

## **Empower Academia for Knowledge Transfer for Value Creation in the Atlantic Area**

### **WP8: Create a positive influence in public innovation policies and funding mechanisms for EST KT**

#### **Action nr. 2:**

### **Mega data analysis of science and technology investments funds**

*Partners: CTA, CENTA, CEIMAR, Frontier IP, LJMU,  
TECH-QUIMPER, Údarás na Gaeltachta, FCT/UNL -  
Universidade NOVA de Lisboa, SPI.*

*Date: 23/04/2021*

## Contents

<b>1. List of acronyms .....</b>	<b>6</b>
<b>2. List of figures .....</b>	<b>7</b>
<b>3. Introduction .....</b>	<b>9</b>
<b>4. Methodology .....</b>	<b>10</b>
Funding Policies Supporting KT.....	10
Skills for KT.....	10
Key stakeholders acting as interface for KT .....	10
Ip for KT .....	11
<b>5. Background information and European Context .....</b>	<b>12</b>
Policy making context at EU level in the Blue Economy .....	12
European programmes fostering R&D&I and KT .....	13
Other European funding programmes and initiatives: .....	14
<b>6. Megadata analysis for Spain.....</b>	<b>14</b>
<b>6.1. Funding policies supporting KT in Spain .....</b>	<b>15</b>
National context .....	15
Barriers for effective KT .....	19
Recommendations.....	20
<b>6.2. Skills for KT in Spain .....</b>	<b>21</b>
National context .....	21
Barriers for effective KT .....	21
Recommendations.....	22
<b>6.3. Key stakeholders acting as interface for KT in Spain .....</b>	<b>22</b>
National context .....	22
Barriers for effective knowledge transfer.....	24
Recommendations.....	25
<b>6.4. IP for KT in Spain .....</b>	<b>25</b>
National context .....	25
Barriers for effective KT .....	27
Recommendations.....	27
<b>6.5. Conclusions and key findings for Spain .....</b>	<b>29</b>
<b>7. Megadata analysis for France.....</b>	<b>31</b>
<b>7.1. Funding policies supporting KT in France .....</b>	<b>31</b>

National context .....	31
Regional context .....	34
Barrier for effective knowledge transfer .....	34
Recommendations.....	35
<b>7.2. Blue skills and resources for KT.</b> .....	36
National context .....	36
Barrier for effective knowledge transfer .....	37
Recommendations.....	37
<b>7.3. Key stakeholders acting as interface for KT in France</b> .....	38
Barrier for effective knowledge transfer .....	40
Recommendations.....	40
<b>7.4. IP and legal framework for KT in France</b> .....	41
National and local level .....	41
Barrier for effective knowledge transfer .....	41
Recommendations.....	41
<b>7.5. Conclusions and key findings for France</b> .....	42
<b>8. Megadata analysis for Ireland</b> .....	44
<b>8.1. Funding policies for effective Knowledge Transfer in Ireland</b> .....	44
National context .....	44
Barrier for effective knowledge transfer .....	47
Recommendations.....	48
<b>8.2. Skills for KT in Ireland</b> .....	48
National context .....	48
Barrier for effective knowledge transfer .....	49
Recommendations.....	49
<b>8.3. Key stakeholders acting as interface for KT in Ireland</b> .....	50
There are many institutions that promote the process of Knowledge Transfer along the Atlantic areas of Ireland.....	50
Local universities .....	50
Barrier for effective knowledge transfer .....	51
Recommendations.....	51
<b>8.4. IP for KT in Ireland</b> .....	52
National and local level .....	52
Barrier for effective knowledge transfer .....	53

Recommendation .....	53
<b>8.5 Conclusions and key findings for the Ireland .....</b>	<b>53</b>
<b>9. Megadata analysis for Portugal .....</b>	<b>54</b>
<b>9.1. Funding policies supporting KT in Portugal.....</b>	<b>55</b>
National context .....	55
Barriers for effective KT .....	60
Recommendations .....	61
<b>9.2. Skills for KT in Portugal .....</b>	<b>61</b>
National context .....	61
Barriers for effective KT .....	62
Recommendations .....	62
<b>9.3. Key stakeholders acting as interface for KT in Portugal.....</b>	<b>62</b>
National context .....	62
Barriers for effective knowledge transfer.....	66
Recommendations .....	66
<b>9.4. IP for KT in Portugal .....</b>	<b>66</b>
National context .....	66
Barriers for effective KT .....	68
Recommendations .....	68
<b>9.5. Conclusions and key findings for Portugal .....</b>	<b>69</b>
<b>10. Megadata analysis for United Kingdom .....</b>	<b>70</b>
<b>10.1. Funding policies supporting KT in the UK .....</b>	<b>71</b>
National context .....	71
Sectors strategy .....	75
Barriers for effective KT .....	79
Recommendations .....	80
<b>10.2. Skills for KT in the UK .....</b>	<b>81</b>
Sector deals - Government & Industry .....	81
National context .....	82
Regional context .....	82
Policy makers and Institutions supporting the Blue Economy .....	83
Barriers for effective KT .....	86
Recommendations.....	87

<b>10.3.</b>	Key stakeholders acting as interface for KT in the UK .....	87
	National context .....	87
	Relevant entities promoting knowledge transfer in the Blue Economy .....	88
	Networking tools .....	88
	Other Stakeholders supporting KT in the Blue Economy.....	89
	Barriers for effective knowledge transfer.....	93
	Recommendations.....	93
<b>10.4.</b>	IP for KT in the UK.....	94
	National context .....	94
	Barriers for effective KT & Recommendations .....	99
<b>10.5.</b>	<b>Conclusions and key findings for the UK .....</b>	<b>100</b>
<b>11.</b>	<b>Key findings at AA level .....</b>	<b>102</b>
<b>12.</b>	<b>References.....</b>	<b>109</b>

## 1. List of acronyms

AA	Atlantic Region
AEI	Research State Agency
ASCRI	Spanish Association of Capital, Growth, and Investment
BE	Blue Economy
CACTI	Advisory Council for Science, Technology, and Innovation
CDTI	Centre for the Development of Industrial Technology
CEI-Mar	Campus of Global International Excellence of the Sea
CETMAR	Technological Centre of the Sea
CF	Cohesion Fund
CIE	Campus of International Excellence
CMMA	Maritime-Marine Cluster of Andalusia
COSCE	Confederación de Sociedades Científicas de España
CPCTI	Council for Science, Technology, and Innovation Policy
CSIC	Superior Council of Scientific Research
CTA	Technological Corporation of Andalusia
EC	European Commission
ECSA	European Community Shipowners Association
EMFF	European and Maritime Fisheries Fund
ENMC	European Network of Maritime Clusters
ERC	European Research Council
ERDF	European Regional Development Fund
ESF	European Social Fund
EST	Early-Stage Technologies
EU	European Union
FECYT	Spanish Foundation for Science and Technology
GDP	Gross domestic product
HEI	Higher Education Institutions
IAPH	Andalusian Institute of Historical Patrimony

