.1	36,543

Ch.	Field	Score value	Rank	Score value	Rank
1.	INSTITUTIONS	62.5	47	66.8	38
1.1	Political environment	77.7	25	71.8	41
1.2	Regulatory environment	76.7	34	74.1	39
1.3	Business environment	33.0	102	54.4	49
2	HUMAN CAPITAL AND RESEARCH	49.4	22	47.7	26
2.1	Education	63.7	18	58.1	46
2.2	Tertiary education	44.0	27	36.5	43
2.3	Research and development (R&D)	40.3	27	48.5	23
3	INFRASTRUCTURE	53.4	39	59.8	16
3.1	Information and communication technologies (ICTs)	82.4	36	86.2	23
3.3	Ecological sustainability	36.8	38	47.5	17
4	MARKET SOPHISTICATION	38.8	42	43.4	30
4.1	Credit	40.1	29	41.1	26
4.2	Investment	10.1	57	12.8	47
4.3	Trade, diversification, and market scale	66.2	27	76.2	14
5.	BUSINESS SOPHISTICATION	38.6	34	41.4	32
5.1	Knowledge workers	50.1	30	55.8	24
5.2	Innovation linkages	30.6	38	29.6	40
5.3	Knowledge absorption	35.2	49	38.9	39
6	KNOWLEDGE AND TECHNOLOGY OUTPUTS	33.3	35	38.1	27
6.1	Knowledge creation	29.4	31	37.4	26
6.2	Knowledge impact	39.5	27	39.8	25
6.3	Knowledge diffusion	30.9	49	37.1	38
7.	CREATIVE OUTPUTS	38.1	25	36.8	28
7.1	Intangible assets	51.2	19	50.6	22
7.2	Creative goods and services	23.6	51	26.1	43
7.3	Online creativity	26.5	28	19.9	31

PRELIMINARY CONCLUSIONS

As regards conclusions in business indicators:

- we have very similar results with a minor variation in starting a business and getting credit.
- Portugal has a better position in Starting a business (very good indeed), Dealing with construction permits, Getting electricity and Registering property.
- It has a worst position in Getting credit (very significant), Protecting minority investors, Paying taxes, Enforcing contracts and Resolving insolvency
- And we are very close and in a very good position in Trading across borders due to the EU general frame and regulations.

As regards conclusions in research and innovation indicators:

- we have very similar results in patenting and marketing.
- Portugal has a more balanced and better position in access to market. In this sense, there is a very good balance between the quality and quantity of scientific production (31) and the impact of this Science into the market (31)
- This means that is very probably that if there is an improvement of scientific production, there will be an important impact into the market
- Spain shows a very poor balance between the quality and quantity of scientific production (14) and the impact of this Science into the market (30)
- Spain needs a very important change in structures to permit Science access into market.

For any other kind of conclusions developed in further detail please see final chapter.



DEFINITION OF WORK AND STUDY. EU INCLUDED AND EXCLUDED MODELS AND INDICATORS

Definition of work and study.

The present work arises from the need to carry out a comparative analysis of the different transfer models of reference institutions in Europe and in the world, establishing relationships of closeness and tangentiality of the processes, resources and structures applied by each one of them in their operating strategy.

Through the analysis of variations through the study of similarities and differences between the models studied, it is intended to establish regularities that, explained through the interpretation of diversity, allow establishing causal relationships, correlations and useful conclusions for decision making.

To do this, we have designed a series of comparative tables selecting a series of "common" indicators that characterize each model, and that define specific roadmaps for the development of different transfer policies, in order to be able to highlight or select those that they seem to reflect better results by adapting to the different national and international innovation ecosystems.

One of the most difficult challenges when trying to develop this comparative analysis has not been obtaining the data, an issue that, in itself, is laborious, but being able to generate that comparative environment with processes that in many cases start from structures and flows. very heterogeneous work, difficult to confront.

In any case, with this analysis an approximation of the "state of the art" or the strategic situation followed by the main referents of European and international models of technology transfer is outlined, trying to compose an aerial photograph, in many cases with a certain zoom, in key aspects of the transfer, support for entrepreneurship and the creation of spin-offs, which can be used to detect areas or points of interest that serve as a basis for deeper reflection on possible improvement actions.

The study has been carried out through a descriptive documentary research, using documentary and bibliographical sources of all types and formats, and collecting the largest volume of data and knowledge about the different models, to later develop an exercise of adaptation and adjustment of the information to be able to develop a comparison between institutions.

We have started from the base of a specific model, that of the Max Planck Society, which we consider interesting due to its characteristics and nature, and a good comparative node since it shares certain characteristics with most of the models chosen in Europe, Israel and the United States. .

Regarding the key aspects to be compared, we have focused first on the different organizational structures of the technology and knowledge transfer offices (TTO-KTO, in English and TTO in Spanish) that manage and coordinate technology transfer and knowledge, establishing and comparing its nature, centralized or decentralized, public or private, and in the management and volume of its human resources. 11

We have also looked at the degree of specialization of these structures in thematic areas or innovation sectors, an aspect that is very common in the models analyzed, a division that is reflected both in the organization charts and in the strategic design of human resources for the transfer

Another aspect or indicator collected by this study is that of industrial and intellectual property that is generated in research centers and that determines the strategy to be followed by these institutions. Thus, the heterogeneous casuistry, percentages and regulations that fundamentally influence transfer processes are reflected in the document, especially in content negotiation processes, as well as the governance of business projects.

The advanced advisory and consulting services provided in these organizations are also taken into account, especially those integrated into the flow of the transfer process, among which we highlight legal and financial advice, training, mentoring and support for spin-offs, marketing and public relations, or competitive surveillance, among others, also establishing the differences in their management, either with own personnel, or with external contracts to the transfer structures themselves.

Another of the compared indicators that is common in the models studied is the way of developing the evaluation processes of the performance of the transfer activity, and especially, if internal and external audits are carried out, and the type of structures and profiles chosen for the development of this work.

A fundamental aspect analyzed is also the very structure of offices or transfer links, and its possible more or less centralized or decentralized variables in the institution and in the network of research centers, the specialization of the personnel, as well as the skills and levels of autonomy for the different functions and actions in the transfer processes. We also include in this section the availability of transfer offices or headquarters in other countries or developing the internationalization of the transfer through other means, such as participation in networks.

The different strategies to encourage technology transfer and valorization within the institutions have also been considered and in this sense both the nature of the incentives and the percentages of distribution among the different stakeholders participating in the process have been studied.

Regarding the indicators associated with business structures and business generation, the study places special emphasis on the formulas and structures to support entrepreneurship and the promotion and creation of spin-offs. In this sense, they have taken into account the organizations and profiles that provide these services in the different models, what incubation and acceleration programs they use, what are the services they provide, whether or not they have internal experts and/or external to their institutions, as well as the different channels for financing/investment (Capital Venture) of its emerging companies, the origin of the funds or the capitalization formulas.

In this section, as will be developed later in the conclusions, a common denominator in most of the models studied is the existence of advisory structures external to the spin-offs, with a high variety of services and different degrees of depth. Information on specific good practice programs has been included in this indicator to optimize the success of business projects.

In a similar strategic line, they have studied whether or not the different models have expert committees to evaluate the investments and the degree of participation of the institutions in the companies, evaluating and comparing not only the existence of these advisory bodies, but also its nature and configuration, its decision-making capacity and trends in terms of selection and also in participation in spin-offs.

This last aspect, the degree of participation in the companies, is collected in special detail in the study, since there are very heterogeneous cases in terms of funds, risk and benefit levels, the most used investment models, whether they are credits, actions or other formulas.

Finally, the different strategies that define the access of entrepreneurs and spin-offs and start-ups to public research infrastructures are reflected, establishing the times, the different formulas, free or paid, as well as the rules of use of all these facilities and services.

Included and excluded models.

All these commented indicators are collected quantitatively in comparative tables, and are mentioned qualitatively through the explanatory texts, as well as in the inclusion of specific cases and their good practices to take science generated from public and private Universities and Institutions into the market in form of products, services or benefits for society. Initially, we have looked into the European model and, later, into the American and also the Israeli model, to which we dedicate a special chapter.

We have chosen these models because of their success in taking science from lab to market and to society. Some of these models are closer to the Spanish or Portuguese system, such as the Universities and Institutions in Germany. In the case of the UK Universities, they are in the first place in all the rankings we have studied and their numbers are very impressive. The problem remains that they are a little bit far away from our continental systems, but there is no discussion of their absolute know-how to cause real impact in taking good science into good results. On the other hand, we have chosen the US most relevant Universities for obvious reasons, as they are the champions of the world and the mirror into everyone is looking for models. Although there is still a big ocean of differences and approaches between them and Europe, we think we must look at them and then adapt their models into narrow gauge or rail, such in our railway systems.

We have not taken into account those systems that are either very far away in vision and habitudes, such the Scandinavian Universities (although they are succeeding been guided by Anglo-Saxon ways), or although they are closer, they are not succeeding or speeding enough to rank, such the French, Italian or Spanish Universities who needs a new approach and maybe more radical views and ways to improve better results.

We have observed the contradiction that all these countries, especially Spain, who has very good science (5-10 in world ranks), she descends to 25-35 in patenting and she goes all down the way (45-55) in taking science to market or converting good knowledge in good products or services.

For example, next tables demonstrate how these happens:

INDICATOR	GER	UK	FRA	ESP	USA	ISR
Country						
Centers of research	Public private Specialized	Private Specialized	Public Centralized	Public Decentralized	Private Specialized	Private Specialized
System	Cooperation specialized 1 KTO for several centers	Competence specialized 1 KTO for each University. Independent entity Ltd.	Cooperation hierarchic 1 KTO central SATT delegations in territorial centers	Competence autonomic 1 KTO central internal delegation in each Region	Competence specialized 1 KTO for each University Independent entity Ltd.	Competence specialized 1 KTO for each center Independent entity Ltd.
Management KTO-OTRI	Centers owned shared companies MPI	Private companies shared by the Centers OUI Oxford CEN Cambridge	Central SATT	Internal units for each University	Private companies shared by the Centers OTD OTL	Private companies shared by the Centers YEDA- WIS Weizzmann Institute
IP	General: Center / exception: co-ownership with companies	General: Center / exception: co-ownership with companies Case by case	General: Center /	General: Center / exception: co-ownership with companies	General: Center / exception: co-ownership with companies Case by case	General: Center /
Measurement results	Science quality Number of spin-off Royalties	Science quality Number of spin-off Royalties # of projects & contracts Revenues and incomes Jobs Benefits and profits of the companies	Science quality Number of spin-off Royalties # of projects & contracts	Science quality Number of spin-off Royalties # of projects & contracts	Science quality Number of spin-off Royalties # of projects & contracts Revenues and incomes Jobs Benefits and profits of the companies	Science quality Number of spin-off Royalties # of projects & contracts Revenues and incomes Jobs Benefits and profits of the companies

Sources DB= Doing Business International, elaborado por OCDE y BANCO MUNDIAL, Oficina Española de Patentes y Marcas y Curso de Contratación Internacional, G. Pérez-Holanda F., Universidad de Oviedo, 2020.

COMPARATIVE CENTERS (governance and goals TTO KTO)

CENTER	GER	FRA	UK	SWE	NOR	FIN
Space generating knowledge	YES	YES	YES	YES	YES	YES
1. Agenda R+D+I	YES	YES	YES	YES	YES	YES
2. Funding external	YES	-	YES	-	-	YES
3. Funding internal	YES	YES	YES	YES	YES	YES
4. Scope of ideas	YES themes	=	=	=	=	YES Cluster
Space generating knowledge consensus	YES	YES	YES	YES	YES	YES
5. Organization	Independent GmbH	Dependent	Independent LTD.	Dependent	Dependent	Independent LTD.
6. Industry as a partner	YES	-	YES	YES	YES	YES
7. Diagnosis & prognosis	YES	YES	YES	YES	YES	YES
8. Competitive Surveillance	YES	YES	YES	YES	YES	YES
9. Treatment of tech information	YES	YES	YES	YES	YES	YES
10. Mentoring and Coaching	YES	YES	YES	YES	YES	YES
11. Intermediary	YES	YES	YES	YES	YES	YES
Space generating knowledge and valorization	YES	YES	YES	YES	YES	YES
Test & validation	YES	-	YES	YES	YES	-
Accreditation	YES	-	YES	-	-	-
Validation & regulation	YES	-	YES	-	-	YES
Protection of results	YES	YES	YES	YES	YES	YES
Commercialization	YES	YES	YES	YES	YES	YES
Evaluation of revenues and assets	YES	YES	YES	YES	YES	YES
Sources: M. Meyer y otros, "Universities, user-driven competences centers and IP", les Nouvelles, vol LIV, nº 2, pp.111 y ss.. and International Business Law, G. Pérez-Holanda F., Universidad de Oviedo, 2010.						

CATALOGUE OF MAPPING INDICATORS UE

INTRODUCTION

Knowledge Transfer KT and commercialization is usually a long and risky process, involving many factors and actors external to the research institution. There has been much evolution over the past twenty years which has seen the concept of knowledge transfer move from the more traditional concept of commercialization and monetization towards a more rounded approach which supports valorization, in the sense of both co-creation and the dissemination of research results with, and to, non-academic third parties.

The first problem is that there are a wide range of heterogeneity in terms of terminology and policies. There are other many problems, such as legal and regulatory context, resources, public support, organization and syndication of KT stakeholders.

The second is to consider that quantitative indicators, such as financial data or IP assets, are insufficient to describe the complexity of knowledge transfer and commercialization processes and their longer-term impact. This is recognized by the major international KT associations.

Another third problem is the incompleteness of national data as not all institutions provide data. See the following table considering Countries in Europe undertaking annual KT surveys.

Country	Via government agency (or similar)	Via KT association	Published
Belgium		✓	✓
Denmark		✓	✓
France		✓	✓
Ireland	✓	✓	✓
Italy		✓	✓
Spain		✓	✓
Switzerland		✓	
UK	✓	✓	✓

Recommendations are summarized below and elaborated in Chapter attending conclusions.

SELECTION

The EC should itself develop a common set of indicators across its programs that support KT and research:

Inputs		Outputs	
Internal Context	Environment	Activity	Impact
PRO & KTO characteristics	National factors that influence	Delivery through KT channels, PRO / KTO actions	Longer term economic and societal returns

COMPLETE LIST OF INDICATORS

General

Total number of students

Total number of students in the degree programme.

Students in their 1st year

Number of first-year students in the degree programme.

International students

Number of international students in the degree programme.

Total number of students in field (major)

Total number of students taking the subject at the department, excluding minor subject students.

Percentage of female students

Percentage of female students enrolled at the department.

Academic staff (fte)

Number of full-time equivalent academic staff at the institution.

Period of study

The normative period of study for the degree programme (years).

Tuition fees for national students

Tuition fees national students are being charged.

Tuition fees for international students

Tuition fees international students are being charged.

Female academic staff

The number of female academic staff as a percentage of total number of academic staff.

Social inclusion

The percentages among all new bachelor entrants of selected groups of traditionally underrepresented groups: mature students, students with disabilities as well as bachelor and master students with non-academic family background (first generation students).

Social inclusion

The percentages among all new bachelor entrants of selected groups of traditionally underrepresented groups: mature students, students with disabilities as well as bachelor and master students with non-academic family background (first generation students).

Teaching & Learning

Student - staff ratio

The number of students (headcount) per member of the academic staff (fte). Staff solely involved in research is excluded.

Graduating on time (bachelors)

The percentage of graduates that graduated within the time expected (normative time) for their bachelor programme.

Graduating on time (masters)

The percentage of graduates that graduated within the time expected (normative time) for their masters programme.

Academic staff with doctorates

The percentage of academic staff holding a doctorate (PhD or equivalent).

Contact with work environment (bachelors)

A composite measure representing at bachelor level: (1) the inclusion of internships / phases of practical experience or external projects in the curriculum; (2) the percentage of students doing an internship; (3) teaching by practitioners from outside the university departments; and, (4) the percentage of degree theses made in cooperation with industry/external organizations.

BA graduation rate

The percentage of new entrants that successfully completed their bachelor programme.

MA graduation rate

The percentage of new entrants that successfully completed their master programme.

BA graduates in normative time

The percentage of graduates that graduated within the time expected (normative time) of their bachelor programme.

MA graduates in normative time

The percentage of graduates that graduated within the time expected (normative time) of their masters programme.

Relative BA graduate unemployment

The percentage of bachelor graduate unemployment 18 months after graduation.

Relative MA graduate unemployment

The percentage of master graduate unemployment 18 months after graduation.

Contacts with work environment

A composite measure representing at bachelor level: (1) the inclusion of internships/phases in work; and (2) the percentage of students doing an internship; and (3) teaching by practitioners from outside university departments.

Contact with work environment (masters)

A composite measure representing at bachelor level: (1) the inclusion of internships / phases of practical experience or external projects in the curriculum; (2) the percentage of students doing an internship; (3) teaching by practitioners from outside the university departments; and, (4) the percentage of degree theses made in cooperation with industry/external organizations.

Graduates in normative time

Percentage of graduates that graduated within the normative time to degree for their programme.

Relative rate of graduate unemployment

Percentage of unemployment of graduates 18 months after graduation.

Hospital beds available for teaching

The number of beds available for teaching at university hospitals and affiliated hospitals per 100 students.

Innovative forms of teaching and assessment

The percentage of examinations (in medical doctor training programmes) which use innovative forms of assessment (assessment of practical work by faculty and structured clinical cases).

Graduation rate long first degree

The percentage of new entrants that successfully completed their long first degree programme.

Graduating on time (long first degree)

The percentage of graduates who graduated within the time expected (normative time) of their long first-degree programme.

Relative graduate unemployment long first degree

The percentage of long first-degree programme graduate unemployment 18 months after graduation.

Innovative forms of teaching and assessment

The percentage of examinations (in medical doctor training programs) which use innovative forms of assessment (assessment of practical work by faculty members and structured clinical cases).

Community service learning

The percentage of credits given in service-learning activities, in relation to total number of credits. Service-learning involves students in community service activities and applies the experience to personal and academic development.

Gender balance

The likelihood of female/male students to take a PhD degree. A zero means that the genders stand equal chances to gain a PhD degree.

Outreach programs

A rating indicator based on the existence of various forms of outreach programmes to underrepresented groups of students.

Pedagogically skilled teaching staff

A rating indicator looking on requirements to teaching staff to have certified pedagogical and didactical skills plus the percentage of teaching staff holding a recognized certificate of pedagogical and didactical skills.

Digital education investment

Investment in digital education as a percentage of the total budget of the institution.

Teaching & Learning

Overall learning experience

An assessment of the quality of the overall learning experience, based on a satisfaction survey.

Quality of courses & teaching

An assessment of the quality of teaching provision, based on a student satisfaction survey.

Organization of program

An assessment of the organization of the programme, based on a student satisfaction survey.

Contact with teachers

An assessment of the feedback given by teachers, based on a student satisfaction survey.

Inclusion of work/practical experience

An assessment of the inclusion of work experience and of elements related to work practice, based on a student satisfaction survey.

Library facilities

An assessment of the quality of library services for students, based on a student satisfaction survey.

Laboratory facilities

An assessment of the quality of laboratories available to students, based on a student satisfaction survey.

IT provision

An assessment of the quality of IT services for students, based on a student satisfaction survey.

Room facilities

An assessment of lecture halls and seminar rooms, based on a student satisfaction survey.

Linking clinical/preclinical teaching

An assessment of the integration of pre-clinical/theoretical and clinical courses, based on a student satisfaction survey.

Skills Labs

An assessment of the skills labs and training centers concerning maintenance, accessibility, technical facilities and mentoring, based on a student satisfaction survey.

Bedside teaching

An assessment of bedside teaching, based on a student satisfaction survey.

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Inclusion of practical experience/clerkships

An assessment of the integration of practical experience with patient contact into the learning experience, based on a student satisfaction survey.

Digital teaching

An assessment of the quality of digital teaching, based on a student satisfaction survey.

Research

External research income

Research revenue that is not part of a core (or base) grant received from the government. Includes research grants from national and international funding agencies, research councils, research foundations, charities and other non-profit organizations. Measured in €1,000s using Purchasing Power Parities (PPP). Expressed per fte academic staff.

Doctorate productivity

The number of doctoral degrees, relative to the number of academic staff (fte).

Research publications (absolute numbers)

The number of the department's research publications indexed in the Web of Science Core Collection database, where at least one author is affiliated to the source university.

Citation rate

The average number of times the department's research publications are cited in other research published in the respective reference period, adjusted (normalized) at global level for the field of science and the year in which a publication appeared.

Top cited papers

The proportion of the department's research publications that, compared to other publications in the same field and in the same year, belong to the top 10% most frequently cited ones.

Interdisciplinary publications

Percentage of the department's research publications within the field's top 10% publications with the highest interdisciplinarity scores.

Research orientation of teaching

An assessment of degree to which the education is informed by research in the field, based on a student satisfaction survey.

External research income

Revenue for research that is not part of a core (or base) grant received from the government. Includes research grants from national and international funding agencies, research councils, research foundations, charities and other non-profit organizations.

Research publications (size-normalized)

The number of research publications (indexed in the Web of Science database), where at least one author is affiliated to the university expressed in relation to the number of students.

Art related output

The number of scholarly outputs in the creative and performing arts, relative to the full-time equivalent (fte) number of academic staff.

Citation rate

The average number of times the university's research publications are cited in other research; adjusted (normalized) at the global level to take into account differences in publication years and to allow for differences in citation customs across academi

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Top cited papers

The proportion of the university's research publications that, compared to other publications in the same field and in the same year, belong to the top 10% most frequently cited worldwide.

Interdisciplinary publications

Extent to which reference lists of university publications reflect cited publications in journals from different scientific disciplines.

Post-doc positions

The number of post-doc positions relative to the number of academic staff (headcount).

Research publications (absolute numbers)

The absolute number of research publications of a university as indexed in the Web of Science Core Collections database. At least one of the authors must be affiliated to the source university.

Professional publications

The number of professional publications per fte academic staff. Professional publications are all publications published in journals, books, and other media that are addressed to a professional audience and that can be traced bibliographically.

Strategic research partnerships

The number of strategic partnerships per fte academic staff.

Open Access Publications

Share of open access publications out of all publications of an institution.

Open Access Publications

Share of open access publications out of all publications of an institution.

Female authors

Percentage of women among all authors at the university.

Female authors

Percentage of women among all authors at the university.

International Orientation

International orientation of bachelor programmes

A composite measure taking into account (1) the existence of joint/dual degree Programmes; (2) the inclusion of study periods abroad; (3) the percentage of international (degree and exchange) students; and (4) the percentage of international academic staff.

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International orientation of master programmes

A composite measure taking into account (1) the existence of joint/dual degree programmes; (2) the inclusion of study periods abroad; (3) the percentage of international (degree and exchange) students; and (4) the percentage of international academic staff.

Opportunities to study abroad

An assessment of the opportunities for studying abroad, based on a student satisfaction survey.

International doctorate degrees

The percentage of doctorate degrees that were awarded to international doctoral candidates.

International joint publications

The percentage of the department's research publications that list at least one affiliate author's address abroad.

International research grants

The proportion of external research revenue from abroad – including public and private funding organizations and businesses.

Foreign language BA programs

The percentage of bachelor programmes that are offered in a foreign language.

Student mobility

A composite of international incoming exchange students, outgoing exchange students and students in international joint degree programmes.

International academic staff

The percentage of academic staff (on a headcount basis) with foreign citizenship.

International doctorate degrees

The percentage of doctorate degrees that are awarded to international doctorate candidates.

International joint publications

The percentage of the university's research publications that list at least one affiliate author's address located in another country.

Foreign language MA programs

The percentage of masters programmes that are offered in a foreign language.

Program international orientation

International orientation of the degree programme: composite of joint/dual degree programmes, inclusion of study periods abroad, international students, international staff, teaching in foreign language.

Foreign language long first degree programmes

The percentage of long first degree programmes that are offered in a foreign language.

Student Internships abroad

Regional Engagement

Student internships in the region

Out of the students who did an internship, the percentage for which the internship was with a company or organization located in the region.

Regional joint publications

The percentage of the department's research publications that list at least one co-author with an affiliate address in the same spatial region (within a distance of 50 km from the university).

Income from regional sources

The proportion of external research revenues – apart from government or local authority core/recurrent grants – that comes from regional sources (i.e. industry, private organizations, charities).

BA graduates working in region

The percentage of bachelor graduates who found their first job (after graduation) in the region where the university is located.

Student internships in region

The percentage of all the university's students doing an internship whose internship was with a company or organization located in the same region as the university.

Regional joint publications

The percentage of the university's research publications that list at least one co-author with an affiliate address located in the same spatial region (within a distance of 50 km).

Income from regional sources

The proportion of external research revenues - apart from government or local authority core/recurrent grants – that comes from regional sources (i.e. industry, private organizations, charities).

MA graduates working in region

The percentage of masters graduates who found their first job (after graduation) in the region where the university is located.

Graduates employment in the region

Percentage of graduates working in the region 18 months after graduation.

Regional Publications with Industrial Partners

The proportion of publications with industrial partners that was published with co-authors from the same region (within a distance of 50 km from the university).

Knowledge Transfer

Income from private sources

The percentage of external research revenues (incl. not-for profit organizations) coming from private sources, excluding tuition fees.

Co-publications with industrial partners

The percentage of a department's research publications that list an author affiliated with an address that refers to a for-profit business enterprise or private sector R&D unit (excludes for-profit hospitals and education organizations).

Publications cited in patents

The percentage of the department's research publications that were cited in the reference list of at least one international patent (as included in the PATSTAT database).

Bachelor theses with regional organizations

Percentage of bachelor theses done in cooperation with private organizations (enterprises/ other external organizations).

Master theses with regional organizations

Percentage of master theses done in cooperation with private organizations (enterprises/ other external organizations).

Income from private sources

Research revenues and knowledge transfer revenues from private sources (incl. not-for-profit organizations), excluding tuition fees. Measured in €1,000s using Purchasing Power Parities. Expressed per full academic staff.

Co-publications with industrial partners

The percentage of the university's research publications which list an author affiliated to an address of a for-profit business enterprise or private sector R&D unit (excludes for-profit hospitals and education organizations).

Patents awarded (size-normalized)

The number of patents assigned to (inventors working at) the university over the respective reference period, expressed per 1,000 students to take into consideration the size of the institution.

Industry co-patents

The percentage of the number of patents assigned to (inventors working at) the university during the respective reference period, which were applied for in co-operation with at least one applicant from the industry.

Spin-offs

The number of spin-offs (i.e. firms established on the basis of a formal knowledge transfer arrangement between the university and the firm) recently created by the university (per 1000 full-time academic staff).

Publications cited in patents.

The percentage of the university's research publications that were mentioned in the reference list of at least one international patent (as included in the PATSTAT database).

Income from continuous professional development (CPD)

The percentage of the university's total revenues that is generated from activities delivering Continuous Professional Development courses and training.

Patents awarded (absolute numbers)

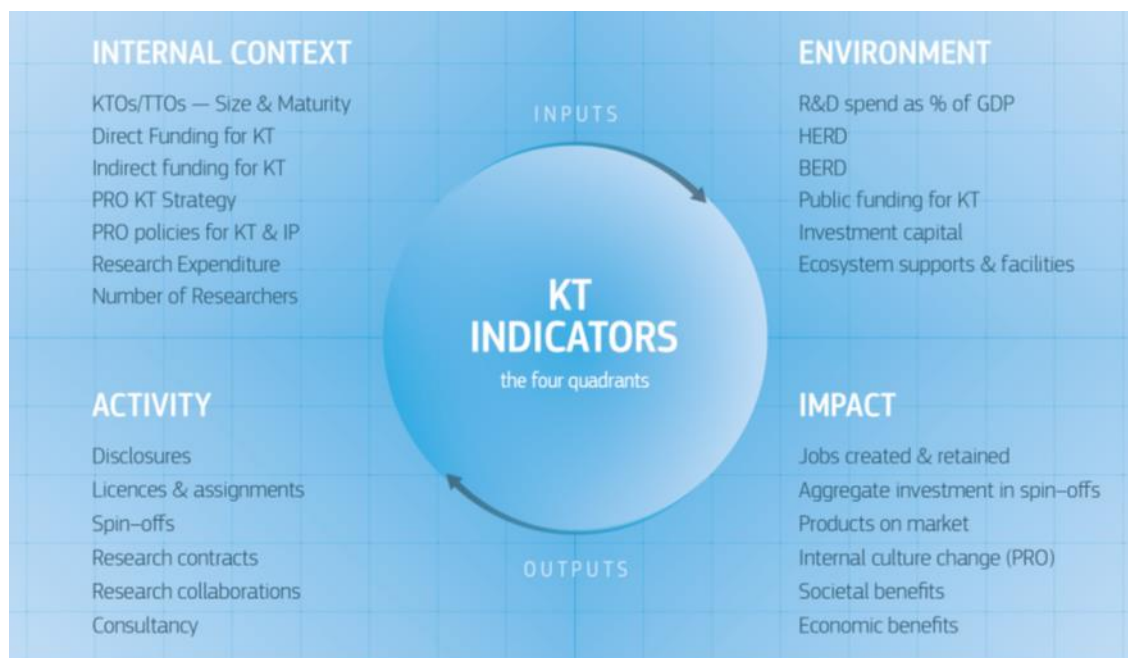
The number of patents assigned to (inventors working at) the university in the respective reference period.

Graduate companies

The number of companies newly founded by graduates per 1000 graduates

LIST OF TECHNOLOGY TRANSFER INDICATORS

Catalogue of mapping indicators EU (resume)



Source: KNOWLEDGE TRANSFER METRICS Towards a European-wide set of harmonised indicators, Report from the European Commission's Expert Group, Alison Campbell, Cecile Cavallade, Christophe Haunold, Petra Karanikic, Andrea Piccaluga, Mattias Dinnetz (Study Manager / Editor), Luxembourg EU publications, 2020

Scope of KT indicators

Indicators should reflect the range of KT channels and not be limited to patenting, licensing volume, spin-offs and commercial revenue. KT channels include:

- Publication & presentations
- Teaching
- Networking / Events
- Consultancy
- Professional Development
- Collaborative Research
- Contract Research
- Licensing
- Company Creation

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Core indicators

The indicators recommended in this report include both outputs and inputs and fall into four groups:

KT INPUT AND OUTPUT INDICATORS

To understand all these tables, we will of course need a Common definition chapter:

Indicators	Definition
Research agreements	Contracts where a firm funds the PRO to perform research on behalf of the firm, with the results usually provided to the firm. Include collaborative agreements where both partners provide funding and share the results. Exclude consultancy agreements and cases where the firm funds a research chair or other research of no expected commercial value to the firm.
Collaborative research agreements	Contracts where both the firm and the PRO participate in the design of the research project, contribute to its implementation and share the project outputs.
Contract research agreements	Contracts where all research is performed by the PRO.
Invention disclosures	Descriptions of inventions or discoveries that are evaluated by the KTO staff or other technology experts to assess their commercial application.
Indicators	Definition
Licenses & assignments executed ¹⁶	Include all licenses and assignments for all types of IP (copyright, know-how, patents, trademarks, etc.). A license grants the right to use IP in a defined field of use or territory. An assignment transfers all or part of the right to IP to the licensee. Software licenses should be accounted for separately ¹⁷ .
Licenses & assignments —gross revenue to PRO	Total income from all types of know-how and IP (patents, copyright, designs, material transfer agreements, confidentiality agreements, plant breeder rights, etc.) before disbursement to the inventor or other parties. Include license issue fees, annual fees and milestone, termination and cash-in payments. Exclude license income forwarded to other institutions than those served by the KTO or to companies.
Spin-offs established	A new company expressly established to develop or exploit IP or know-how created by the PRO and with a formal contractual relationship for this IP or know-how, such as a license or equity agreement. Include, but do not limit to, spin-offs established by the institution's staff. Exclude start-ups that do not sign a formal agreement for developing IP or know-how created by the institution.
SME	The European Commission's SME definition ¹ applies. The three main points that need to be satisfied simultaneously are: Less than 250 employees, either an annual turnover of 50 mill € or less, or a total balance sheet of 43 mill € or less Autonomous, i.e. not owned or controlled to more than 25% by another enterprise or public body.
Research expenditures in PRO	Total expenditures on all types of basic and applied research (science and humanities) in the affiliated institution(s) from all funding sources: all levels of government, industry, non-profit foundations, etc. Include share of academic costs dedicated to research, costs of administrative support and capital expenditures on new equipment. Exclude cost of new buildings or land. The definition is in line with the Frascati manual (OECD, 2002).
Number of researchers	Average number of research personnel in the reference year in FTEs. Include time spent by academic staff on research, other researchers (post-docs, PhD students, researchers on fellowships, part and full time researchers), technicians and administrative support personnel. Exclude time spent by academic staff on teaching

INPUTS: INTERNAL CONTEXT INDICATORS

This set of indicators consider the minimum components within a PRO that are required to create a fertile and effective environment within which to carry out KT. Supplementary indicators are suggested that may allow the PRO to drill further into its operations.