ICTS	Unique Scientific and Technological Infrastructure
IEO	Spanish Institute of Oceanography
IFAPA	Andalusian Institute for Research and Training in Agriculture, Fisheries, Food and Organic Production
ISCIH	Carlos III Health Institute
KT	Knowledge Transfer
KTP	Knowledge Transfer Partnership
LCTI	Law of Science, Technology, and Innovation
NECSTouR	Network of European Regions for a Sustainable and Competitive Tourism
OECD	Organization for Economic Co-operation and Development
OTRI	Research Results Transfer Offices
PID	Research and Development individual Projects
PLOCAN	Oceanic Platform of the Canary Islands
PROs	Publicly funded Research Organisations
R&D&I	Research, Development, and Innovation
RTO	Research and Technologic Organizations
S&T	Science and Technology
SECTI	Spanish Science, Technology, and Innovation System
SMEs	Small Medium Enterprises
SPTO	Spanish Patent and Trademark Office
VET	Vocational Education and Training

## 2. List of figures

Figure 1 - Knowledge Transfer process [1]. .....	9
Figure 2 - Percentage Breakdown of Irish Government Budget Allocations for Research and Development by Government Departments, 2018 .....	45
Figure 3 - The UK Catapult Network .....	73

Figure 4 – Knowledge Transfer Partnerships in the UK [108] .....	74
Figure 5 - UK HEI patent applications by year of first publication from 1999 to 2018. ....	96
Figure 6 - Count of patent families from UK HEIs with a co-applicant split by the organisation type of the co-applicant from 1999 to 2018. ....	97
Figure 7 - Count of UK HEI spinouts by incorporation year from 2000 to 2016 .....	98



### 3. Introduction

The present work has been carried out within the EMPORIA4KT Project and is funded by the Atlantic Area INTERREG Programme through the European Regional Development Fund (ERDF). EMPORIA4KT project was born with the overall objective of improving transnational cooperation and synergies between triple helix players to foster innovation and competitiveness in AA's blue economy, by focusing on upgrading Academia skills for knowledge transfer (KT) and innovation.

The present report is developed under WP8, which objective is to create a positive influence in public innovation policies and funding mechanisms for EST KT. The objective of this specific report is to consolidate a transnational view about the policy context that both, hinders but also, foster public and KT for innovative EST market entry. This report does not aim to provide an exhaustive list of elements affecting KT, but to identify key factors that are slowing-down the progress of knowledge transfer in AA regions and provide recommendations for action.

The report is developed under a unique time with the COVID-19 pandemic. In these circumstances, it has become even more evident that science and innovation are essential to face the great social challenges and to find solutions to the complex problems associated to them. KT aims to maximise the two-way flow of technology, IP, and ideas. In turn this enables companies (existing and new) or other non-academic organisations and the public sector, to **drive innovation leading to economic and social benefit** and enables publicly funded research organisations (PROs) to advance research and teaching. KT is now a recognised activity in which PROs are expected to engage and has been adopted as a part of the "third mission" alongside teaching and research by many, PROs, and universities across Europe.

As refereed in [1] for many, KT is seen as an essential source of innovation and a mechanism for the dissemination of research results. KT and commercialisation is usually a long and risky process, involving many factors and actors external to the research institution. This is best illustrated in the figure below:

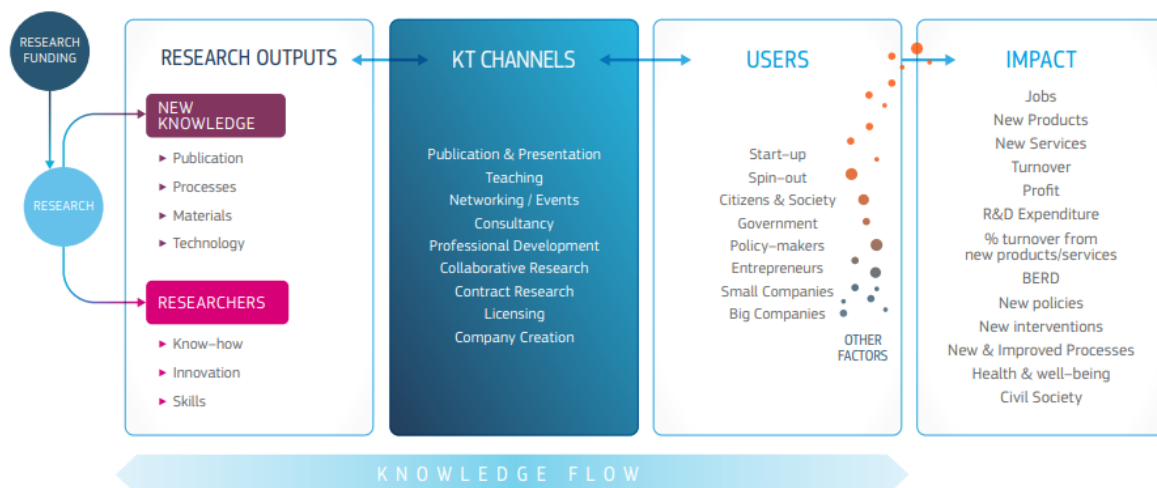


Figure 1 - Knowledge Transfer process [1].

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 commercialisation and monetisation towards a

more rounded approach which supports both co-creation and the dissemination of research results with, and to, non-academic third parties.

## 4. Methodology

In methodological terms, this report brings together conclusions after the analysis of the information gathered within 8.1 deliverable (Assessment of Blue Economy State of the art) as well as analysis of results from national and international EMPORIA4KT bootcamps (WP4) where different co-creation activities were put into place to understand the different stakeholders' views, how academy-industry-government relate and what are the main obstacles.

This report does not aim to provide an exhaustive list of elements affecting knowledge transfer, but to identify key factors that are slowing-down the progress of knowledge transfer in AA regions. The report is structured following the following four key factors:

### Funding Policies Supporting KT

Regional policies adopted by Public Administrations are of paramount importance to the economic development of business innovation and the success of Business-University collaboration. In an heterogeneous system such as the one that characterize the Blue Economy sector, coordination of different policies is crucial to ensure the success of joint development of technologies that respond to market needs. Green Deal policies will likely boost the blue economy sector in the future and will provide opportunities for synergies among different blue economy subsector in the development of new technologies, but proactive, flexible policies are needed to ensure that they adapt to the changing trends of the market and society.

### Skills for KT

People are the most important asset of the knowledge society but both companies and universities must face fierce global competition to attract and retain the most qualified and talented staff. The collaboration between Business and universities is based on the mutual effort of individuals within these organisations.

Research activities requires human resources, infrastructure, and equipment of scientific and technical excellence. These are rarely within the reach of most small companies and research groups. Incentives are needed to attract talent at academic and business level, to train and coach people, to create a risk-taking culture and to stimulate the entrepreneurial spirit.

This factor has been included as a key pillar in the Atlantic action plan 2.0, with a strong focus in bridging the skills gap between education offer and labour market needs, especially with regards to technological developments and innovation, improving the communication and cooperation between education and industry.