TABLE: KT Internal Context Indicators

Core Indicators	Answer	Supplementary indicators
Existence of PRO KT & IP Policies	Yes / No	—
PRO KT Strategy	Yes / No	—
Direct funding via the PRO for KT e.g. to KTO	Yes / No	<ul style="list-style-type: none"> • Total annual budget for KTO • IP & Patent budget
Indirect funding via the PRO for KT e.g. proof of concept	Yes / No	<ul style="list-style-type: none"> • Annual budget
Existence of KTO	Yes / No	<ul style="list-style-type: none"> • Number of FTE in KTO • Number of RTTP qualified FTE
Age of KTO	Years	—
Research expenditure in PRO	Total expenditure in year, from all sources of research funding to the PRO including from non-academic third parties	—
Number of researchers	# Number	<ul style="list-style-type: none"> • STEM • Other

INPUTS: ENVIRONMENT INDICATORS

Environment indicators address the environment external to the PRO. Availability of funding, innovation facilities and the appetite from companies to engage with the PRO will all affect the outcomes from KT that can be achieved. The supplementary indicators consider the national and regional dimensions and the regulatory and legal frameworks. These require a more narrative consideration.

TABLE: KT Environment indicators

Core Indicators	Answer	Supplementary indicators
National R&D spend as % GDP	%	—
National Higher Education Expenditure on R&D (HERD)	Value	—
National Business Expenditure on R&D (BERD)	Value	—
Availability of public funding programmes to support KT/Industry engagement	Yes / No	<ul style="list-style-type: none"> • National • Regional
Availability of investment capital	Yes / No	<ul style="list-style-type: none"> • National • Regional
—	—	Incubators & accelerators <ul style="list-style-type: none"> • National • Regional
—	—	Local company types e.g. SME/MNC mix, absorptive capacity <ul style="list-style-type: none"> • National • Regional
—	—	National policy, legal & regulatory environment as it affects KT

OUTPUTS: ACTIVITY INDICATORS

This set of indicators are the more traditional KT indicators. They encompass volume of activity and revenue across the transactional KT channels. The core indicators represent the key measures, and the supplementary indicators provide more detail and are frequently collected by PROs.

Core Indicators	Supplementary indicators
Invention disclosures (IDF) — number	# & comparative and % of IDFs resulting in license or assignment
Licenses & assignments — number	License by type — number: MTA Patent, copyright, trademark & know-how Software IP Protection by type: Patent filings Copyright registration Trademark registration Plant variety By type of transaction: License Assignment Other: % of patents licensed or assigned License by type — gross revenue to PRO: MTA Patent, copyright, trademark & know-how Software By type of transaction: License Assignment
Licenses & assignments — gross revenue to PRO	Stage — number: Formed, pre-investment Receiving first investment Maturity — companies in existence 5+ years Acquired
Spin-offs — number	—
Spin-offs — gross revenue to PRO from equity sale	—
Core Indicators	Supplementary indicators
Research collaboration agreements & research contracts with non-academic third parties — number	Detail by: Collaborative research (Where both the firm and the PRO participate in the design of the research project, contribute to its implementation and share the project outputs) Contract research (Where all research is performed by the PRO) Further breakdown: Number with companies By other non-academic third parties Other: % of Research collaboration agreements & research contracts which have led to IP license or assignment
Research collaboration agreements & research contracts with non-academic third parties — gross revenue to PRO	Detail by: Collaborative research Contract research Further breakdown: By companies By other non-academic third parties Direct funding from non-academic third party Total funding (non-academic third party plus anyco-funding e.g. from EU, national government)
Consultancy agreements with non-academic third parties — number	Further breakdown: By business By other non-academic third parties
Consultancy agreements with non-academic third parties — gross revenue to PRO	Further breakdown: By business By other non-academic third parties

OUTPUTS: IMPACT INDICATORS

Understanding and measuring impact is gaining more importance as the third mission of PROs develops. In some PROs the KTO remit and function is expanding to include innovation and impact, while in others there are separate functions to support the impact agenda. Impact is both societal and economic. The indicators proposed below are deliberately limited in number to those for which it should be possible for the PRO to drive. How the information can be captured and relayed, combined with the challenges are described.

Core Indicators	Commentary
Jobs created in spin-offs number	PRO will need to retain relationship with the spin-off and/or actively monitor public information. Data harder to access/interpret when a spin-off is acquired.
Aggregate investment in spin-offs total amount	PRO will need to retain relationship with the spin-off and/or actively monitor public information. Data may be difficult to access as company and investors may wish to keep confidentiality.
Products on market number and variety	PRO will need to retain relationship with the spin-off or licensee company and/or actively monitor public information. Data harder to access over time due to causality — as the company will often not recall the source of the IP. Easier to collect where the Product is linked to a royalty stream.
Culture change in PRO	<p>Indicators could include:</p> <ul style="list-style-type: none"> • Percentage of researchers engaged in KT (and change over time) • Net promoter score for engagement in KT <ul style="list-style-type: none"> • Prominence of KT in PRO strategy • % change in PRO funding for KT/KTO
Societal benefits	Best captured through evidence-based case studies. In addition to IP and technology-based outcomes, many benefits are generated through gaining new knowledge, for example impact on new products or process (pollution, costs, hazard etc); impact on policy; healthcare interventions etc. In many cases the outcomes are a result of access to technology and new knowledge.
Economic Benefits	The broader economic benefits are challenging to capture and will often require externally commissioned expert support. Usually such studies are lengthy and expensive and rely on assistance from the companies and other non-academic “users”. But such studies which may demonstrate Economic Value Added (EVA) and job creation within a region or country can be powerful. They should be undertaken on an occasional basis.

CONCLUSIONS

The EU report builds on existing studies and a depth and breadth of practice across EU Member States. The development of EU-wide harmonized metrics, if done correctly, has much to offer to support development of KT activity and policy by PROs and at national level by funding agencies and policymakers.

This report offers a basic set of core and comparative indicators that could be used EU-wide

We also suggest supplementary indicators that would add value.

It would be for the local PROs to select from these supplementary indicators and to include others of their own.

There are several barriers to adoption of core harmonized indicators, from the practical through to the philosophical. The latter includes a fear of how such data will be used and the implications for PROs and their KTOs.

Input indicators describe the internal structure and environment in which KT is performed, both within the PRO and at national level and can have a significant impact on the outcomes that can be achieved.

Output indicators are focus on the strategy or funding for KT will result in maximum outputs, in activity not be limited to patenting, licensing volume, spin-offs and commercial revenue and in economic and social results

Data should be collected by year and not be an accumulated figure. Such longitudinal studies will follow from annual data collection.

The indicators that will influence knowledge transfer activity and outcomes can best be represented across the quadrant in the figures above.

We have also taken into account matrix of indicators in UK and US and make our own comparative complete table across the quadrants in the figures below.

See tables containing German model (Max Planck Institut and Fraunhofer) below and bibliography at last chapter.



CATALOGUE OF MAPPING INDICATORS UK

The longest standing survey is the annual UK Higher Education Business Interaction Survey (HEBCIS) which is run by the government agency UKRI and to which mandatory data are provided by all UK universities (started 1999). See tables below indicating that indicators provide data. See the following table considering Countries in Europe undertaking annual KT surveys.

Table 1: Activities and indicators included in part B the HE-BCI survey

Sections	Sub-areas	Indicators
Research related activities	Collaborative research with public funding (i) Contract research (iii)	Income, in-kind (ii) contribution) Income, total value, number of contracts (by: SME (iv) , Non SME commercial, non-commercial)
Business and Community service	Consultancy contracts Courses for business and the community (CPD and CE)(v)	Income, total value, number of contracts (by: SME , Non SME commercial, non-commercial) Revenue, total learner days delivered(vi) (by: SME , Non SME commercial, non-commercial, individual) Facilities and equipment related services Income, total value, total number of services (by: SME , Non SME commercial, non-commercial, individual)
Regeneration and development programs	Regeneration and development programs	Income from European Regional Development Fund (ERDF), European Social Foundation (ESF), UK Government regeneration funds, Regional Development Agency (RDA) programme, Others Income
Intellectual Property (IP)	Disclosures and patents filed by or on behalf of the HEI License numbers IP Income Spin-off activity	Number of new patent applications filed in year Number of patents granted in year Cumulative patent portfolio(vii) Number of licenses for non-software and software (by: SME, non-SME commercial and non-commercial) Partner type: SMEs, Other (non-commercial) businesses and other non-commercial organizations). IP revenues, Total cost Spin-offs(viii), staff start-up(ix) graduate start-up(x) HEI owned, non-HEI owned. Number of active firms, estimates employment, turnover, investment received
Social, community and cultural engagement	Public lectures, Performance arts, Exhibitions, Museum education, Other	Number of Attendees (free events, chargeable events), staff time

Table 2: Activities and indicators included in part official evaluations

Concept	Measures of Quantity	Measures of Quality
Networks	<ul style="list-style-type: none"> - # of people met at events which led to other Knowledge Transfer Activities - # of people met at events which led to other Knowledge Transfer Activities 	<ul style="list-style-type: none"> - % of people coming from Industry - % of incomes coming from networking activities
Continuing Professional Development (CPD)	<ul style="list-style-type: none"> - # of CPD Courses and people that attend, - # of companies attending CPD courses 	<ul style="list-style-type: none"> - Repeat business, - customer feedback - Income from courses
Consultancy	<ul style="list-style-type: none"> - # and value/income of contracts, - # of client companies, - hours spent consulting - # and value/income of contracts, - # of innovative businesses that evolve from consultancy contracts 	<ul style="list-style-type: none"> - Repeat business, - customer feedback, - quality of client company, - importance of client relative to company (i.e. Senior Management or junior employee) - % of turnover from services/products
Collaborative Research	<ul style="list-style-type: none"> - # and value/income of contracts, - Geographical proximity of clients to university, 	<ul style="list-style-type: none"> - % income relative to total research income, - length of client relationship - Repeat Business, - customer feedback, - # of products successfully created from the research, - # of licenses that originate from the research - # and value of contracts, - Market share - Repeat Business, - Customer feedback, - Quality of partner company, - longevity of partnership
Contract Research	<ul style="list-style-type: none"> - # and value/income of contracts, - Geographical proximity of clients to university, 	<ul style="list-style-type: none"> - Length of client relationship - Repeat Business, - customer feedback - # and value of contracts, - Market share - Repeat Business, - Customer feedback, - Quality of partner company, - longevity of partnership
Licensing	<ul style="list-style-type: none"> - # of licenses, - # of licenses to start-ups, - # of licenses to existing companies, - Income generated from licenses, - # of products that arose from licenses - # of licenses, - Income generated from licenses - Case studies, 	<ul style="list-style-type: none"> - Quality of Licensee company, - potential impact of the technology, - repeat business in licensing. - repeat business in the form of other knowledge transfer activities, - customer feedback - Length of licenses
Spin-Outs	<ul style="list-style-type: none"> - # of spin-outs formed, - amount of external investment raised - # spin-outs that are geographically close to the university - # revenues generated - Growth amount in total 	<ul style="list-style-type: none"> - Investor satisfaction, - survival rate, - quality of investors - external investment raised, - , flotation/ exit value - Survival rate/ viability, - Growth rate, - Customer feedback - Revenues rate
Teaching	<ul style="list-style-type: none"> - # of graduated students, - rate at which students get hired (in industry) - # of podcasts of lectures (or other course material) downloaded - # of teachers per faculty 	<ul style="list-style-type: none"> - Graduation rate - Student satisfaction (after subsequent employment), - employer satisfaction of student, - Commercial skill sets of academics (i.e. marketing, legal, commercial training) - rate at which students get hired (in industry)
Other Measures	<ul style="list-style-type: none"> - # Physical Migration of Students to Industry, - Publications as a Measure of Research - Outputs total 	<ul style="list-style-type: none"> - Access of academics to high technology equipment, - Measure of user investment as indicator of success - Publication and University rating

CATALOGUE OF MAPPING INDICATORS US & CANADA

The longest standing survey is the annual AUTM Licensing Survey which takes in voluntary data from Technology Transfer Offices in the USA and Canada (started 1991).

See tables below indicating that indicators:

OUTPUTS
TTO ACTIVITY
Number of requests for protection
Inventions
Number of patents, utility models, software registrations, plant varieties,...
Number of active patents
Percentage of jointly owned patents
License numbers
% of patents licensed
License income
Income from royalties
Trademark Licensing
Patent expenditures
Other measures
BUSSINESS/SPINOFFS-STARTUPS
Number of spin-offs and startups
Number of employees (Total/average)
Accumulated turnover and EBITDA
Survival rate at 5 and 10 years
Investment captured by spinoffs
Products-Services on the market /Sales
Ratio/1.000 (Spin-off/reserchers)
Spin-offs (Total/anual)
Income from the sale of shares
Others measures

INPUTS
INTERNAL TTO CONTEXT
Existence of a TTO strategic plan
Years since the creation of the TTO
Number of people in the TTO with specific qualification for innovation management activities.
It has a commercial catalog of its research (Yes or No/Number)
Number research in commercial catalog
Frequency of meetings with the Authority you depend on
TTO annual budget
% Public research expenditure / KTO-OTT
% Private research expenditure / KTO-OTT
Number of projects that are in different stages of innovation: capture of ideas, evaluation, development process, transfer and market.
Collaborations numbers: Number of research collaboration agreements with non-academic entities (Collaborations)
Collaboration revenue: Revenue from research collaboration with nonacademic entities
Number of researchers contacted by the TTO
Conferences and events
Number of Membership to networks, cluster, platforms, etc.
Number of national and international agreements signed with companies and other institutions
RELATIONSHIP WITH THE UNIVERSITY
Realization, practices, doctoral theses, ...
Number of projects contracted to the University
Amount of projects contracted to the University
NON-COMPETITIVE PUBLIC-PRIVATE COLLABORATION PROJECTS
Number of research collaboration agreements with non-academic entities
Income from research collaboration with non-academic organizations

See tables containing US model (Harvard, Stanford & Berkeley and Texas, MIT and Carnegie Melon) below and bibliography at last chapter.

CATALOGUE OF MAPPING INDICATORS COMPARATIVE VIEW

We are now going to compare all these tables trying to ensemble something reasonable considering the EU report, the annual UK Higher Education Business Interaction Survey (HEBCIS) and the annual AUTM Licensing Survey which takes in voluntary data from Technology Transfer Offices in the US and Canada.

See tables below studying that indicators:

Table: KT Environment Indicators EU			USA	UK
Core Indicators	Answer	Supplementary indicators	General indicators	QTY QLY
National R&D spend as % GDP	%	—	-	
National Higher Education Expenditure on R&D (HERD)	Value	—	-	
National Business Expenditure on R&D (BERD)	Value		-	Income, in-kind (ii) contribution) Income, total value, number of contracts (by: SME (iv) , Non SME commercial, non-commercial)
Availability of public funding programmes to support KT/Industry engagement	Yes / No	<ul style="list-style-type: none"> National Regional 	Number of research collaboration agreements with non-academic entities	Income, total value, number of contracts (by: SME , Non SME commercial, non-commercial) Revenue, total learner days delivered(vi) (by: SME , Non SME commercial, non-commercial, individual) Facilities and equipment related services
Availability of investment capital	Yes / No	<ul style="list-style-type: none"> National Regional 	Income from research collaboration with non-academic organizations	Income from European Regional Development Fund (ERDF), European Social Foundation (ESF), UK Government regeneration funds, Regional Development Agency (RDA) programmed, Others Income
—	—	Incubators & accelerators <ul style="list-style-type: none"> National Regional 		
—	—	Local company types e.g., SME/MNC mix, absorptive capacity <ul style="list-style-type: none"> National Regional 		
—	—	National policy, legal & regulatory environment as it affects KT		
			Realization, practices, doctoral theses, ...	
			Number of projects contracted to the University	
			Amount of projects contracted to the University	

Outputs: Activity Indicators

EU

USA

UK

Core Indicators	Supplementary indicators	General indicators	QTY	QLY
Invention disclosures (IDF) number	# & comparative and % of IDFs resulting in license or assignment	Number of requests for protection		
Licenses & assignments number	License by type — number: MTA Patent, copyright, trademark & know-how Software IP Protection by type: Patent filings Copyright registration Trademark registration Plant variety By type of transaction: License & Assignment Other: % of patents licensed or assigned	Inventions Number of patents, utility models, software registrations, plant varieties,... Number of active patents % of jointly owned patents % of patents licensed Patent expenditures	# of licenses, # of licenses to start-ups, # of licenses to existing companies, Income generated from licenses, # of products that arose from licenses # of licenses, Income generated from licenses Case studies,	Quality of Licensee company, potential impact of the technology, repeat business in licensing. repeat business in the form of other knowledge transfer activities, customer feedback Length of licenses
Licenses & assignments — gross revenue to PRO	License by type — gross revenue to PRO: MTA Patent, copyright, trademark & know-how Software By type of transaction: License Assignment	License numbers License income Income from royalties Trademark Licensing	Partner type: SMEs, Other (non-commercial) businesses and other non-commercial organizations). IP revenues, Total cost Repeat business, customer feedback, quality of client company, importance of client relative to company (i.e. Senior Management or junior employee) % of turnover from services/products	
Spin-offs — number	Stage — number: Formed, pre-investment Receiving first investment Maturity — companies in existence 5+ years Acquired	Number of spin-offs and startups Investment captured by spinoffs Survival rate at 5 and 10 years	# of spin-outs formed, amount of external investment raised # spin-outs that are geographically close to the university # revenues generated Growth amount in total Partner type: SMEs, Other (non-commercial) businesses and other non-commercial organizations). IP revenues, Total cost	Investor satisfaction, survival rate, quality of investors external investment raised, flotation/ exit value Survival rate/ viability, Growth rate, Customer feedback Revenues rate
Spin-offs — gross revenue to PRO - from equity sale	—	Income from the sale of shares	Spin-offs(viii), staff start-up(ix) graduate start-up(x) HEI owned, non-HEI owned. Number of active firms, estimates employment, turnover, investment received	

		Number of employees (Total/average)		
Other measures		Accumulated turnover and EBITDA	# of people met at events which led to other Knowledge Transfer Activities	% of people coming from Industry
		Ratio/1.000 (Spin-off/reserchers)	# of people met at events which led to other Knowledge Transfer Activities	% of incomes coming from networking activities
		Spin-offs (Total/annual)		
		Detail by:		
Research collaboration agreements & research contracts with non-academic third parties — number	Collaborative research (Where both the firm and the PRO participate in the design of the research project, contribute to its implementation and share the project outputs)	% Public research expenditure / KTO-OTT	# of CPD Courses and people that attend,	Repeat business,
	Contract research (Where all research is performed by the PRO)	Collaborations numbers: Number of research collaboration agreements with non-academic entities (Collaborations)	# of companies attending CPD courses	customer feedback
	Further breakdown:			Income from courses
	Number with companies			
Research collaboration agreements & research contracts with non-academic third parties —gross revenue to PRO	By other non-academic third parties			
	Other: % of Research collaboration agreements & research contracts which have led to IP license or assignment			
	Detail by:			
	Collaborative research	TTO annual Budget	# and value/income of contracts,	Repeat business,
Research collaboration agreements & research contracts with non-academic third parties —gross revenue to PRO	Contract research	% Private research expenditure / KTO-OTT	# of client companies,	customer feedback,
	Further breakdown:	Collaboration revenue: Revenue from research collaboration with nonacademic entities	hours spent consulting	quality of client company,
	By companies		# and value/income of contracts,	importance of client relative to company (i.e. Senior Management or junior employee)
	By other non-academic third parties		# of innovative businesses that evolve from consultancy contracts	% of turnover from services/products
Consultancy agreements with non-academic third parties — number	Direct funding from non-academic third party			% income relative to total research income,
	Total funding (non-academic third party plus anyco-funding e.g. from EU, national government)			length of client relationship
	Further breakdown:		# and value/income of contracts,	Repeat Business,
	By business		Geographical proximity of clients to university,	customer feedback,
Consultancy agreements with non-academic third parties — gross revenue to PRO	By other non-academic third parties		# of products successfully created from the research,	Market share
			# of licenses that originate from the research	Repeat Business,
			# and value of contracts,	Customer feedback,
				Quality of partner company,
Consultancy agreements with non-academic third parties — gross revenue to PRO				longevity of partnership
Consultancy agreements with non-academic third parties — gross revenue to PRO				
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Consultancy agreements with non-academic third parties — gross revenue to PRO				
Consultancy agreements with non-academic third				

Outputs:impacts EU

USA

UK

Core Indicators	Commentary	General indicators	QTY QLY
Jobs created in spin-offs number	PRO will need to retain relationship with the spin-off and/or actively monitor public information. Data harder to access/interpret when a spin-off is acquired.	Number of employees (Total/average) Accumulated turnover and EBITDA	# of people finding jobs in spin off Activities # of people finding jobs in other Knowledge Transfer Activities People feedback Salaries from spin offs
Aggregate investment in spin-offs total amount	PRO will need to retain relationship with the spin-off and/or actively monitor public information. Data may be difficult to access as company and investors may wish to keep confidentiality.	Investment captured by spinoffs Income from the sale of shares	# of spin-outs formed, # amount of external investment raised # spin-outs that are geographically close to the university # revenues generated Growth amount in total Investor satisfaction, survival rate, quality of investors external investment raised, flotation/ exit value Survival rate/ viability, Growth rate, Customer feedback Revenues rate
Products on market number and variety	PRO will need to retain relationship with the spin-off or licensee company and/or actively monitor public information. Data harder to access over time due to causality — as the company will often not recall the source of the IP. Easier to collect where the Product is linked to a royalty stream.	Products-Services on the market Sales	Partner type: SMEs, Other (non-commercial) businesses and other non-commercial organizations). IP revenues, Total cost Spin-offs(viii), staff start-up(ix) graduate start-up(x) HEI owned, non-HEI owned. Number of active firms, estimates employment, turnover,investment received Repeat business, customer feedback, quality of client company, importance of client relative to company (i.e. Senior Management or junior employee) % of turnover from services/products

COMPARATIVE SUMMARY TABLES OF EUROPEAN MODEL INDICATORS MAX PLANCK, FRAUNHOFER, OXFORD, CAMBRIDGE

1. EXPLANATION OF THE RESPECTIVE TABLES

A) TTO/KTO Organizational structures:

1.1 Centralized legal structure that manages industrial property independently: Almost all cases have a branch or subsidiary organizational structure that manages patents and technologies to market and helps researchers to establish new companies based on research results from the entire University or Center. They also make valorization and commercialization. They all have internal employees (around 30 on average up to 60) and, in addition, have external or outsourced specialized staff to provide professional management (patent and license managers, start-up managers, patent attorneys and legal experts, company representatives) and an Advisory Board of several members (some are internal and others external). They all have a network of investors and outsource numerous services.

1.2 Specialized in specific areas: yes, they all are specialized in different areas, two or three, such as Biological-medical section. Chemistry, Physics, Technology, and others Section (depends on the Universities). There are qualified personnel specialized in the different areas that coordinate the exchange of information of the institutes belonging to those areas.

1.3 self-sustaining structure: The subsidiaries created vary between limited companies (GmbH in Germany and Ltd. in the UK) and also foundations (in both countries), although, in both countries, the foundations have ended up being converted into limited liability companies with public-private capital. They receive part of their operating funds from the public matrix (center or university), but some have managed to have their own income that covers their costs, with which some of them could be completely financially independent, especially in the Anglo-Saxon world. In turn, all the income generated by the subsidiaries goes directly to the parent company's budget. It can be considered a self-sustaining model, given its ability to generate income greater than its operating costs. Legally, there are completely independent structures, through limited companies and foundations in which the Universities and Centers participate. There are also dependent structures within the administrative apparatus itself without legal independence, although with economic independence (French and Italian model).

1.4 Local structures (links): It is carried out at the local level through the Scientific Coordination and Technology Transfer Offices with representation in each of the Institutes and under the coordination of the managing subsidiary. After the technology verification cut-off, it is escalated to the matrix, which is who decides the policy of technological sovereignty and preference of lines of investigation. Both the centers and the local offices also have the capacity to draft and file patents for which they rely on the marketing affiliate. They even have the capacity to negotiate agreements in almost all cases, always coordinated by the subsidiary itself.

1.5 Local structures: Specialization in thematic lines. It seems that since there are local offices and liaisons in each Institute, their staff specialize in their own research areas. It has not been possible to observe superior organizational structures specialized in general thematic areas or organized by areas with entrepreneurial capacities in a specific sector. This role is coordinated by the branch in all centers.

1.6 External performance evaluation: An external international committee made up of technology transfer managers as well as industry representatives evaluate the performance of the subsidiary and its staff and the degree of compliance with the proposed objectives.

1.7 International presence: Forming part of international networks of the most important, many of them: Association of University Technology Managers (AUTM), Association of European Science and Technology Transfer Professionals (ASTP), Licensing Executive Society (LES), Alliances for the transfer and others

1.8 Incentive for non-curricular and economic researchers: The curricular incentive is designed from the matrix and is a priority for the institution. However, the non-curricular is given, in some models from the parent company and in others from the subsidiary. In fact, it seems that the subsidiaries set up for knowledge management in each Institute are allowed to give various types of incentives: access to high-impact publications, patents and their management, as well as entry into public, private or international projects. mixed. Regarding economic incentives, it is important to highlight that almost all agree on the rule of thirds, where income is divided into three parts for the parent company, for the subsidiary and for the researcher. An important issue is the allocation of general expenses for the operation of the subsidiary. In this sense, the European rule is to retain 30% of income for operating expenses and the American rule is 15%. The rest, which would be the net income, is divided into several portions that vary greatly depending on the country and model, but it is clear that the ones that work best are those that involve the benefit of a greater number of entities, without neglecting the researcher, who is the asset. fundamental of these institutions and in which, in most systems, quantitative income limits are not placed on it, so as not to achieve the opposite effect to the desired one. Finally, it is important that if in the end it is not exploited via licenses, if not via the creation of a company, spin-off, EBT, etc. Entities (sometimes the parent company and other times the generated subsidiaries) are allowed to give sabbatical days, but they are entrepreneurial days, that is, days that researchers can dedicate to their companies or company projects without losing a salary, without diminishing their academic or scientific performance. In this sense, they are given a few days off per month (2-4) so that they can fully dedicate themselves to their projects, freeing them from their teaching or service or research obligations.

B) TTO/KTO Business structures (BUSINESS)

2.1 Centralized management structure: The parent company generally commissions its subsidiary (SL or foundation) to develop a concept to encourage technology transfer through spin-offs in which the center or university itself participates. In many of them, parallel structures called Incubators have been created, where some models once again outsource and generate new companies for their management.

2.2 Incubators, accelerators and shuttles: "Pre-seed" thematic platforms have been created for selected start-up companies with the greatest potential for commercial success in specific areas related to the areas of specialization and the most important centers of excellence for the generation of flagship products. Subsequently, once incubated, they move to an acceleration environment, where they are provided with tools for business growth and the start of market access. Once accelerated and put in reasonable market numbers, they are passed to the shuttles that are autonomous entities in some of the models, where they are provided with sufficient business structure and capital to make them attractive in the market and achieve success or sale of the company generated in the research and innovation environment that would produce returns for the institution and for the researchers, according to the distribution seen above.

2.3 External counseling: The team is trained and supplemented with external experts in negotiation, business management, finance, and industrial and intellectual property rights, where coverage is provided through various external companies that collaborate with entities through alumni networks. and sponsors and patrons of the institutions themselves

2.4 Investment and conflict of interest committee: In order for the newly formed companies to opt for investments from the incubator funds, they must go through an expert investment committee made up of internal personnel from the parent entity, from the knowledge management subsidiary itself and from external people from the industry or the market that decide on equal terms about the projects that can be endowed with their own funds or from others and those that the institution wants to promote. Likewise, the most evolved models present some conflict of interest committees to avoid those situations in which the members of the investor committees or knowledge managers or advisors could be in situations of difficult management for decision-making due to their involvement in the company or analyzed business. These committees also establish ethical codes and action protocols to avoid this type of conflict.

2.5 Advice on business plan and marketing: The staff of the knowledge management subsidiary itself and the staff of the companies created, in some cases, to act as an incubator, accelerator or shuttle, help to prepare the business plan during the incubation, acceleration and exit phase. or launch and will guide them through rounds of fundraising, capitalization and generation of product accessible to the market in the best conditions.

2.6 Training, coaching, mentoring, benchmarking: The project team receives monitoring, training and advice throughout the process to develop the technical, managerial and interpersonal skills necessary to guide and develop the start-up in later stages. In addition, the team can participate in a seminar called “Start-up days” organized by the most important research organizations, where researchers learn about a series of basic topics that are very relevant to becoming an entrepreneur and being surrounded. Other institutions go further and do not try to turn researchers into entrepreneurs, but accompany them throughout the process and what they do is mentor researchers so that they guide them in the decision-making process until they are ready. fully prepared, if they have chosen to become entrepreneurs or well advised and accompanied by trusted managers who do this work for them, if they decide not to become entrepreneurs or managers and remain in a role of technical advisors.

2.7 Spin-off / Start-up access to public research infrastructures: Researchers and collaborators setting up the spin-off can stay at the research facility while working at their start-up company, which can also use the facility, giving them a safety net they wouldn't have if they started up again. immediate, having to invest in spaces and equipment, with an average of 5 years, in some cases extendable up to 7 years, especially in the case of bio areas, where the process of reaching the market takes more years than in the other fields of application.

2.8 Participation in spin-offs, start-ups and EBT: The knowledge management subsidiary and/or the companies created as incubators, accelerators and launchers may have participation in the form of shares at the time of incorporation, which depends on the period of incubation, acceleration and launch. Generally, the subsidiary takes the shares that the regulations prevent public researchers from having and retains the majority until the project decides to be launched on the market, in which case, the shares required by the investor are sold to try a flexible dilution of the researcher and that it retains the maximum allowed by law for the longest possible time of incubation and acceleration so that it can receive the greatest number of income for its project. Such participation is financed by a combination of public and private funds. In addition to license income, it also includes income from the sale of shares of the company that is to be incorporated and put up for sale in the future, after incubating and accelerating it. In some models, after incubation and acceleration (in the most advanced management models), participation is opened to private companies from the industrial sector related to the newborn project and generally, some of the institutions set limits on the participation of the matrix or of the subsidiary in order not to take majority shares. In other models (Anglo) the decision is made on a case-by-case basis, depending on the circumstances

2.9 Business participation and mixed investment funds: The knowledge management subsidiary (the limited company or instrumental foundation created to deal more directly with the market) and/or the consulting, management companies, etc. that participate within the incubators, accelerators and launchers can manage and dispose of a fund investment affiliate in which various sectoral companies in that area participate. In the Anglo area it is more private and in the German area mixed capital with the presence of public investment. This financed participation is complemented by other types of investment funds, business angels, or mixed venture capital, including public funds that also take part in the companies, with which part of the risk and benefit is assumed by private entities that are interested in finance it and another part is supported from the public sector, in a socialization of risk in early phases that allows faster success.

2.10 Participation of other research institutions: The incubators of some of the models decided to partner with other research organizations and open the program to participation along with other universities in order to establish a critical mass of high-quality researchers and projects. This is happening in the Anglo world, where the leading universities have embraced fund management to enter projects to create start-ups and spin-offs from other universities, first English and then European, setting up consultancies that are spreading throughout the entire continent to capture talent, value and benefits in other countries that have not been able to develop such systems.