### Key stakeholders acting as interface for KT

To be transformed into innovation and to generate wealth the results of R&D in Universities, educational training and technical or scientific Innovation require the backing of private enterprise. Therefore, apart from supporting basic and applied training and research, additional measures are

needed to dynamize transfer processes by using instruments, institutions, actors and initiatives, public or private, which promote cooperation actions and the establishing of links so that the results of research carried out in Companies and Universities can be transferred to society as a whole (Technological Centres, Entrepreneurship Programmes, Knowledge Transfer Offices, networks and platforms, etc.)

### Ip for KT

The management of intellectual property protection is one of the key aspects of the relationship between the triple-helix. The essential features of this procedure should be communication concerning inventions; patent applications and confidentiality agreements to protect the knowledge which is generated; licences which permit Companies to use technologies developed by universities, with or without their collaboration, R&D&I contracts, and the creation of technology-based companies (spinoffs and start-ups).

It is very important that companies and universities understand all these concepts clearly and that they know how they should be managed. The rights and obligations of each party should also be clearly defined from the outset.

The valorisation of knowledge is one of the key aspects in the relationship between companies and universities. It is often the case that patents developed within academic institutions are not commercialised due to difficulties in their implementation or lack of funding, or because companies which have obtained unexpected research results do not wish to put them into practice.

Many of the universities and companies which are accustomed to collaborating have a series of standard contracts which optimise management tasks and prevent issues such as lack of equality in relationships, rights and obligations, or the abuse of situations, etc.

Defining contracts, responsibilities, and signatories, and making them easily accessible helps both sides in the negotiation process and the subsequent implementation of the project. This includes contractual elements related to intellectual property.

The following chapters summarise an analysis and vision of the current situation of the knowledge transfer system in the Atlantic countries members of EMPORIA4KT, based on these factors and with special emphasis on the Blue Economy, as well as a series of recommendations to eliminate existing gaps. For each one of the factors the analysis follows the same structure: **1) national context, 2) barriers detected for an effective kt and 3) recommendations.**

## 5. Background information and European Context

The Knowledge Society is based on three essential pillars: Enterprise, Universities and Public Administration. The effective interaction between these three agents is critical to realising the European aspiration of becoming the world's most advanced economy and society. The European Union has continuously promoted this idea, and triple helix collaboration was the focus of the European Modernisation Agenda for Universities: Education, Research, and Innovation, presented in 2006 [2].

In 2009, the [Communication from the European Parliamentary Commission to the Council, the European Economic and Social Committee, and the Committee of the Regions](#) [3] suggested that Universities should develop structured partnerships with the business community with the aim of "acquiring increasing economic power, being able to respond more quickly to market demands and establishing partnerships which maximise scientific and technological knowledge".

Indeed, Universities and business have always operated at different speeds and independently of each other, mainly because they have very different interests, goals, and target publics. However, today, in which knowledge forms the backbone which sustains the world's most advanced economies, the relationship between the two could resemble what in biology is called "mutualism".

Historically, Universities have focused exclusively on academic training and research. However, in recent years new demands have been made on them to develop mechanisms to transfer that knowledge and technology to society. The aim of this process is to effectively incorporate knowledge into the productive sector.


### Policy making context at EU level in the Blue Economy

The policy trend for promoting international cooperation in the Blue Economy at EU level has been progressing from a more strategic and policy driven approach, with the adoption of the Atlantic maritime strategy in 2011 [4], to a more operative approach with the recent publication in July 2020 of the Atlantic Strategy 2.0 plan. The 2011 strategy identified the challenges and opportunities facing the region under five thematic headings (implementing the ecosystem approach reducing Europe's carbon footprint, sustainable exploration of the natural resources on the sea floor, responding to threats and emergencies and socially inclusive growth). In 2013 the European Commission introduced an Atlantic action plan [5] to implement the strategy. This plan provided a framework for dynamic project development at local, regional, and national levels, as advocated in the Atlantic maritime strategy. The plan showed tangible results through 1,200 new maritime projects primarily targeting **environmental protection, improved connectivity, and social inclusion** that can be attributed to implementation of the action plan across the Atlantic area. Together, these projects represent investments of nearly €6 billion, including funding from the EU, the European Investment Bank, and national, regional and private sources.

Seven years later, the Atlantic Action plan 2.0, published in July 2020 [6], was based on a public consultation and a midterm review published in 2018.

The purpose of the **Atlantic action plan 2.0** is to unlock the potential of blue economy in the Atlantic area while preserving marine ecosystems and contributing to climate change adaptation and mitigation. It emphasizes synergies with the European Green Deal [7] and establishes the basis for a

sustainable, resilient and competitive blue economy in the EU Atlantic area, covering France, Ireland, Portugal and Spain.

	<p>The Atlantic action plan 2.0 goals are the core challenges for the AA and are therefore essential to the action plan's success. The seven goals are:</p> <p><b>1. Ports as gateways for trade in the Atlantic; 2. Ports as catalysts for business; 3. Quality education, training, and life-long learning; 4. Ocean literacy; 5. The promotion of carbon neutrality through marine renewable energy; 6. Stronger coastal resilience; 7. The fight against marine pollution.</b></p>
---	--

Coordination and cooperation are expected among the relevant countries across these seven priority goals backed by concrete actions, such as:

- The reduction of greenhouse gas emissions and the development of renewable energy - by supporting research and investment in marine renewable energy (going beyond offshore wind) for which the Atlantic has a huge potential.
- The fight against marine pollution - by promoting green shipping and coordinating actions against marine litter.
- The creation of new jobs
- The adaptation to climate change - by improving coastal observation and designing and promoting cost effective coastal protection measures.

Each one of these challenges are being addressed as pillars to be developed within different working groups. **Knowledge transfer** can be considered as a horizontal aspect in each of the pillars, and specifically targeted within the 3<sup>rd</sup> pillar, where a **focus is given in addressing the skills gaps in the blue economy sectors and in supporting cooperation between EU training centres and businesses supporting cooperation.**

### European programmes fostering R&D&I and KT

This chapter summarises the programmes offering guidance and tools to foster R&I&D for EU Member states and associated countries, developing transnational cooperation through collaborative projects involving public and private actors.

EU Research and Innovation programme **Horizon 2020** (2014-2020) funds projects according to three priorities: Excellent science, Societal challenges, and Industrial leadership. Next programme **Horizon Europe** (2021-2027) will be based on 3 pillars: Excellent science, Global Challenges and European Industrial Competitiveness and Innovative Europe. Horizon Europe targets impacts that support the Political guidelines in the EC, especially an EU Green Deal and an Economy that works for People. Horizon Europe will include new instruments currently under development: missions and partnerships. Five mission areas have been identified. Among them, the **mission "Healthy oceans, seas, coastal and inland waters"** will address priorities linked to EMPORIA4KT.

The [European and Maritime Fisheries Fund \(EMFF\)](#) [8] is the fund for the EU's maritime and fisheries policies for 2014- 2020. It is one of the five European Structural and Investment Funds (ESIF) which seek to promote a growth and job-based recovery in Europe. As an instrument for supporting the European Common Fishery Policy, EMFF:

- helps fishermen in the transition to sustainable fishing.
- supports coastal communities in diversifying their economies.

- finances projects that create new jobs and improve quality of life along European coasts.
- supports sustainable aquaculture developments.