Now we are going to study the comparative tables between the different universities and entities of research studied in our own model. For further explanation of the model and the tables see second report on IP ownership, strategy and management:

2. COMPARATIVE TABLES

ORGANIZATION:	Max Planck	Fraunhofer	Oxford	Cambridge
1.- Internal structure for IP and knowledge ownership and management	YES externalized		YES externalized	YES externalized
2.- Specialized areas PRO	YES 3		YES 3	YES 3
3.- Competitive Surveillance	YES		YES	YES
4.- External structure for IP and knowledge management	YES		YES	YES
5.- Research and results ownership	100% ENTIDAD CBC		100% ENTIDAD CBC	100% ENTIDAD CBC
6.- Local structure TTO	YES		NO	YES
7.- Specialized areas TTO	YES 3		NO 3	YES 3
8.- External auditing of TTO	YES		YES Comité 15	YES Comité Mixto
9.- International Presence	YES 5		YES 54	YES 54
10.- Researchers incentives policy	YES		YES	YES
11.- Form of incentives	1/3 OPI+ 1/3 Center+ 1/3 researcher		70% FCI: 10-20-30% Faculty 30% Royalty and general costs: FCI 0-15-30% Center 60-30-15% <70K 700K+700K	30% + 70%: para FCI 70% FCI: 10-60% Faculty 0-30% Center 90-10% researcher

BUSINESS	Max planck	Fraunhofer	Oxford	Cambridge
12.- Internal structure for IP and knowledge ownership and management	YES		YES	YES
13.- Incubator Acelerator Launcher	YES- NO- NO		YES- YES- NO	YES- YES- NO
14.- External consulting (business, finances, corporate, IPR...)	YES		YES	YES
15.- Investment committee Conflict of interest committee	YES NO		YES YES	YES YES
16.- Business consultancy y commercialization	YES NO		YES YES	YES YES
17.- training coaching / mentoring benchmarking	YES YES		YES YES	YES YES
18.- Good access to infrastructure by companies	YES		YES	YES
19.- Collaboration with other PRO	YES		YES	YES
20.- Possibility of participation of TTO in spin-offs	YES		YES	YES
21.- TTO form of participation (equity in spin-off...)	<30%		CBC	CBC
22.- Business external Participation	YES		YES	YES
23. Private Funding	YES		YES	YES

Indicadores comparativos:	Max planck	Fraunhofer	Oxford	Cambridge
BUSINESS				
22.- Business external Participation	YES		YES	YES
23. Private Funding	YES		YES	YES

GERMANY	MPI MAX PLANCK		KU LEUVEN	TUM MUNICH
Private Funding & Venture capital	MPI GmbH Fondo: KHAN Technology Transfer Fund I GmbH & Co KG	FTTF - Fraunhofer Technology-Transfer Fund	KU Fondo: Gemma Frisius	Unternehmer TUM Venture Capital Partners GmbH

UK	OXFORD	CAMBRIDGE	IMPERIAL COLLEGE	EDIMBURGH
Ges tora y Fondo de inversión Venture capital	OUI Parkwalk investments & UNIVERSITY of Oxford Innovations Fund Ltd	CE Parkwalk investments & UNIVERSITY of Cambridge Enterprises Fund Ltd Fondo Cambridge Innovation Capital (CIC),	ICI Parkwalk investments Imperial College Innovations Ltd	Edinburgh Innovations Ltd Edinburgh Technology Fund Ltd (ETF)

COMPARISON OF OTHER INTERNATIONAL MODELS HARVARD, STANFORD, BERKELEY, (US) & WIT (ISR)

ORGANIZATION		Harvard	Stanford	Berkeley	I.C.Weizmann (Israel)
1.- Internal structure for IP and knowledge ownership and management		YES externa Board of entity Harvard Office of Technology development	YES externa Board of entity Stanford Office of Technology Licensing	YES externa Board of entity Berkeley office of technology and IPR	YES externa Board of entity Yeda Research and Development Cy Ltd.
2.- Specialized areas PRO		YES 2 = áreas: físicos, biology biomedic	YES 2 = áreas: : físicos, biology PC quantic	YES	YES 7 Agricultura Química y nanotecnología Ciencias ambientales y energía solar Matemáticas e Informática Dispositivos médicos Productos farmacéuticos y diagnósticos Física y electroóptica
3.- Competitive Surveillance		YES	YES	YES	YES
4.- External structure for IP and knowledge management		YES	YES	YES	YES
5.- Research and results ownership		100% ENTITY CBC not substantial RDI	100% ENTIDAD CBC	100% ENTIDAD CBC	100% ENTITY
6.- Local structure TTO		NO	NO	NO	NO

ORGANIZATION II	Harvard	Stanford	Berkeley	I.C.Weizmann (Israel)
7.- Specialized areas TTO	YES	YES	-	-
8.- External auditing of TTO	YES	YES	YES	YES
9.- International Presence	YES	YES	-	-
10.- Researchers incentives policy	YES	YES	YES	YES
11.- Form of incentives	Royalty & total revenues:			
	15% general expenses	15% general expenses	15% general expenses	
	85% FCI	85% FCI	85% FCI	
	FCI	FCI	FCI	
	Faculty, Center, Researcher	Faculty, Center, Researcher	Faculty, Center, Researcher	
	Net incomes	Net incomes	Net incomes	
	20% Faculty	33% Faculty	65% Faculty	
	15% Center	33% Center	% Center	
	35% Researcher	33% Researcher	35% Researcher	
	15% President	% President	% President	
	% Management	% Management	% Management	

Indicadores comparativos: BUSINESS	Harvard	Stanford	Berkeley
22.- Business external Participation	YES	YES	YES
23. Private Funding	YES VC	YES VC	YES VC

Investment funds or Venture capital	HOTD Experiment Fund (Harvard UNIVERSITY); X fund Dorm Room Fund Private equity VC	SOTL StartX (Stanford UNIVERSITY) (Stanford.Entrepreneurship.Network) Dorm Room Fund Private equity VC	BOTL Berkeley Ventures (UNIVERSITY of California, Berkeley); Dorm Room Fund Private equity VC
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USA	OTHERS
Investment funds or Venture capital	<p>A. UNIVERSITY-backed VC funds:</p> <ul style="list-style-type: none"> • StartX (Stanford UNIVERSITY) (Stanford.Entrepreneurship.Network) • UCLA VC Fund (UCLA); • NYU Innovation Venture Fund (New York UNIVERSITY); • BRV - BR Venture Fund (Cornell UNIVERSITY); • SIMON School Venture Capital Fund (UNIVERSITY of Rochester); • Triton Technology Fund (UNIVERSITY of California, San Diego); • Venture Center at Office for Technology Commercialization (UNIVERSITY of Minnesota) - Similarly to Stanford UNIVERSITY, not a VC fund per se, but an example of very popular UNIVERSITY <i>technology transfer</i> programs, where licensing is a major instrument of venture funding; • The Garber Venture Capital Center (Penn State UNIVERSITY); • CSU Ventures (Colorado State UNIVERSITY); • Rutt Bridges Venture Capital Fund (UNIVERSITY of Colorado, Denver); • OSU Venture Fund (Oregon State UNIVERSITY); • UNIVERSITY Venture Development Fund (Portland State UNIVERSITY); • Boyd Venture Fund (UNIVERSITY of Tennessee, Knoxville); • Innovate Indiana Fund (UNIVERSITY of Indiana). <p>B. UNIVERSITY-affiliated VC funds:</p> <ul style="list-style-type: none"> • Berkeley Ventures (UNIVERSITY of California, Berkeley); • The Athenaeum Fund (California Institute of Technology - Caltech); • Experiment Fund (Harvard UNIVERSITY); • ARCH Venture Partners (UNIVERSITY of Chicago); • Icon Venture Partners (UNIVERSITY of Minnesota); • The UNIVERSITY Technology Seed Fund (UNIVERSITY of Rochester); • MentorTech Ventures (UNIVERSITY of Pennsylvania); • Drive Capital (Ohio State UNIVERSITY). <p>C. Student-run or student-focused VC funds:</p> <ul style="list-style-type: none"> • Dorm Room Fund (UNIVERSITY-neutral - current coverage: Boston, New York, Philadelphia, San Francisco Bay Area); • Wolverine Venture Fund (UNIVERSITY of Michigan); • Zell Lurie Commercialization Fund (UNIVERSITY of Michigan); • Social Venture Fund (UNIVERSITY of Michigan); • UNIVERSITY Venture Fund (UNIVERSITY of Utah, Brigham Young UNIVERSITY, Westminster College); • Deming Center Venture Fund (Colorado UNIVERSITY, Boulder); • Dakota Venture Group (UNIVERSITY of North Dakota).
Shareholders and management	See references
Objective investment	See references

COMPARISON OF OTHER INTERNATIONAL MODELS (UNITED STATES TEXAS TECH AND CARNEGIE MELON, MIT (US))

ORGANIZATION		MIT	TX	Carnegie
1.- Internal structure for IP and knowledge ownership and management	1. MIT Technology Licensing Office (TLO) 2 Office of Strategic Alliances and Technology Transfer (OSATT)	YES Board of entity	YES Board of entity	YES Board of entity Center for Technology Transfer and Enterprise Creation CTTEC
2.- Specialized areas P RO		YES 4	YES	YES
life science, physical science, software, technology				
3.- Competitive Surveillance		YES	YES	YES
4.- External structure for IP and knowledge management		YES	YES	YES
5.- Research and results ownership		100% ENTITY CBC not substantial RDI	100% ENTITY CBC 50	100% ENTITY CBC
6.- Local structure TTO		NO	NO	NO

ORGANIZATION II	MIT	TX	CARNEGIE
7.- Specialized areas TTO	YES	YES	-
8.- External auditing of TTO	YES	YES	YES
9.- International Presence	YES	YES	-
10.- Researchers incentives policy	YES	YES	YES
11.- Form of incentives	Royalty & total revenues:		
	15% general expenses	15% general expenses	15% general expenses
	85% FCI	85% FCI	85% FCI
	*FCI	*FCI	*FCI
	Faculty, Center, Researcher	Faculty, Center, Researcher	Faculty, Center, Researcher
	Net incomes	Net incomes	Net incomes
	% Faculty	26% Faculty MIT General Fund	% Faculty
	% Center	26% Center	% Center
	% Researcher	33% Researcher	% Researcher
	% President	% President	% President
	% Management	1% Management	% Management

BUSINESS	MIT	TX	CARNEGIE
12.- Internal structure for IP and knowledge ownership and management	MIHQ, MTC, Deshpande Center for Technological Innovation, TE, Solve, Venture Mentoring Service) YES	YES	YES
13.- Incubator Acelerator Launcher	YES- MIT InnovationHQ YES- Martin Trust Center for MIT Entrepreneurship YES The Engine,	YES- Austin Technology Incubator (ATI) YES- Entrepreneurs in Residence, Herb Kelleher Entrepreneurship Center YES Texas Innovation Center, LaunchPad	YES- YES YES
14.- consulting (Business, finances, IPR...) External corporate,	YES MIT VMS	YES	YES
15.- Investment committee Conflict of interest committee	YES MIT GOVERNING BOARD YES SANDBOX MIT FUNDING BOARD	YES YES	YES YES
16.- Business consultancy y commercialization	YES MTC YES MTC	YES YES	YES YES
17.- training coaching / mentoring benchmarking	YES MIT VMS YES MIT VMS	YES YES	YES YES
18.- Good access to infrastructure by companies	YES	YES	-
19.- Collaboration with other PRO	-	YES	YES
20.- Possibility of participation of TTO in spin-offs	YES	YES	YES
21.- TTO form of participation (equity in spin-off...)	CBC	CBC	<50%
22.- Business external Participation	YES	YES	YES
23. Private Funding	YES VC and MIT fund instruments	YES VC Seed Fund	YES VC Venture Bridge program

Indicators BUSINESS	MIT	TX	CARNEGIE
22.- Business external Participation	YES YES	YES	
23. Private Funding	YES VC and MIT fund instruments	YES VC Seed Fund	YES VC Venture Bridge program






USA	OTHERS
Investment funds or Venture capital	<p>A. UNIVERSITY-backed VC funds:</p> <ul style="list-style-type: none"> • StartX (Stanford UNIVERSITY) (Stanford.Entrepreneurship.Network) • UCLA VC Fund (UCLA); • NYU Innovation Venture Fund (New York UNIVERSITY); • BRV - BR Venture Fund (Cornell UNIVERSITY); • SIMON School Venture Capital Fund (UNIVERSITY of Rochester); • Triton Technology Fund (UNIVERSITY of California, San Diego); • Venture Center at Office for Technology Commercialization (UNIVERSITY of Minnesota) - Similarly to Stanford UNIVERSITY, not a VC fund per se, but an example of very popular UNIVERSITY <i>technology transfer</i> programs, where licensing is a major instrument of venture funding; • The Garber Venture Capital Center (Penn State UNIVERSITY); • CSU Ventures (Colorado State UNIVERSITY); • Rutt Bridges Venture Capital Fund (UNIVERSITY of Colorado, Denver); • OSU Venture Fund (Oregon State UNIVERSITY); • UNIVERSITY Venture Development Fund (Portland State UNIVERSITY); • Boyd Venture Fund (UNIVERSITY of Tennessee, Knoxville); • Innovate Indiana Fund (UNIVERSITY of Indiana). <p>B. UNIVERSITY-affiliated VC funds:</p> <ul style="list-style-type: none"> • Berkeley Ventures (UNIVERSITY of California, Berkeley); • The Athenaeum Fund (California Institute of Technology - Caltech); • Experiment Fund (Harvard UNIVERSITY); • ARCH Venture Partners (UNIVERSITY of Chicago); • Icon Venture Partners (UNIVERSITY of Minnesota); • The UNIVERSITY Technology Seed Fund (UNIVERSITY of Rochester); • MentorTech Ventures (UNIVERSITY of Pennsylvania); • Drive Capital (Ohio State UNIVERSITY). <p>C. Student-run or student-focused VC funds:</p> <ul style="list-style-type: none"> • Dorm Room Fund (UNIVERSITY-neutral - current coverage: Boston, New York, Philadelphia, San Francisco Bay Area); • Wolverine Venture Fund (UNIVERSITY of Michigan); • Zell Lurie Commercialization Fund (UNIVERSITY of Michigan); • Social Venture Fund (UNIVERSITY of Michigan); • UNIVERSITY Venture Fund (UNIVERSITY of Utah, Brigham Young UNIVERSITY, Westminster College); • Deming Center Venture Fund (Colorado UNIVERSITY, Boulder); • Dakota Venture Group (UNIVERSITY of North Dakota).
Shareholders	See references
Objective	See references






TABLE COMPILATION OF METRIC CONSENSUS AND INDICATORS

Academic Research	A scholarly or scientific investigation or inquiry, usually undertaken within a Higher Education Institution, that is based on intellectual investigation, and is aimed at discovering, interpreting, and revising knowledge on different aspects of the world
Citation	A reference to a authoritative source, such as a previously published article, book, web page, or other published item, used for substantiation of an idea, process or comment, and with sufficient detail to identify the source uniquely. Unpublished writings or speech, such as working papers or personal communications, can also be cited.
(Social) Networks	A social network is a social structure made of nodes (which are generally individuals or organizations such as universities and businesses) that are tied by one or more specific types of interdependency, such as values, visions, ideas, knowledge, technology or financial exchange, or friendship.
Collaborative Research	A structured research project that involves two or more partners in addition to the Higher Education Institution, where all parties work together toward a common goal by sharing knowledge, learning and building consensus
Contract Research	Research arising from collaborative interactions that specifically meets the research needs of the external partners
Commercialization	The process through which research discoveries are brought to the market place and new ideas or discoveries are developed into new products, services or technologies that are sold around the world.
Consultancy	The provision of expert advice and work which, while it may involve a degree of analysis, measurement or testing, is crucially dependent on a high degree of intellectual input from the Higher Education Institution to the client (Commercial or Non-Commercial), but without the creation of new knowledge (although new understanding is the main desired impact).
Continuing Professional Development (CPD)	The means by which members of professional associations maintain, improve and broaden their knowledge and skills and develop the personal qualities required in their professional lives, usually through a range of short and long training programmes, some of which have an option of accreditation.
Economic Development	The development of economic wealth of countries or regions for the well-being of their inhabitants. The economic development process supposes that legal and institutional adjustments are made to give incentives for innovation and for investments so as to develop an efficient production and distribution system for goods and service. Economic development is a sustainable increase in living standards that implies increased per capita income, better education and health.
Economic Impact	A process which leads to significant changes in the welfare of consumers, the profits of firms or the revenue of government. Economic impacts range from those that are readily quantifiable, in terms of greater wealth, cheaper prices and more revenue, to those less easily quantifiable, such as effects on the environment, public health and quality of life.
Equipment and Facilities Services	The use by an external party (that is not another Higher Education Institution) of the physical academic resources of the Higher Education Institution. This could range from electron microscopes to performance space. Provision of such resources may include a degree of, for example, technician support.
Full-Time Equivalent (FTE)	A method to measure a worker's involvement in a project, or a student's enrolment at an educational institution. An FTE of 1.0 means that the person is equivalent to a full-time worker, while an FTE of 0.5 signals that the worker is only half-time. Typically, different scales are used to calibrate this number, depending on the type of institution (schools, industry, research) and scope of the report (personnel cost, productivity).
Intellectual Property Rights (IPR)	Such rights protect the creator's right to be appropriately acknowledged for their work, such as an invention or a manuscript. IPR gives the creator a means of controlling how their protected work is exploited, thereby ensuring that they are properly rewarded for their creative endeavours. This includes patents, registered trademarks and copyright.
Invention Disclosure	A document that describes a discovery or a development, names the contributors to that discovery, and provides many other key pieces of information needed to determine if an invention - a discovery that can be protected under patent law - has been made.
Investment (In Spin-Outs)	An outlay of a sum of money to be used in such a way that a profit or increase in capital may be expected.