This fund enabled the **BlueInvest initiative**, aiming to support the development of innovative services and technologies and awards grants to market- and investment-ready SMEs with innovative products, technologies, and services for the blue economy.

The [BlueInvest Fund \[9\]](#) is a new equity initiative supporting the EU policy objective to stimulate investments in the innovative blue economy. The BlueInvest 2019 call (EUR 22,5 M€) received 104 proposals. 29 SMEs were invited to pitch their proposals to an Investor Jury. 10 high-profile company projects were retained for funding. At the time of preparing this report the [EMFF \[10\]](#) call was open to support the sustainable development of the blue economy SMEs across the European Union. With an overall budget of €20 million its co-fund up to 70% of the projects. Any for-profit SME based in the EU (single participant or a member of a consortium) can apply.

#### Other European funding programmes and initiatives:

- Interreg– 2014-2020 (Axes 3 “Natural and cultural resources”)
- [Blue Technology - transfer of innovative solutions to sea basin economies \[11\]](#)
- [Blue Labs - innovative solutions for maritime challenges \[12\]](#)
- [Bio-based Industries Joint Undertaking \[13\]](#)
- [LIFE programme \[14\]](#)
- JPI-O action: Science4GES “Science for Good Environmental Status”.
- European Regional Development Fund (ERDF)
- Cohesion Fund (CF)
- [BlueInvest](#): a European Commission initiative that aims to improve access to finance and investment readiness for start-ups, early-stage businesses, and SMEs active in the Blue Economy. Its features include an online community, investment readiness assistance for companies, investor engagement, events, an academy, and a projects pipeline.

In partnership with the European Investment Bank, and backed by the European Fund for Strategic Investments, the financial pillar of the Investment Plan for Europe [15], has earmarked finance for enterprises with innovative products and services that can help the blue economy deliver the EU's Green Deal priorities. From late January 2020, the new fund will be able to provide finance to funds that are wholly or partly targeting the blue economy or to individual enterprises backed by more general funds.

## 6. Megadata analysis for Spain

According to the [OECD \[16\]](#), Spain is in 2017 (last year of available data) one of the developed countries with the least public support for private sector R&D. It is in the 27th position, falling two places from the previous year, out of a total of 46 economies (the 37 in the OECD and nine countries additionally selected for the study). This position is the result of both its lower direct support (through the granting of subsidies, purchase of R&D services, etc.) and, above all, its lower indirect support (through credits, deductions, or more beneficial tax conditions for companies) to business R&D&I. The international comparison does not allow us to visualize a single model of successful public support for business R&D.

The slight increases in investment in R&D of the last two years, always below the GDP, lead public research to a gradual and continuous loss of weight in the productive structure. This loss is parallel to the severe reduction in public resources allocated to this activity, due to both the reduction in budget items for R&D&I and the low level of execution achieved. [17]

In Spain, one of the main problems is the difficulties of companies to take advantage of all the knowledge generated in the innovation ecosystem and its agents. This lack of innovative culture in companies is a complex and structural problem in Spain and highlights the importance of public R&D for the productive sector. In this sense, innovation policies should focus their efforts on building these capacities and promoting the ability of enterprises to undertake cooperative projects with knowledge agents.

In Spain, recent reports and analyses outline a situation of blocked and unbalanced knowledge transfer (see “Report on Science and Technology in Spain (2017)” [18] and “Topics and facts about knowledge transfer in Spain” [19]). It is particularly significant that the transfer by means of licences has not taken off and that the number of spin-off companies has even decreased. The most disruptive innovations take the form of **new business and many innovations are undertaken by established companies**. Some causes of this situation have their origin in the legal and institutional framework of Spain.

Several factors have been identified that are slowing-down the progress of knowledge transfer in Spain:

### 6.1. Funding policies supporting KT in Spain

#### National context

The **Spanish Science, Technology, and Innovation System (SECTI)** is made up of all public and private coordination, financing and execution agents and their relations, structures, measures and actions for the promotion, development, and support of R&D&I policy in Spain, as presented in report 8.1.

The governance of the system is defined and regulated by Law 14/2011, of 1 June, on Science, Technology, and Innovation (LCTI). In addition to the Ministry of Science, Innovation and Universities, this includes the Council for Science, Technology, and Innovation Policy (CPCTI) and the Advisory Council for Science, Technology, and Innovation (CACTI). [20]

There is also an advisory group made up of the funding agencies of the Ministry of Science, Innovation and Universities, which are the **State Research Agency (AEI)**, the **Centre for the Development of Industrial Technology (CDTI)**, the **Carlos III Health Institute (ISCIII)** and the **Spanish Foundation for Science and Technology (FECYT)**.



The State Research Agency (AEI) is an instrument for the financing of R&D&I activities with public funds. Its purpose is to promote scientific and technical research in all areas of knowledge through the efficient allocation of public resources, to encourage collaboration between the agents in the R&D&I system and to support the generation of knowledge with a high scientific and technical, economic and social impact, including that oriented towards the challenges of society and the monitoring of the activities financed



The Centre for the Development of Industrial Technology ([CDTI](#)) is a Public Business Entity, answering to the Ministry of Economy, Industry and Competitiveness, which fosters the technological development and innovation of Spanish companies. It is the entity that channels the funding and support applications for national and international R&D&I projects of Spanish companies. The CDTI thus seeks to contribute to improving the technological level of the Spanish companies by means of implementing the following activities: Financial and economic-technical assessment of R&D projects implemented by companies, managing and fostering Spanish participation in international technological cooperation programmes; fostering international business technology transfer and support services for technological innovation and supporting the setting up and consolidating technological companies.



The transfer and management of knowledge is one of the priority areas of the Spanish Strategy for Science and Technology and Innovation of the Ministry of Science, Innovation and Universities ([Estrategia Española de Ciencia y Tecnología y de Innovación 2021-2027](#)) [21], whose objectives are aligned with those set out in the European Union's framework programme for funding R&D&I activities.

One of the objectives of the Strategy is to promote **knowledge transfer** and develop bidirectional links between science and business, through mutual understanding of needs and objectives, especially in the case of SMEs. To achieve this, actions are taken to promote **effective channels of knowledge transfer, cooperation and exchange between the public and private sectors**.

Other measures as stated in the strategy include **increasing the budget allocated to R&D&I** and encouraging **private investment** to reach the EU average, through direct aid (grants), and promoting the establishment of appropriate lines to facilitate the use of European funds, as well as compliance with regulations.

[State Plan for Scientific and Technical Research and Innovation 2017-2020](#) [20]. The State Plan is the main instrument of the General State Administration for the development and achievement of the objectives of the Spanish Strategy for Science and Technology and Innovation 2013-2020 and the Europe 2020 Strategy and includes state aid for R&D&I, which is granted preferably through competitive calls for proposals.



The State Plan is made up of four state programmes that correspond to the general objectives established in the Strategy:

- promotion of talent and its employability.
- generation of knowledge and strengthening of the system business leadership in R&D&I.
- R&D&I oriented towards the challenges of society.

Within the State Programmes for the generation of knowledge and strengthening of the system business leadership in R&D&I and R&D&I oriented towards the challenges of society of the Ministry of Science, Innovation and Universities, there are a series of annual calls for aid: [Cervera R&D Transfer Projects \[22\]](#), [Spanish R&D&i programme towards societal challenges \[23\]](#)

Spanish programmes for boosting knowledge transfer from academic area to the enterprises network in the Blue Economy (BE) area vary depending on numerous factors. For this analysis, EMPORIA4KT's project has revised three different levels under 8.1 deliverable [24]: i.e., programmes that act at national, regional, and local. Other varieties studied in those programmes where: whether they are directly related to the BE; type of beneficiaries of the programme, such as start-ups, SMEs, big industries, universities and other; type of funding, whether they are grant, equity or blended; and the funding origin, i.e., public, private or mix. The following paragraphs summarise conclusions extracted from this analysis.

At national level most of the programmes and instruments found within this project follows a similar profile, i.e., project collaboration programmes, financed by public grant or blended instruments (mostly covering the 65%-85% of the project's budget) between public research bodies (universities and Research and Technologic Organizations, RTOs) and private business (start-ups, SMEs, and big industries) to interchange. Some examples are [CDTI Missions \[25\]](#), [Spanish R&D&i programme towards societal challenges \[23\]](#) or [Grants for Technology and Innovation Platforms 2020 \[26\]](#). Usually those instruments open yearly calls and covers topics beyond the BE area. Some particularities are instruments that focus on human resources capacitation such as Torres Quevedo.

The Centre for the Development of Industrial Technology (CDTI) has a line of financing called **"Innovation and investment projects in the fisheries and aquaculture sector"** related to the European Maritime and Fisheries Fund (EMFF).

Specifically, the CDTI, with co-financing from the FEMP, has two lines of action to finance business initiatives in the field of fisheries and aquaculture, which are:

- Innovation projects, with three subtypes:
  - Innovation projects in the fisheries sector.
  - Innovation projects related to the conservation of marine biological resources.
  - Innovation projects in the aquaculture sector.
- Investment projects, with two sub-types: in activities related to the processing of fisheries and aquaculture products.
  - Aquaculture investment projects.
  - Investment projects in activities related to the processing of fishery and aquaculture products.

## Strategic Plan for Innovation and Technological Development in Fisheries and Aquaculture

In terms of fisheries and agriculture in Spain, the [Strategic Plan for Innovation and Technological Development in Fisheries and Aquaculture \[27\]](#) stands out.

Innovation is one of the solutions for improving the competitiveness of the Spanish business sector with respect to other countries. In the case of the fishing and aquaculture sector, which is so deeply rooted in Spain, R&D is a key factor in improving its sustainability and continuity.

This fact, together with the need to adapt and take advantage of the new circumstances of change and funding from the Horizon 2020 programme and the European Maritime and Fisheries Fund, has been the reason why the General Secretariat for Fisheries has drawn up this Plan, which sets out the priorities for innovation in extractive fishing and fish farming, including the transformation and marketing of their products.

This [strategic plan \[27\]](#) identifies the lack of knowledge transfer in the sector in Spain. Therefore, the plan encourages the knowledge transfer as part of its scientific excellence proposal. Its fifth strategic line looks for the reinforcement of the aquaculture sector by knowledge transfer mechanisms to share R&D&I results.

### Funding of emergent sectors

For more emergent sectors such as Ocean Energy, R&D is mostly funded through the [Institute for Energy Saving and Diversification \(IDAE\)](#) at the national-level and regional governments, frequently in collaboration. For instance, [Biscay Marine Energy Platform, S. A.](#) is an infrastructure operating in real marine conditions for the research, demonstration, and operation of marine energy collector devices. It was set up as a public-sector company by the Energy Saving and Diversification (IDAE) and the Basque Energy Agency. In Canary Islands, The Oceanic Platform of the Canary Islands ([PLOCAN](#)) is a Research Infrastructure (RI) labelled by the ICTS (Unique Scientific and Technological Infrastructure) Spanish National Roadmap, co-funded by the Ministry of Science, Innovation and Universities of the Spanish government and the Canary Islands government and by the ERDF.

There also exist other public-private initiatives linked to venture capital funds specifically oriented to invest in biotechnology projects (for instance [Caixa Capital Biomed](#) and [Caixa Innvierte Biomed II](#), in collaboration with CDTI).


### Funding instruments at regional level

In November 2019, the Regional Ministry of Economy, Knowledge, Business and University of the **Andalusian government** granted a total of six million euros from the European Regional Development Fund (ERDF) for research projects for the six existing **Campus of International Excellence (CEI)** in the Andalusian region, which are led and participated in by Andalusian public universities.

This budget made it possible to launch the first phase of an **innovative programme of R&D&I and knowledge transfer initiatives** created by the Regional Ministry of Economy, which seeks to strengthen the synergies between the agents of the Andalusian knowledge system and companies in the research areas considered to be priorities.

In the case of the Campus of Global International Excellence of the Sea ([CEI-Mar \[28\]](#)), the budget granted amounts to 1.5 million euros to develop the **ITEAzul project (Innovation and Transfer for the**

**Blue Economy**), which is the proposal led by the University of Cadiz, in collaboration with the CEI-MAR aggregation and includes as partners the four Andalusian universities located on the Andalusian coast (Almeria, Granada, Huelva and Malaga), research institutions such as IFAPA, IAPH, CSIC, IEO and 16 technology-based companies that have emerged from the Andalusian public research system. It also includes, as associate members, 6 large multinational companies (CEPSA, ENDESA, TELEFÓNICA, Banco Santander, AIRBUS and NAVANTIA) and two foreign universities (University of Algarve and Abdelmalek Essâdi University).

	<p><b>The Andalusian government</b> granted a total of 1.5 million euros from the European Regional Development Fund (ERDF) for the Campus of Global International Excellence of the Sea (<b>CEI-Mar</b>) to R&amp;D&amp;I and knowledge transfer initiatives in <b>Blue Economy</b> framework.</p>
---	---

In 2020, the Andalusian Regional Government has published several calls for incentives to carry out projects of collaborative interest in the field of Innovation Ecosystems of the [International Campus of Excellence](#) [28], and the call for collaborative projects between Andalusian industry and public research bodies to promote knowledge transfer in the region.

**Private Funds.** Private capital (Venture Capital + private equity) deserves a specific mention due to its importance as a financial mechanism to drive different stages of the life cycle of innovative companies. According to the employers' association of the [ASCRI](#) sector, private capital investment in Spain reached a new historical maximum, exceeding 6,000 million Euros in 2018 (21% more than in 2017). In addition, in terms of GDP, grew to 0.5%, exceeding the European average (0.47%). In 2018 there is a simultaneous growth of investment by different actors in the sector. International funds -which continue to concentrate the bulk of the activity (76% of the total)- increase by 28%, reaching a new historical maximum. The national agents, despite having a lower relative weight (24% with respect to total investment), increased by 5% with respect to the previous year. In any case, it is interesting to note that the Private Capital entities are the main drivers of this growth, as public entities reduced their direct investment activity by 46% compared to the previous year. [29]

### Barriers for effective KT

Analysis of the projects funded by the Spanish State Research Agency shows that only 3% of the projects awarded in 2019 involve good funding from university research groups. Most of the projects funded allow only for the survival of the average type of group (three/four researchers). More than 1500 research groups will receive less than 34,000 euros per year, the cost of a graduate contract. Thus, it is not possible to compete with groups from Northern European countries, the USA, or emerging countries. [30]

This has led researchers to apply to international programmes, with very successful results and return figures very close to the Spanish contribution (10%). However, in the highest quality programmes, such as those proposed in the framework of the European Research Council (ERC), only 5.4% of the selected proposals have had a Spanish institution as leader. However, despite the positive results in terms of Spanish scientific productivity, science policy has not yet explicitly incorporated internationalisation as a mechanism for evaluating the merits of the researcher.