IP Protection Expenditure	Costs incurred in protecting IP, including those from patenting, external legal and other protection fees, and specialist IP consultancy advice.
Joint Venture	A contractual agreement resulting in the formation of an entity between two or more parties to undertake economic activity together. The parties agree to create a new entity by both contributing equity, and they then share in the revenues, profits or losses, expenses, and control of the enterprise.
Knowledge Transfer	The process by which the knowledge, expertise and intellectually linked assets of Higher Education Institutions are constructively applied beyond Higher Education for the wider benefit of the economy and society, through two-way engagement with business, the public sector, cultural and community partners.
License Agreement	A formal agreement that allows the transfer of technology between two parties, where the owner of the technology (licensor) permits the other party (licensee) to share the rights to use the technology, without fear of a claim of intellectual property infringement brought by the licensor.
Licensing Income	Income which includes: license issue fees, payments under options, annual minimums, running royalties, termination payments, the amount of equity received when cashed-in, and software and biological material end user license fees equal to GBP £500 or more. Licensing Income does not include research funding, patent expense reimbursement, a valuation of equity not cashed-in, software and biological material end-user license fees less than GBP £500, or trademark licensing royalties from university insignia, or any income received in support of the cost to make and transfer materials under Material Transfer Agreements.
Option Agreement	An option agreement grants the potential licensee a time period during which it may evaluate the technology and negotiate the terms of a license agreement. An option agreement is not constituted by an option clause in a research agreement that grants rights to future inventions, until an actual invention has occurred which is subject to that option.
Patent	An exclusive right granted for an invention, which is a product or a process that provides, in general, a new way of doing something, or offers a new technical solution to a problem. A patent gives an inventor the right for a limited period to stop others from making, using or selling the invention without the permission of the inventor.
Patent Filed / Granted	A process by which a patent is filed with the patent office. After the patent is granted, the invention becomes the property of the inventor, which - like any form of property or business asset - can be bought, sold, rented or hired.
Proof of Concept Publication	Evidence that demonstrates that an experimental or business model, or an idea is feasible The act of publishing novel ideas or outcomes of research and business projects, for example in periodicals such as scholarly journals, newspapers and magazines, or in books and websites. Publications can be peer-reviewed (for example in many academic journals), or not.
Research Funding (Income)	Any funding for scientific research awarded to a Higher Education Institution. Research funding is often awarded through a competitive process, in which potential research projects are evaluated and only the most promising receive funding. Such processes are usually run by governmental funding and research councils, industrial corporations or foundations and non-commercial organizations.
Secondment	The detachment of a person from their regular organization for temporary assignment elsewhere, for example in industry.
Spin-off	"From a Higher Education perspective, spin-offs are defined as companies' set-up to exploit IP that has originated from within the Higher Education Institute. From a business perspective, a spin-off occurs when a division of a company or organization becomes an independent business. The newly formed company usually obtains the assets, intellectual property, technology, and/or existing products from the parent organization.
Start-Up Company	A newly-formed company that has a limited operating history. These companies, generally newly created, are in a phase of development and research for markets. Start-up companies can have a high element of risk associated with their development, but this can be balanced by their high potential rate of growth and scalability.
Technology Transfer	The process of developing practical applications for the results of scientific research. This usually involves the identification of research, typically by dedicated technology transfer offices in universities, governmental organizations, and companies, which has potential commercial interest and the design of strategies for how to exploit it. Such strategies can include the creation of licensing agreements or joint ventures, partnerships, or spin-out companies to develop the new technology and bring it to market

EXAMPLES OF QUANTITATIVE INDICATORS

2020					
Invenções	135	733	359	422	65
Patentes	80	623	100 (media)	251	35
Contratos	82	444	846	832	---
Ingresos Explotación	20 mill. €	107 mill. €	16,6 -28,7 mill. L	11-38 mill. L	10 mill. €
Ingresos participación	80 mill. €	19 mill. €	102-139 mill. L	109 mill. L	-- mill. €
Ratio/1.000 (Spin-off/científicos)	0,5	2	1,7	1,2	0,01
Spin-offs (Acumul./anual)	159/21	---/26 (2019)	148/18	132-151/12-15	---/10
Ingresos totales por venta acciones	509 mill. €	--- mill. €	--- mill. €	178 mill. €	--- mill. €

2020					
Invenções	135	821	912	415	65
Patentes	80	170	148	112	35
Contratos	82	1623	---	---	---
Ingresos Explotación	20 mill. €	65 mill. \$	122 mill. \$	48 mill. \$	10 mill. €
Ingresos participación	80 mill. €	69 mill. \$	162 mill. \$	32 mill. \$	-- mill. €
Ratio/1.000 (Spin-off/científicos)	0,5	10	11	9	0,01
Spin-offs (Acumul./anual)	159/21	---/221	---/162	---/109	---/10
Ingresos totales por venta acciones	509 mill. €	--- mill. \$	--- mill. \$	--- mill. \$	--- mill. €

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UNIVERSITY OF HARVARD

New Innovations

New Patent

Applications Filed

U.S. Patents Issued

Major License Agreements

Commercialization Revenue (MM)

Startup Companies

Corporate Research Partnerships

Corporate Research Funding (MM)

FY18	FY19	FY20	FY21	FY22
442	450	443	383	376
234	224	208	180	185
181	163	178	193	191
51	45	45	44	47
\$54.1	\$97.8	\$58.7	\$106.0	\$152.1
21	15	14	27	23
77	74	72	93	95
\$53.0	\$66.0	\$50.3	\$64.7	\$85.2

UNIVERSITIES OF AUSTIN, TX; MIT; CARNEGIE MELON

	UT Austin	MIT Harvard	U. Carnegie Mellon
Number of requests for protection			244 (Solicits 2022)
Inventions	182	696 (2022)	234 (2022)
Number of patents, utility models, software registrations, plant varieties,...	786	354 US (2022) 474 Internac. (2022)	84 (Patents 022)
		3718	
Percentage of jointly owned patents			
License numbers	762	3301 (1960–2022)/ 99 (2022)	2894 (2005-2022)/233 (2022)
% of patents licensed		21%	34% (2022)
License income		82,7 mill. \$	90,5 mill. \$
Income from royalties		\$69,6 millones en regalías (2011)	
Trademark Licensing		237k \$	
Patent expenditures		16 mill. \$ (2009)	
Existence of a TTO strategic plan	YES		YES
Years since the creation of the TTO		40 (1983 restructuración. Origen 1932)	30 (Origen 1993)
Number of people in the TTO and specific qualification for innovation management activities.	8	50	7
It has a commercial catalog of its research (Yes or No/Number)		YES/667	
Number research in commercial catalog		667	
Frequency of meetings with the Authority you depend on			
TTO annual budget			
% Public research expenditure / KTO-OTT	Research Expenditures: 84,7% - 660,06 mill. \$ OTT: Not data	Research Expenditures: 57% - 525,55 mill. \$ OTT: Not data	
% Private research expenditure / KTO-OTT	Research Expenditures: 15,3% - 119,23 mill. \$ OTT: Not data	Research Expenditures: 33% - 257,62 mill. \$ OTT: Not data	

	UT Austin	MIT Harvard	U. Carnegie Mellon
Number of projects that are in different stages of innovation: capture of ideas, evaluation, development process, transfer and market.		Invention Disclosures: 22,651 (1940–2021) 696 (2022)	Invention Disclosures: 3,980 (2005–2022) / 234 (2022)
Collaborations numbers: Number of research collaboration agreements with non-academic entities (Collaborations)		145 Licenses & Options Executed	1049 Licenses, Options and other agreements (2018–2022)
Collaboration revenue: Revenue from research collaboration with nonacademic entities		\$82.2M (2009)	
Number of researchers contacted by the TTO			547 (Inventors Served 2022)
Conferences and events			
Number of Membership to networks, cluster, platforms, etc.		MIT “Ecosystem” of centers, programs and networks – Entrepreneurship Center – Enterprise Forum – Venture Mentoring Service – Deshpande Center – 100K Competition – Venture Capital and Private Equity Club, Science and Engineering Business Club, Technology Club, other student/alumni groups	
Number of national and international agreements signed with companies and other institutions			500+ (2020)

UT Austin	MIT Harvard	U. Carnegie Mellon
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Number of spin-offs and startups	80 (Pre-seed: 36; Seed: 14; Serie A: 9; Serie B: 3; Serie C: 2; Post-Revenue: 14)	579 (1997-2021)/27 (2022)	152
Number of employees (Total/average)	4.799/	(/10)(Datos 2015)	
Accumulated turnover and EBITDA	1,43 mill. \$		
Cumulative Amount Raised (excl. M&A)			
Survival rate at 5 and 10 years		80%/70% (2015)	
Investment captured by spinoffs			
Products/Services on the market	114		
Ratio/1.000 (Spin-off/reserchers)		0,44 (579/1.300)	
Spin-offs (Total/anual)		579 (1997-2021)/27 (2022)	
Income from the sale of shares			

RELATIONSHIP WITH THE UNIVERSITY	
Realización, prácticas, tesis doctorales, ...con la Universidad	Realization, practices, doctoral theses, ...
Número de proyectos contratados a la universidad	Number of projects contracted to the University
Cuánta proyectos contratados a la Universidad	Amount of projects contracted to the University
NON-COMPETITIVE PUBLIC-PRIVATE COLLABORATION PROJECTS	
Número de convenios de colaboración en investigación con entidades no académicas distinguiendo tipo de colaboración	Number of research collaboration agreements with non-academic entities
Ingresos de la colaboración en investigación con organizaciones no académicas distinguiendo tipo de colaboración	Income from research collaboration with non-academic organizations

TABLE COMPILATION OF QUANTITATIVE AND QUALITATIVE INDICATORS

We are now going to compare all these tables trying to ensemble something reasonable considering the **EU** report, the annual **UK** Higher Education Business Interaction Survey (HEBCIS) and the annual AUTM Licensing Survey which takes in voluntary data from Technology Transfer Offices in the USA and Canada.

See tables below with indicators:

INPUTS KT Internal Context Indicators

Core Indicators QTY	Answer	Supplementary indicators	Specific indicators	QTY	QLY
Existence of PRO KT & IP Policies	Yes / No		Number research in commercial catalog	Facilities and equipment related services	
PRO KT Strategy	Yes / No		Existence of a TTO strategic plan	—% of people coming from Industry	
Direct funding via the PRO for KT e.g. to KTO	Yes / No	<ul style="list-style-type: none"> Total annual budget for KTO IP & Patent budget 	% Public research expenditure / KTO-OTT Collaborations numbers: Number of research collaboration agreements with non-academic entities (Collaborations)	—% of incomes coming from networking activities	
Indirect funding via the PRO for KT e.g. proof of concept	Yes / No	<ul style="list-style-type: none"> Annual budget 		Income, total value, total number of services (by: SME , Non SME commercial, non-commercial, individual)	
Existence of KTO	Yes / No	<ul style="list-style-type: none"> Number of FTE in KTO Number of RTTP qualified FTE 		Income from European sources), UK Government regeneration funds, Regional Development Agency (RDA) programme, Others Income	
Age of KTO	Years	—	Years since the creation of the TTO		
Research expenditure in PRO	Total expenditure in year,	— from all sources of research funding to the PRO including from non-academic third parties— % of incomes coming from networking activities	TTO annual Budget % Private research expenditure / KTO-OTT Collaboration revenue: Revenue from research collaboration with nonacademic entities Number of national and international agreements signed with companies and other institutions		
Number of researchers	# Number	<ul style="list-style-type: none"> STEM Other— % of people coming from Industry	Frequency of meetings with the Authority you depend on Number of people in the TTO with specific qualification for innovation management activities Number of projects that are in different stages of innovation: capture of ideas, evaluation, development process, transfer and market. Number of researchers contacted by the TTO Conferences and events Number of Membership to networks, cluster, platforms, etc.	# Physical Migration of Students to Industry, Publications as a Measure of Research - Outputs total -	Access of academics to high technology equipment, Measure of user investment as indicator of success Publication and University rating

INPUTS : KT Environment Indicators

Core Indicators	Answer	Supplementary indicators	Specific indicators	QTY	QLY
National R&D spend as % GDP	%	-	-		
National Higher Education Expenditure on R&D (HERD)	Value	-	-		
National Business Expenditure on R&D (BERD)	Value	-	-	Income, in-kind (ii) contribution) Income, total value, number of contracts (by: SME (iv) , Non SME commercial, non-commercial)	
Availability of public funding programmes to support KT/Industry engagement	Yes / No	<ul style="list-style-type: none"> National Regional 	Number of research collaboration agreements with non-academic entities	Income, total value, number of contracts (by: SME , Non SME commercial, non-commercial) Revenue, total learner days delivered(vi) (by: SME , Non SME commercial, non-commercial, individual) Facilities and equipment related services	
Availability of investment capital	Yes / No	<ul style="list-style-type: none"> National Regional 	Income from research collaboration with non-academic organizations	Income from European Regional Development Fund (ERDF), European Social Foundation (ESF), UK Government regeneration funds, Regional Development Agency (RDA) programme, Others Income	
-	-	Incubators & accelerators <ul style="list-style-type: none"> National Regional 	-	-	
-	-	Local company types e.g. SME/MNC mix, absorptive capacity <ul style="list-style-type: none"> National Regional 	-		
-	-	National policy, legal & regulatory environment as it affects KT	-	-	
-	-	-	Realization, practices, doctoral theses, ... Number of projects contracted to the University	-	
-	-	-	Amount of projects contracted to the University	-	

OUTPUTS: Activity Indicators

Core Indicators	Supplementary indicators	Specific indicators	QTY	QLY
Invention disclosures (IDF) — number	# & comparative and % of IDFs resulting in license or assignment	Number of requests for protection		
Licenses & assignments — number	License by type — number: MTA Patent, copyright, trademark & know-how Software IP Protection by type: Patent filings Copyright registration Trademark registration Plant variety By type of transaction: License & Assignment Other: % of patents licensed or assigned	Inventions Number of patents, utility models, software registrations, plant varieties,... Number of active patents % of jointly owned patents % of patents licensed Patent expenditures	# of licenses, # of licenses to start-ups, # of licenses to existing companies, Income generated from licenses, # of products that arose from licenses # of licenses, Income generated from licenses Case studies,	Quality of Licensee company, potential impact of the technology, repeat business in licensing. repeat business in the form of other knowledge transfer activities, customer feedback Length of licenses
Licenses & assignments — gross revenue to PRO	License by type — gross revenue to PRO: MTA Patent, copyright, trademark & know-how Software By type of transaction: License Assignment	License numbers License income Income from royalties Trademark Licensing	Partner type: SMEs, Other (non-commercial) businesses and other non-commercial organizations). IP revenues, Total cost Repeat business, customer feedback, quality of client company, importance of client relative to company (i.e. Senior Management or junior employee) % of turnover from services/products	
Spin-offs — number	Stage — number: Formed, pre-investment Receiving first investment Maturity — companies in existence 5+ years Acquired	Number of spin-offs and startups Investment captured by spinoffs Survival rate at 5 and 10 years	# of spin-outs formed, amount of external investment raised # spin-outs that are geographically close to the university # revenues generated Growth amount in total Partner type: SMEs, Other (non-commercial) businesses and other non-commercial organizations). IP revenues, Total cost	Investor satisfaction, survival rate, quality of investors external investment raised, flotation/ exit value Survival rate/ viability, Growth rate, Customer feedback Revenues rate
Spin-offs — gross revenue to PRO from equity sale		Income from the sale of shares	Spin-offs(viii), staff start-up(ix) graduate start-up(x) HEI owned, non-HEI owned. Number of active firms, estimates employment, turnover, investment received	

Other measures		<p>Number of employees (Total/average)</p> <p>Accumulated turnover and EBITDA</p> <p>Ratio/1.000 (Spin-off/researchers)</p> <p>Spin-offs (Total/annual)</p>	<p># of people met at events which led to other Knowledge Transfer Activities</p> <p># of people met at events which led to other Knowledge Transfer Activities</p>	<p>% of people coming from Industry</p> <p>% of incomes coming from networking activities</p>
Research collaboration agreements & research contracts with non-academic third parties — number	<p>Detail by:</p> <p>Collaborative research (Where both the firm and the PRO participate in the design of the research project, contribute to its implementation and share the project outputs)</p> <p>Contract research (Where all research is performed by the PRO)</p> <p>Further breakdown:</p> <p>Number with companies</p> <p>By other non-academic third parties</p> <p>Other: % of Research collaboration agreements & research contracts which have led to IP license or assignment</p>	<p>% Public research expenditure / KTO-OTT</p> <p>Collaborations numbers: Number of research collaboration agreements with non-academic entities (Collaborations)</p>	<p># of CPD Courses and people that attend,</p> <p># of companies attending CPD courses</p>	<p>Repeat business, customer feedback</p> <p>Income from courses</p>
Research collaboration agreements & research contracts with non-academic third parties — gross revenue to PRO	<p>Detail by:</p> <p>Collaborative research</p> <p>Contract research</p> <p>Further breakdown:</p> <p>By companies</p> <p>By other non-academic third parties</p> <p>Direct funding from non-academic third party</p> <p>Total funding (non-academic third party plus anyco-funding e.g. from EU, national government)</p>	<p>TTO annual Budget</p> <p>% Private research expenditure / KTO-OTT</p> <p>Collaboration revenue: Revenue from research collaboration with nonacademic entities</p>	<p># and value/income of contracts,</p> <p># of client companies,</p> <p>hours spent consulting</p> <p># and value/income of contracts,</p> <p># of innovative businesses that evolve from consultancy contracts</p>	<p>Repeat business, customer feedback, quality of client company,</p> <p>importance of client relative to company (i.e. Senior Management or junior employee)</p> <p>% of turnover from services/products</p>
Consultancy agreements with non-academic third parties — number	<p>Further breakdown:</p> <p>By business</p> <p>By other non-academic third parties</p>		<p># and value/income of contracts,</p> <p>Geographical proximity of clients to university,</p> <p># of products successfully created from the research,</p> <p># of licenses that originate from the research</p> <p># and value of contracts,</p>	<p>% income relative to total research income,</p> <p>length of client relationship</p> <p>Repeat Business, customer feedback, Market share</p> <p>Repeat Business, Customer feedback, Quality of partner company, longevity of partnership</p>
Consultancy agreements with non-academic third parties — gross revenue to PRO	<p>Further breakdown:</p> <p>By business</p> <p>By other non-academic third parties</p>	<p>Number of projects that are in different stages of innovation: capture of ideas, evaluation, development process, transfer and market.</p>	<p># and value/income of contracts, Geographical proximity of clients to university,</p>	<p>Length of client relationship</p> <p>Repeat Business, customer feedback</p> <p># and value of contracts, Market share</p> <p>Repeat Business,</p>
				<p>Customer feedback, Quality of partner company, longevity of partnership</p>

OUTPUTS: Impact Indicators

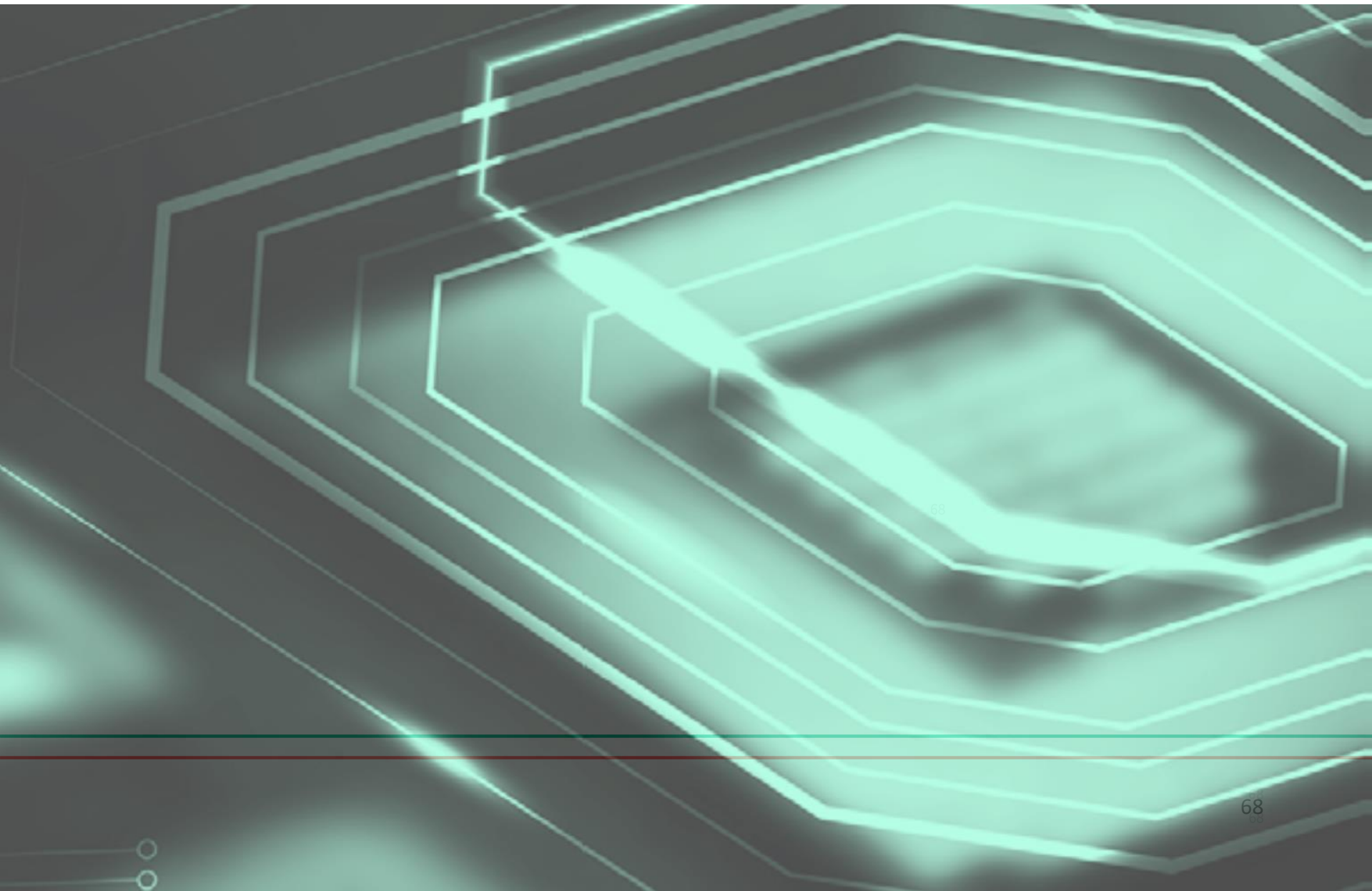
Core Indicators	Commentary	Specific indicators	QTY	QLY
Jobs created in spin-offs number	PRO will need to retain relationship with the spin-off and/or actively monitor public information. Data harder to access/interpret when a spin-off is acquired.	Number of employees (Total/average) Accumulated turnover and EBITDA	# of people finding jobs in spin off Activities # of people finding jobs in other Knowledge Transfer Activities	% of people coming from Industry People feedback Salaries from spin offs
Aggregate investment spin-offs total amount	in PRO will need to retain relationship with the spin-off and/or actively monitor public information. Data may be difficult to access as company and investors may wish to keep confidentiality.	Investment captured by spinoffs Income from the sale of shares	# of spin-outs formed, # amount of external investment raised # spin-outs that are geographically close to the university # revenues generated Growth amount in total	Investor satisfaction, survival rate, quality of investors external investment raised, flotation/ exit value Survival rate/ viability, Growth rate, Customer feedback Revenues rate
Products on market number and variety	PRO will need to retain relationship with the spin-off or licensee company and/or actively monitor public information. Data harder to access over time due to causality — as the company will often not recall the source of the IP. Easier to collect where the Product is linked to a royalty stream.	Products-Services on the market /Sales	Partner type: SMEs, Other (non-commercial) businesses and other non-commercial organizations). IP revenues, Total cost Spin-offs(viii), staff start-up(ix) graduate start-up(x) HEI owned, non-HEI owned. Number of active firms, estimates employment, turnover, investment received	Repeat business, customer feedback, quality of client company, importance of client relative to company (i.e. Senior Management or junior employee) % of turnover from services/products
Culture change in PRO	Indicators could include: • Percentage of researchers engaged in KT (and change over time) • Net promoter score for engagement in KT • Prominence of KT in PRO strategy • % change in PRO funding for KT/KTO	% Public research expenditure / KTO-OTT Collaborations numbers: Number of research collaboration agreements with non-academic entities (Collaborations)	# and value/income of contracts, Geographical proximity of clients to university, # of products successfully created from the research, # of licenses that originate from the research # and value of contracts,	% income relative to total research income, length of client relationship Repeat Business, customer feedback, Market share Repeat Business, Customer feedback, Quality of partner company, longevity of partnership

Societal benefits	<p>Best captured through evidence-based case studies. In addition to IP and technology-based outcomes, many benefits are generated through gaining new knowledge, for example impact on new products or process (pollution, costs, hazard etc); impact on policy; healthcare interventions etc. In many cases the outcomes are a result of access to technology and new knowledge.</p> <p>Conferences and events</p> <p>Number of national and international agreements signed with companies and other institutions</p> <p>Realization, practices, doctoral theses, ...</p>	<p># Physical Migration of Students to Industry,</p> <p>Publications as a Measure of Research</p> <p>Outputs total</p> <p>Publication and University rating</p> <p># of people met at events which led to other Knowledge Transfer Activities</p> <p># of people met at events which led to other Knowledge Transfer Activities# of CPD Courses and people that attend,</p> <p># of companies attending CPD courses</p>
Economic Benefits	<p>The broader economic benefits are challenging to capture and will often require externally commissioned expert support. Usually such studies are lengthy and expensive and rely on assistance from the companies and other non-academic "users". But such studies which may demonstrate Economic Value Added (EVA) and job creation within a region or country can be powerful. They should be undertaken on an occasional basis.</p> <p>Number of researchers contacted by the TTO</p> <p>Number of Membership to networks, cluster, platforms, etc</p> <p>Number of projects contracted to the University</p>	<p>Access of academics to high technology equipment,</p> <p>Measure of user investment as indicator of success</p> <p>-</p>

CONCLUSIONS

Following principal reports on this subject (EU mainly), our conclusions are the following:

- This report builds on existing studies and a depth and breadth of practice across EU UK and US.
- The development harmonized metrics, if done correctly, has much to offer to support development of KT activity and policy by PROs and at national level by funding agencies and policymakers.
- This report offers a basic set of core indicators that could be used wide and suggests supplementary indicators that would add value.
- It would be for the national Governments and local PROs to select from these supplementary indicators and to include others of their own.
- There are several barriers to adoption of core harmonized indicators, from the practical through to the philosophical.
- The PROs must think how such data will be used and the implications for PROs and their KTOs.
- A significant recommendation in this report is that any analysis used both output and input data.



PROPOSALS FOR IMPROVEMENT

At a practical level there are some topics that require further exploration and conclusion. These are:

- gaining consensus on adoption of the indicators, definitions and mechanisms to implement and
- agreeing a consistent reporting year for data collection.

Further such discussions, if they are to lead to implementation, must go beyond the KTO community to involve key decision-makers such those in senior leadership positions in PROs, universities and government agencies.

There is also the issue of how the wide data are collected, curated and reported. This must be managed by a credible organization that understands KT and is recognized by the KT profession.

It needs to be neutral and to collaborate with national KT associations and government agencies as appropriate. Incentives may be required at a national level to stimulate and support the ability to engage at the EU level.

A further topic for consideration is the use of the core indicators in this report to inform development of composite indicators, which might enable a simpler top-level assessment of KT activities by country.

Having detail on core indicators will be essential to interpretation of composites which require drilling into the kind of detail provided by the core indicators. Successful KT is the responsibility of the PRO leadership and researchers and the national ministries and agencies who will review: Detailed Indicators and files to be taken into account concerning TTO and Questionnaires



- **ANNEXES**
- **GLOBAL INNOVATION DATA COLLECTION**

ANEX A) DATA DOING BUSINESS WB SPAIN AND PORTUGAL

- **Starting a business** Procedures, time, cost and paid-in minimum capital to start a limited liability company
- **Dealing with construction permits** Procedures, time and cost to complete all formalities to build a warehouse and the quality control and safety mechanisms in the construction permitting system
- **Getting electricity** Procedures, time and cost to get connected to the electrical grid, and the reliability of the electricity supply and the transparency of tariffs
- **Registering property** Procedures, time and cost to transfer a property and the quality of the land administration system
- **Getting credit** Movable collateral laws and credit information systems
- **Protecting minority investors** Minority shareholders' rights in related-party transactions and in corporate governance
- **Paying taxes** Payments, time, total tax and contribution rate for a firm to comply with all tax regulations as well as post-filing processes
- **Trading across borders** Time and cost to export the product of comparative advantage and import auto parts.
- **Enforcing contracts** Time and cost to resolve a commercial dispute and the quality of judicial processes
- **Resolving insolvency** Time, cost, outcome and recovery rate for a commercial insolvency and the strength of the legal framework for insolvency
Employing workers Flexibility in employment regulation and redundancy cost

DOING BUSINESS WB SPAIN AND PORTUGAL

Temas	Clasificación DB	2017	2018	2019	2020-22	SPAIN	PORTUGAL
•GLOBAL		34	33	28		30	39
•Starting a business		78	82	86		97	63
•Dealing with construction permits	97	101	123		79	60	
•Getting electricity		78	74	42		55	52
•Registering property		49	48	53		59	35
•Getting credit		52	59	68		80	119
•Protecting minority investors		44	29	24		28	61
•Paying taxes		79	60	34		35	43
•Trading across borders		1	1	1		1	1
•Enforcing contracts		39	39	26		26	38
•Resolving insolvency		23	25	19		18	15
<hr/>							
•GLOBAL INNOVACION							
•Scientific Research		10	10	10		14-5	30
•Innovation patented		27	27	28		21-30	35
•Innovation in market		44	44	45		30-40	31
<hr/>							
RESUME 2015-2022 (=18)							
•		SPAIN OCDE	GER USA				
•Time (years)		3.5	2.7	2.5	1.5		
•Cost (%G/PIB)		0,6	1,2	2	3%		
•Profit Rate publication		0,0	0,6	0,3	1%		
•Patent Rate (% publica)		0,7	6	10/100			
•Profit Rate (+100K\$ / patent)		0,01	3%	5	10		
•Big deal Rate (+1M\$ """)		0,0	0.3%	0.5	1%		
<hr/>							
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•Profit Rate (+100K\$ / patent)		0,01	3%	5	10		
•Big deal Rate (+1M\$ """)		0,0	0.3%	0.5	1%		

2.1. INNOVACIÓN MERCADO	UE	ESPAÑA	ALEMANIA	USA	COREA
- Tiempo en años a llegar a mercad	2,7	3,5	2,5	1,5	
- Esfuerzo en I+D (% PIB)	1,9	1,2	2,9	3	4,5
- Esfuerzo Publico en %	40	47,5	30	20	
- Esfuerzo Privado en %	60	52,5	70	80	
- Esfuerzo PYME	30	45	13	8	
- Esfuerzo GE multinacional	70	50	89	90	
2.2. INVESTIGACIÓN E INNOVACIÓN					
- Ratio publicación/scopus*	--	3,1	7	25	
- Ratio publicación/patentes**	5	0,7	6	10	
- Ratio 3	0,01		5	9	
- Ratio patentes/renta +1M\$	0,3	0,001	0,5	1	
- Export high tech equipment	++	+	+++	++++	

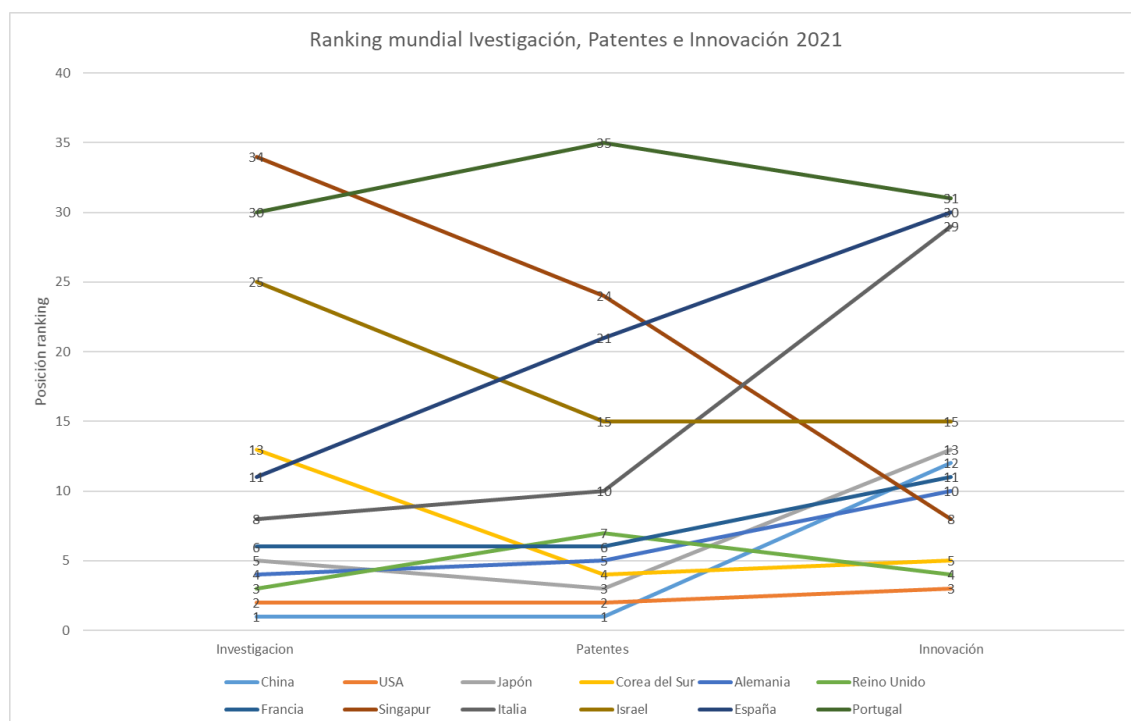
*porcentaje de publicaciones del país en scopus a nivel mundial (España presenta ese porcentaje de producción científica y el 16% en la de calidad)

**porcentaje de publicaciones que llegan a convertirse en patentes registradas (no se diferencia nacionales de internacionales, ni el impacto). En USA (nº 1 del mundo) de cada 100 publicaciones 10 llegan a convertirse en patentes.