The success of other countries in calls for excellence is largely due to substantial national funding, with infrastructures and organisation that allow results to be achieved with which to compete at European level for research excellence.

Insufficient national funding is a barrier in KT at national level, together with the insufficient public incentives addressed to the University to promote collaboration with the industry.

The R&D&I system depends largely on public funding, also since private financing systems for innovation can be considered still emerging.

## Recommendations

The efficient management of public policies in this area is the most effective way of ensuring a regional economic development model which is based on Innovation, Science and Technology. In short, public support is considered essential for business competitiveness. In this respect, it is necessary to develop a clearly defined funding strategy and devise all the processes required to implement it.

Although public funding is key to the creation of innovative technologies and companies, the private sector must be actively involved to play a leading role in the development and exploitation of cutting-edge technologies. In Spain, various models of public-private collaboration have been developed in recent years, particularly in the field of infrastructures and the provision of services. In this sense, a set of recommendations are proposed to optimize alternative mechanisms for financing KT activities and to develop additional support services.

- Identifying new types of private R&D&I investors and analysing the advantages of Business Angels
- Identifying new formulas for financing Innovation, such as involving companies in the financing of Doctorate programmes
- Leasing technological infrastructure from universities
- Sharing physical scientific and technical resources
- Promoting equal collaboration agreements
- Finding support for the process of financing Innovation and coordinate mechanisms for funding search.

These recommendations can be complemented with the ones proposed by the European Commission, within the framework of next 2021-2027 ERDF, to continue with the concentration of investments in those areas of greater added value for the EU (innovation and low carbon economy). In the case of Spain (having a GDP between 75% and 100% of the EU), 45% of investments should be dedicated to innovation, digitization, and the competitiveness of SMEs. Specifically, the Commission has presented its preliminary vision of the priority investment areas in innovation [31] as follows:

- Improve the research and innovation capacities of the public sector and companies, through the adoption of advanced technologies to increase the country's innovative performance and productivity, through the reinforcement of investment in R&D&I, particularly aimed at innovative SMEs.
- Improve technology transfer and market-oriented cooperation between companies, research centres and universities.

- Stimulate interregional cooperation in new value chains, also with other Member States and increase cooperation between operational programmes.

## 6.2. Skills for KT in Spain

### National context

In addition to the insufficient investment in R&D and innovation, the human element is a crucial factor to unlock the Blue Growth potential. Furthermore, human capital constitutes an overarching condition to achieve the region's economic, knowledge and technology priorities, in terms of research and innovation.

Within the State Programme for the Promotion of Talent and its Employability in R&D&I of the Ministry of Science, Innovation and Universities, there are a series of annual calls for grants, both for training and for recruitment:

- Grants for contracts *Juan de la Cierva* (training).
- Grants for contracts for training of researchers in companies (Industrial Doctorates).
- Grants for *Ramón y Cajal* contracts.
- Aid for *Torres Quevedo* contracts, etc.

In relation with training and human capital in the BE in Spain, there are measures that are being taken at public level, such as:

The Ministry of Agriculture, Fisheries and Food promotes **Grants for practical training in the field of fishery resources** and financial economics 2020-2021 addressed to practical training for university graduates to perform practical activity in fish and aquiculture knowledge area (among others).

It also promotes **sustainable fish action forums** where it encourages the exchange and dissemination of information among fishermen, scientists, governments, and other stakeholders on the use of mitigation measures and the development of coordinated approaches to the testing of new measures or events and forums for fish and aquiculture innovation.

Through **Fundación Biodiversidad**, the **MEJORA 2020** call has been launched for training and advisory projects in green and blue economy, aimed at self-employed people or people working for others, to which public and private legal entities with and without profit and based in Spain may apply. Also, the Fundación launch the **PLEAMAR 1** program that, on a competitive basis, grants training and support projects for entrepreneurs for the creation of companies within the framework of the Employment-Green Programme co-financed by the European Social Fund (ESF), 2020.

### Barriers for effective KT

The economic crisis caused by COVID 2019 has reaffirmed that the European challenge is to change the production model towards an economy based on knowledge. The system for incorporating research personnel into the Spanish science and technology system, has not been as successful as expected. Among other reasons, the hired researchers have had difficulty in starting their work due to the lack of synchronisation between recruitment and obtaining funding to establish a competitive group at European level.

Spain has a high rate of higher education graduates who suffer from a very strong underutilization of their skills and who receive low pay. [32] There is a clear need to **close the skills gap between the education on offer and the labour market** by increasing cooperation between academia and industry and increasing the attractiveness of the blue sectors.

## Recommendations

In almost all sectors of the Blue Economy the availability of appropriate vocational training courses is a necessary condition for the creations of jobs. Attention should therefore be paid to the provision of short training programmes that develop skills meeting the needs of employers and which agree with the national/regional strategies and investments. The following recommendations target the development of blue skills which is crucial to provide the conditions for a dynamic blue economy.

- Develop a network of training research centres to train new professionals on sampling, recording, and working on marine environmental, engineering, and scientific level.
- Boosting specific BE training in the field of Innovation
- Companies and institutions employing professionals in Knowledge Transfer should incorporate human resources with the diversity of profiles that are necessary at each moment. It is necessary to move away from rigidity in the definition of positions and towards a flexible and adapted selection of personnel, attending to the specialised profiles that are needed at each moment.
- Align high-education curricula, design joint MSc, PhD programs, short term scientific exchanges, to prepare the next generation of blue-economy scientists, technologist, and entrepreneurs. Establishing a coordinated network of marine institutes, universities, stations, observatories, and public and private companies
- Promoting new policies to encourage staff mobility (incorporation of researchers into companies)
- Develop an electronic platform for e-mentoring of young start-uppers in blue growth acting like a virtual incubator to create a lively ecosystem of entrepreneurs of innovation. Exploit new digital technologies for training purposes, including for operators, including Virtual or Augmented Reality.

### 6.3. Key stakeholders acting as interface for KT in Spain

#### National context

In R&D&I environments, which are formed by an intensive network of stakeholders, structures, it is of vital importance to have approaches, models, and work methodologies to carry out a timely and efficient management of the knowledge and research results transfer. To promote greater effectiveness in technology transfer processes, in particular the implementation of Knowledge government systems that facilitate such transfer as well as the exploitation of research results achieved.