***porcentaje de patentes que llegan a obtener rentabilidades superiores a 100.000USD. En USA (nº 1 del mundo) de cada 100 patentes, 9 generan rentabilidades superiores a estas cantidades.

****porcentaje de patentes que llegan a obtener rentabilidades superiores a 1 millón USD. En USA (nº 1 del mundo) de cada 100 patentes, 1 genera rentabilidades superiores a estas cantidades

Fuentes: Doing Business International, elaborado por OCDE y BANCO MUNDIAL, Oficina Española de Patentes y Marcas,



Country	GII	Institutions	Human capital research	Infrastructure	Market sophistication	Business sophistication	Knowledge and technology outputs	Creative outputs
Switzerland	1	2	4	4	8	7	1	1
United States	2	13	9	19	1	3	3	12
Sweden	3	19	3	1	13	1	2	8
United Kingdom	4	24	6	8	5	22	8	3
Netherlands	5	4	14	14	18	10	5	10
...								
Italy	28	58	28	26	35	33	16	16
Spain	29	38	26	16	30	32	27	28
Czech Republic	30	43	33	20	76	28	17	37
UAE	31	6	17	7	23	26	59	45
Portugal	32	47	22	39	42	34	35	25
Slovenia	33	37	25	24	68	29	26	56
Hungary	34	48	37	35	67	30	23	46
Bulgary	35	67	68	34	62	40	30	23

	Output rank	Input rank	Income Region Population (mn)	GDP, PPP\$ (bn)	GDP per capita, PPP\$
SPAIN 28	26	28	High 46.7	1,984.0	42,075
PORTUGAL 32	31	32	High 10.2	376.1	36,543

PORTUGAL & SPAIN ALL INNOVATION INDICATORS

Ch.	Field	Score value	Rank	Score value	Rank
1.	INSTITUTIONS	62.5	47	66.8	38
1.1	Political environment	77.7	25	71.8	41
1.1.1	Political and operational stability	83.6	16	74.5	42
1.1.2	Government effectiveness	71.7	31	69.0	35
1.2	Regulatory environment	76.7	34	74.1	39
1.2.1	Regulatory quality	65.7	38	64.1	41
1.2.2	Rule of law	76.8	23	69.5	36
1.2.3	Cost of redundancy dismissal	17.0	69	17.4	75
1.3	Business environment	33.0	102	54.4	49
1.3.1	Policies for doing business†	49.5	64	48.3	69
1.3.2	Entrepreneurship policies and culture	16.5	62	60.5	22

	Output rank	Input rank	Income Region Population (mn)	GDP, (bn)	PPP\$	GDP per capita, PPP\$
SPAIN 28	26	28	High 46.7	1,984.0		42,075
PORTUGAL 32	31	32	High 10.2	376.1		36,543

Ch.	Field	Score value	Rank	Score value	Rank
2	HUMAN CAPITAL AND RESEARCH	49.4	22	47.7	26
2.1	Education	63.7	18	58.1	46
2.1.1	Expenditure on education, % GDP	4.7	53	4.2	71
2.1.2	Government funding/pupil, secondary, % GDP/cap	27.4	15	18.7	60
2.1.3	School life expectancy, years	16.9	19	17.9	13
2.1.4	PISA scales in reading, maths and science	492.0	26	482.3	29
2.1.5	Pupil-teacher ratio, secondary	9.2	21	11.3	41
2.2	Tertiary education	44.0	27	36.5	43
2.2.1	Tertiary enrolment, % gross	67.9	39	92.9	9
2.2.2	Graduates in science and engineering, %	27.8	28	20.8	61
2.2.3	Tertiary inbound mobility, %	9.7	27	3.7	60
2.3	Research and development (R&D)	40.3	27	48.5	⁷³ 23
2.3.1	Researchers, FTE/mn pop.	5,214.8	15	3,109.2	31
2.3.2	Gross expenditure on R&D, % GDP	1.6	24	1.4	30
2.3.3	Global corporate R&D investors, top 3, mn USD	45.4	34	70.6	13
2.3.4	QS university ranking, top 3	30.9	40	44.3	26

Ch.	Field	Score value	Rank	Score value	Rank
3	INFRASTRUCTURE	53.4	39	59.8	16
3.1	Information and communication technologies (ICTs)	82.4	36	86.2	23
3.1.1	ICT access	90.7	40	91.5	34
3.1.2	ICT use	73.2	47	80.0	22
3.1.3	Government's online service	83.5	35	88.8	17
3.1.4	E-participation	82.1	41	84.5	36
3.2	General infrastructure	41.1	37	45.6	27
3.2.1	Electricity output, GWh/mn pop.	5,070.9	42	5,465.9	39
3.2.2	Logistics performance	74.0	23	82.8	17
3.2.3	Gross capital formation, % GDP	19.6	95	21.1	85
3.3	Ecological sustainability	36.8	38	47.5	17
3.3.1	GDP/unit of energy use	15.7	20	14.7	26
3.3.2	Environmental performance	50.4	41	56.6	27
3.3.3	ISO 14001 environmental certificates/bn GDP	2.5	34	7.2	14

Ch.	Field	Score value	Rank	Score value	Rank
4	MARKET SOPHISTICATION	38.8	42	43.4	30
4.1	Credit	40.1	29	41.1	26
4.1.1	Finance for startups and scaleups	42.4	34	41.5	36
4.1.2	Domestic credit to private sector, % GDP	101.2	26	108.5	22
4.1.3	Loans from microfinance institutions, % GDP	n/a	n/a	n/a	n/a
4.2	Investment	10.1	57	12.8	47
4.2.1	Market capitalization, % GDP	29.1	48	55.8	34
4.2.2	Venture capital investors, deals/bn PPP\$ GDP	0.1	33	0.1	37
4.2.3	Venture capital recipients, deals/bn PPP\$ GDP	0.0	38	0.0	47
4.2.4	Venture capital received, value, % GDP	0.0	64	0.0	38
4.3	Trade, diversification, and market scale	66.2	27	76.2	14
4.3.1	Applied tariff rate, weighted avg., %	1.5	20	1.5	20
4.3.2	Domestic industry diversification	100.0	1	93.8	29
4.3.3	Domestic market scale, bn PPP	376	51	1,984.0	16

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Ch.	Field	Score value	Rank	Score value	Rank
5.	BUSINESS SOPHISTICATION	38.6	34	41.4	32
5.1	Knowledge workers	50.1	30	55.8	24
5.1.1	Knowledge-intensive employment, %	42.7	26	35.5	43
5.1.2	Firms offering formal training, %	29.0	58	55.2	14
5.1.3	GERD performed by business, % GDP	0.9	24	0.8	32
5.1.4	GERD financed by business, %	52.2	26	49.1	33
5.1.5	Females employed w/advanced degrees, %	21.1	28	24.6	21
5.2	Innovation linkages	30.6	38	29.6	40
5.2.1	University-industry R&D collaboration†	55.5	30	43.6	66
5.2.2	State of cluster development and depth†	53.1	41	59.0	30
5.2.3	GERD financed by abroad, % GDP	0.1	34	0.1	35
5.2.4	Joint venture/strategic alliance deals/bn PPP\$ GDP	0.0	57	0.0	45
5.2.5	Patent families/bn PPP\$ GDP	0.6	30	0.6	31
5.3	Knowledge absorption	35.2	49	38.9	39
5.3.1	Intellectual property payments, % total trade	0.9	46	1.4	28
5.3.2	High-tech imports, % total trade	9.4	48	8.0	72
5.3.3	ICT services imports, % total trade	1.5	65	2.3	30
5.3.4	FDI net inflows, % GDP	3.2	40	2.8	50
5.3.5	Research talent, % in businesses	41.3	33	38.0	36

Ch.	Field	Score value	Rank	Score value	Rank
6	KNOWLEDGE AND TECHNOLOGY OUTPUTS	33.3	35	38.1	27
6.1	Knowledge creation	29.4	31	37.4	26
6.1.1	Patents by origin/bn PPP\$ GDP	2.7	27	1.8	40
6.1.2	PCT patents by origin/bn PPP\$ GDP	0.7	30	0.8	29
6.1.3	Utility models by origin/bn PPP\$ GDP	0.2	54	1.8	13
6.1.4	Scientific and technical articles/bn PPP\$ GDP	53.4	9	38.8	24
6.1.5	Citable documents H-index	33.1	30	61.7	12
6.2	Knowledge impact	39.5	27	39.8	25
6.2.1	Labor productivity growth, %	-0.3	96	-0.9	104
6.2.2	New businesses/th pop. 15-64	5.5	27	2.5	50
6.2.3	Software spending, % GDP	0.6	6	0.6	5
6.2.4	ISO 9001 quality certificates/bn PPP\$ GDP	13.6	22	16.7	18
6.2.5	High-tech manufacturing, %	30.5	42	38.0	30
6.3	Knowledge diffusion	30.9	49	37.1	38
6.3.1	Intellectual property receipts, % total trade	0.1	49	0.7	25
6.3.2	Production and export complexity	56.5	38	60.6	32
6.3.3	High-tech exports, % total trade	3.9	44	4.4	40
6.3.4	ICT services exports, % total trade	3.0	46	3.0	42

Ch.	Field	Score value	Rank	Score value	Rank
7.	CREATIVE OUTPUTS	38.1	25	36.8	28
7.1	Intangible assets	51.2	19	50.6	22
7.1.1	Intangible asset intensity, top 15, %	55.2	47	65.5	29
7.1.2	Trademarks by origin/bn PPP\$ GDP	97.7	14	52.3	44
7.1.3	Global brand value, top 5,000, % GDP	44.7	37	86.2	25
7.1.4	Industrial designs by origin/bn PPP\$ GDP	7.1	15	8.6	12
7.2	Creative goods and services	23.6	51	26.1	43
7.2.1	Cultural and creative services exports, % total trade	0.7	41	1.2	24
7.2.2	National feature films/mn pop. 15–69	5.1	22	7.7	12
7.2.3	Entertainment and media market/th pop. 15–69	32.4	22	28.4	24
7.2.4	Printing and other media, % manufacturing	1.1	41	1.2	36
7.2.5	Creative goods exports, % total trade	1.6	35	0.9	44
7.3	Online creativity	26.5	28	19.9	31
7.3.1	Generic top-level domains (TLDs)/th pop. 15–69	19.6	29	28.8	22
7.3.2	Country-code TLDs/th pop. 15–69	59.6	14	17.2	31
7.3.3	GitHub commit pushes received/mn pop. 15–69	19.2	34	21.5	31
7.3.4	Mobile app creation/bn PPP\$ GDP	7.4	50	12.1	33

Table with Rank University Country

ARWU	QSWUR	THEWUR
1 Harvard University US	Massachusetts Institute of Technology (MIT) US	University of Oxford UK
2 Stanford University US	Stanford University US	California Institute of Technology US
3 University of Cambridge UK	Harvard University US	University of Cambridge UK
4 (MIT) US	University of Oxford UK	Stanford University US
5 University of California US	CALTECH) US	(MIT) US
6 Princeton University US	ETH Zurich—Swiss Institute of Technology CH	Princeton University US
7. Columbia University US	University of Cambridge UK	Harvard University US
8 CALTECH) US	University College London (UCL) UK	Yale University US
9 University of Oxford UK	Imperial College London UK	University of Chicago US
10. University of Chicago US	University of Chicago US	Imperial College London UK ⁶

GLOSSARY OF TERMS

AUTM Asociación de Directivos Universitarios de Tecnología

ASTP Asociación de Profesionales Europeos de Transferencia de Ciencia y Tecnología

BOTL Berkeley Office of Technology and IPR

- **BERKU** Berkeley University

CIC Cambridge Innovation Capital

CAMU Cambridge University

CE Cambrige Enterprise

CBC Case by Case

Com. Comité

CCF Corporate IP Commercialization Fraunhofer-Gesellschaf

EBT Empresa de Base Tecnológica

EARTO European Association of Research and Technology

ERCIM European Research Consortium for Informatics and Mathematics

EXT Externo

FCI Facultad, Center e Investigador

UOIF Fondo de Innovación Universidad de Oxford

EIF Fondo Europeo de Inversiones

KHAN Fondo Mixto Max Plank Institute, Banco Wirtschaftsservice de Austria y EIF

FHF Fraunhofer

FRA Fraunhofer

FFE Fraunhofer Fosters Entrepreneurship **FFM** Fraunhofer Fosters Management **FTTF** Fraunhofer Technology Transfer Fund

- **GmbH** Gesellschaft mit beschränkter Haftung (Sociedad de responsabilidad limitada)

GE Gran Empresa

HAVU Harvard University

HOTD Harvard Office of Technology Development

IPR Intellectual Property Rights

IA Inteligencia Artificial

- **INT** Interno

- **Inv.** Inversión

KHAN KHAN Technology Transfer Fund (Max Planck)

KT **Knowledge Trasfer**

- **KTO** **Knowledge Trasfer Office**
- **LES** **Licensing Executives Society**
- **LSI** **Life Science Inkubator (MPI)**
- **LLC** **Limited Liability Company USA**

MPINB **Max Planck Institute for Neurobiology of Behavior**

MPS **Max Planck Society for the Advancement of Science**

MP **Max Plank**

MPI **Max Plank Innovation**

- **Mix.** **Mixto**

OTT **Oficina de Transferencia de Tecnología**

OTRI **Oficina de Trasferencia de Resultados de Investigación**

OION **Oxford Investment Opportunity Network**

OXU **Oxford University**

- **OUI** **Oxford University Innovation**
- **PIB** **Producto Interior Bruto Prom. Act.** **Promoción activa**

PII **Propiedad intelectual e industrial**

SATT **Sociétés d'Accélération du Transfert de Technologies**

- **ST** **Staff**

SOTL **Stanford Office of Technology Licensing**

- **STAU** **Stanford University**
- **TRL** **Technology Readiness Level**
- **TTO** **Technology Transfer Office**
- **UN** **Unidad**
- **UCE** **Universidad Cambridge Enterprise**
- **TUM** **Universidad Técnica de Munich**
- **VC** **Venture Capital**
- **WIS** **Weizmann Institute of Science**
- **WAITRO** **World Association of Industrial and Technological Research Organizations**

INDICATORS

Assignment: Contract transferring ownership of right in IP to a third party.

ASTP: European association for Knowledge Transfer professionals.

AUTM: Association for Technology Transfer professionals, USA headquartered.

BERD: Business Expenditure on Research and Development (R&D).

CURIE: Réseau C.U.R.I.E, French national knowledge transfer association.

EC: European Commission.

EU: European Union.

FTE: Full Time Equivalents — People working part-time are only included for the fraction that they are employed.

GDP: Gross Domestic Product.

HEBCIS: Higher Education Business Interaction Survey (UK).

HERD: Higher Education Expenditure on Research and Development (R&D).

Invention disclosure/IDF: The invention disclosure is when a potential new commercial opportunity is recorded by the KTO. It usually involves completion of an Invention Disclosure Form (IDF) which contains basic information, which helps to evaluate and subsequently, potentially, protect and commercialise any underpinning intellectual property.

IP: Intellectual property.

JRC: Joint Research Centre of the EC.

KT (KTT/TT): Knowledge transfer – the sharing of expertise, capability, technology and intellectual property between the research base and industry or the public sector with the aim of developing new or improved products, processes and services that deliver societal and economic benefit. The terms Knowledge Transfer (KT) and Knowledge & Technology Transfer (KTT) are often interchangeable. Technology Transfer (TT) tends to refer to research commercialization and may be considered a subset of KT.

KTO: Knowledge Transfer Office (KTO) may also be referred to as Technology Transfer Office (TTO), Innovation Office or similar variations. For this report the terminology KTO is used.

License: A contract under which IP rights are transferred from one party to another for the purpose of commercialization.

MTA: Material Transfer Agreement.

OECD: Organisation for Economic Co-operation and Development

Option: A contract under which the PRO grants a potential licensee a period of exclusivity during which it can decide whether it may wish to take a license or assignment and negotiate the terms of such an agreement.

Patent filing: The first filing of a patent application with a relevant patent office.

PRO: Publicly Funded Research Organisation. PROs include universities and colleges.

RTTP: Registered Technology Transfer Professional, the international standard for professional competence & experience in knowledge/Technology Transfer.

SME: Small and medium sized enterprises.

Spin-off: A new company expressly established to develop or exploit IP or know-how created by the PRO and with a formal contractual relationship for this IP or know-how, such as a license or equity agreement.

Start-up: Company formed by staff or students from the PRO not based on knowledge or IP generated by the PRO and where there is no formal IP license or equity share with the PRO.

STEM: Science, technology, engineering, and mathematics.

VP: Vice President. Equivalents in some universities include Vice Principal, Vice Rector and Pro-Vice Chancellor.

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