Much of the academic transfer processes in Spain are linked to the activity of the Offices for Transfer of Research Results (OTRIS). Its creation was a strong commitment by the Spanish government three decades ago, to promote the transfer. Today, there are more than 200 OTRI from universities and research centres.

Moreover, the Ministry of universities facilitates a series of tools to help knowledge transfer among knowledge generators and the business sector, including guidelines, procedures, contracts; indicators of knowledge transfer achieved by the key agents of the R&D&I system; technological offer of the key public entities of research.

**Other relevant entities promoting knowledge transfer at national level:**

*RedTransfer:* The [REDTRANSFER Association](#) mission is to enhance the impact of research in and for society through the support to knowledge transfer, innovation, and research management, carried out by Universities and R&D centres. RedTransfer will prosecute its targets through:

- ^ Organizing and promoting learning activities and professional development events
- ^ Networking and exchange for professionals
- ^ Encouraging staff mobility between university and industry
- ^ Drafting and dissemination of reports and newsletters
- ^ Developing projects aimed at knowledge transfer, innovation, and research management.
- ^ Partnering with similar entities in other countries and territories

*Private foundations*

Foundations are committed - sometimes with very limited resources - to supporting well-defined actions in line with their missions and which may involve public or private actors. Many foundations have under their objectives of supporting research and innovation, environmental preservation, sustainable development, capacity building and education.

The figure of multisectoral private clusters, such as [Technological Corporation of Andalusia](#), that includes triple helix actors within their governance structure, and with a focus in the promotion and private funding of R&D&I activities and knowledge transfer among different sectors and actors, have been proved a success case of public-private collaboration model. They do so by supporting innovative projects, products and services, internationalisation of micro, small and medium enterprises, open innovation activities, dissemination of new knowledge and skills, etc.

*Maritime Clusters*

Maritime clusters, such as the [Maritime-Marine Cluster of Andalusia](#), are effective tools to support local stakeholders active in the Blue Economy to identify areas for further development and ensure sustainable growth and jobs. Maritime Clusters have been growingly acknowledged as essential booster for innovation and diversification of the Blue Economy and therefore they should play a major role in the development of blue companies and start-ups.

*Thematic Platforms and networks:*

- Spanish Institute of Oceanography (Spain) [33]
- Spanish Maritime Cluster, Spain [34]
- Technological Centre of the Sea (CETMAR), Spain [35]
- [Blue Bioeconomy Platform](#) [36]
- European Network of Maritime Clusters (ENMC) [37] (<https://enmc.eu/about-us/>)
- European Aquaculture Technology and Innovation Platform [38]: <http://eatip.eu/>
- European Fisheries Technology Platform [39]: <http://eftp.eu/>



- European MSP Platform: <https://www.msp-platform.eu/> [40]
  - Waterborne Technology Platform [41](<https://www.waterborne.eu/>);
  - European Community Shipowners Association (ECSA) [42] (<https://www.ecsa.eu/>)
- NECSTouR - Network of European Regions for a Sustainable and Competitive Tourism (<https://necstour.eu/>) [43].

### Networking tools

- As a general principle, networking tools are understood as networks where stakeholders can share information and coordinate their actions. Such tools intend to contribute to the development of an interactive community of a specific topic/ area and ultimately to promote dialogue and opportunities for operational collaboration among stakeholders. [32]
- There are a multitude of networking tools linked to Blue Economy. Big events and exhibitions/fairs/conferences (e.g., Ecomondo, Euromaritime) are also powerful tools for sharing new ideas and promoting sustainable innovations. [32]
- To develop the investment in the private sector and supporting start-ups and SMEs, programmes, platforms, and events which organize meetings between entrepreneurs, investors, researchers, corporates and innovation stakeholders are essential (e.g., Transfiere) [32]

### Barriers for effective knowledge transfer

The efficient functioning of innovation systems depends on to a large extent the existence of channels and mechanisms that induce and facilitate the exchange of knowledge between different actors. Therefore, cooperation between the public research sector and the private sector has been decades one of the priorities of innovation policies. However, despite continued efforts to promote collaboration between universities, research centres and businesses, barriers persist that prevent these actors find opportunities for cooperation that will benefit both sectors and society.

A key aspect is that the **industry sector** does not have the capacity to use what is being researched. There is much to improve in the dissemination of the offer of existing technologies, research results and in the social practices necessary for their implementation. Better dissemination would maximise the success of a specific transfer process, with a consequently higher impact. Currently, the impact of knowledge transfer is not considered from early stages and is mainly view as a mandatory “box to check” needed to ensure funding for a specific technology or project.

From the point of view of **transferring technology developed by the private sector or the academia** into evidence-based policy, the system also lacks effectivity. Public consultation mechanisms are being put into place in AA regions, however, an easy to implement methods is not available for policy makers to integrate information into decision making. Decision making often integrates the interests of big traditional industries, while new smaller emerging industries have more difficulties in accessing to these consultation processes. Another added difficulty is related to national adaptation and implementation of European guidelines into the national perspective. Consultation processes must be put into place in short terms and under the pressure of being mandatory, therefore the adaptation does not envisage real information about the reality of each of the national territories nor all stakeholders.



The creation of **interface stakeholders** has been a determining element in the promotion of the culture of transfer and networking among universities, research centres, industries, and public administration. However, it is quite generalized that these entities have difficulties in financing its structures and have limited resources, which affect to the main objective of creating and maintaining effective collaboration mechanisms. This barrier is increased by the lack of positive perception of the need for collaboration with other agents, and limited knowledge about the advantages of networks. Adaptation to the current situation is necessary, where it has become evident the difficulty of innovating unilaterally.

### Recommendations

- Create tools for an effective dissemination of technological offer in the academia accessible to the industry.
- Disseminate the benefits of participating and networking with other related initiative.
- Promoting participation in Open Innovation projects
- Collaborating in university training programmes aimed at promoting Innovation.
- Involving management staff in business relationships with Universities.
- Integration with international networks which support Business Innovation.
- Promoting specific collaboration systems between SMEs and large companies in the BE.
- Creating local associative initiatives to promote Innovation (Clusters, techno-business incubators, etc.).
- Design mechanisms to consider societal and market needs in R&D&I policy making.
- Linking various agents under a common BE brand

### 6.4. IP for KT in Spain

#### National context

This section analyses the legal framework associated with IP and knowledge transfer in Spain, with a focus on the main laws that affect it, such as the Patent law, the Subsidies law, the six-year research period and the Corporate Tax Act, as well as the institutions in charge of IP management.

According to the European Innovation Scoreboard [44], the comparison of Spain with the EU for 2018 is 79.3% of the European average, which places Spain in the group of "moderately innovative" countries, behind the leading countries. Companies' R&D expenditure is 52% of the European average and the number of Spanish SMEs that innovate is only 30% of the European average. In relation to this information, it is necessary to highlight some data on patents and exports:

- Patent applications in Spain are only 39.3% of the European average.
- Exports of technology-intensive products are 79% of the European average.
- And exports of knowledge-intensive services, 31.3% of the European average.

Furthermore, it must be said that barely 24% of international patents are licensed to companies, in other words, they are applied. In this sense, there is still much room for improvement in the field of international patents at national level.

### **IP Asset Management Support for Universities and companies**

Universities and R&D institutions increasingly play an important role in the process of technological innovation, technology transfer and commercialization of intellectual property (IP) arising from research activities. Several initiatives are being created to respond to the needs of IP asset management.

The [Spanish Patent and Trademark Office \(SPTO\)](#) [45] is the public body responsible for the registration and granting of the different types of Industrial Property. In Spain there are several types of industrial property right:

- Industrial Designs: these protect the external appearance of products.
- Trademarks and Trade Names (Distinctive Signs): these protect the combination of graphic and/or denominative elements that help distinguish products and services on the market from other similar ones offered by other economic agents.
- Patents and utility models: these protect inventions consisting of products and procedures which are susceptible to reproduction and/or use for industrial purposes.

Industrial property rights enable the holder to decide who can use them and how. These rights are granted through a procedure carried out by the competent organisation and the protection they provide covers the whole country.

On the other hand, there are Regional Industrial Property Information Centres, public institutions that help and advise the applicant for industrial protection. Among the institutions in the EMPORIA4KT Atlantic area, the following are highlighted:

- Andalusia: Agencia de Innovación y Desarrollo de Andalucía (IDEA)-Consejería de Economía, Innovación y Ciencia.
- Galicia: Agencia Gallega de Innovación.
- Canarias: Dirección General de Industria y Energía, Consejería de Economía, Industria, Comercio y Conocimiento.

Other resources available to promote technology transfer, are for instance the [Technology Market](#) [46] with R&D&I and technology offering of Spanish research bodies, universities, technology platforms, etc.

Moreover, the Spanish OTRI network (RedOTRI) has a Patent Working Group which is made up of knowledge transfer professionals who work on patents and other industrial and intellectual property titles.

At Andalusian level, the Andalusian OTRI network (ROA) has a [catalogue of patents](#) [47] from Andalusian universities and offers a patent licensing service. The OTRIs of the 9 Andalusian public universities also have a catalogue of patents and an advisory service for researchers. They are responsible for managing and marketing industrial property.

### **Evaluation framework of knowledge transfer and innovation activities in Spanish universities.**

The Ministry of Science, Innovation and Universities has a framework for evaluating knowledge and innovation transfer activities in Spanish universities, based in the evaluation of the Research activity

every 6 years. This initiative includes a call for the evaluation of merits that will strengthen incentive policies in universities. Spain is the first country to create an assessment model of this type. Since 2000, this instrument was taken as a reference in the evaluation of the individual research career. As a result, Spain is in the «Top 10» of reference models and excellence in terms of scientific production. [48]

### Barriers for effective KT

Spanish great capital of knowledge does not correspond to its impact and effect on the country's economic and social growth. Precisely because the instrument of the six-year research period seems not to have had the expected effect on the research and teaching community.

In general, the activities on which these indicators focus are patents and utility models, contracts and reports, spin-offs, etc. within the domain of the University. Transfer actions that are carried out in companies or entities in which the universities have a stake, promoted, or encouraged, are not considered, which determines the elimination of the entrepreneurial dimension of the university.

Next a list of barriers to effective KT is provided:

- Measurement system to reward, recognize and give prestige to Research, Development, and Innovation (R&D&I) hardly contemplates Knowledge Transfer, discouraging the researcher and research institutions that promote such transfer.
- Limited experience in the protection of intellectual property within the Innovation and Open Collaboration system.
- Knowledge transfer requires a high level of legal specialisation.
- SMEs have limited knowledge and experience about establishing agreements with Universities, and vice versa.
- Difficulty of exploiting commercial patents at a national and international level.
- Lack of patent exchange between the business and academic sectors.
- Low level of internationalisation, in both the academic and business environments.
- Repetitive approaches to the protection of intellectual property.
- High cost of patent maintenance.
- Difficulty of estimating necessary levels of protection during the early stages of research.
- Excessive interest in commercialising results of research as quickly as possible rather than developing a long-term legal protection strategy.

### Recommendations

- The enrichment and recognition of the Knowledge Transfer system is considered vital, equating it with the value of fundamental research. It is necessary to establish an adequate evaluation framework, that recognizes and reward individual effort in transmission and transfer processes of knowledge produced in universities, compatible and complementary with the one already established evaluation systems for research activity.
- To encourage governments to urge their research and scientific institutions to enhance cooperation and exchange with research and development (R&D) institutions and companies.

- Enhanced capacity of IP professionals and creation of a critical mass of IP specialists/experts.
- To explore IP related policies and initiatives necessary to promote the transfer and dissemination of technology.
- Greater awareness of the legal principles and practices, of the patent system, including the flexibilities existing in the system, and enhanced understanding and further clarification of current and emerging issues that arise in relation to patent-related matters.
- Establishing specialised intellectual property advisory services in different technological areas.
- Implementing an integrated intellectual property management system.
- Supporting the creation of technology-based spinoffs and start-ups.

## 6.5. Conclusions and key findings for Spain

Funders and recipients of public research alike recognise the need to demonstrate, in the broadest sense, the value return from investments.

**From the Industry point of view:** According to a study carried out in Spain by COTEC [49], most Spanish companies that collaborate with universities and/or public research bodies do so within the framework of an R&D&I project, through technical assistance and, to a lesser extent, through a licensing agreement, or by creating a company for the commercial exploitation of technologies and knowledge generated.

Companies that do not collaborate with universities and/or public bodies usually do so for

- Lack of information about the technology and knowledge that can be accessed.
- Different working rhythms/cultures between companies and universities/research public bodies.
- Excess bureaucracy hinders recruitment.
- Technological offer not aligned with business needs.

The transfer mechanism considered most effective by companies is technological cooperation in R&D&I projects, while staff mobility (incorporation of researchers into companies) is a very unknown instrument.

Companies consider it necessary to evaluate and reward the technology and/or knowledge transfer carried out by research public bodies and universities, and it is provided with a greater amount of funds and resources.

It is necessary to evaluate and reward researchers for the transfer of knowledge and innovation they carry out, like what is done with basic research.

Many companies do not know how to access the knowledge and skills of research groups from universities and IPOs, reflecting the need for greater exchange, dissemination, and implementation of existing knowledge.

### **From the academy point of view**

Among the most used transfer mechanisms by the Spanish researchers are responsible for publication and dissemination, technical assistance, and training. While among the least used would be the licensing agreement and the creation of companies.

The main barriers researchers face when establishing partnerships with the private sector are:

- The difficulty in financing projects (lack of public aid, funds for recruitment, etc.)
- Administrative difficulties (in signing contracts and agreements, rigidity of collaboration programmes, in IIP contracting, etc.)
- Ignorance of the offer and scientific and technical capacities
- Ignorance of the different ways of collaboration
- Lack of geographical proximity
- Lack of alignment between the needs of companies and lines of research

### **From the administration point of view**

The administration must encourage and promote the transfer of knowledge and innovation, as well as technological cooperation between the academic and industrial sectors. In this sense, these sectors must make available with sufficient financing and all the tools that allow the optimally and efficiently development of a competitive R&D&i, both nationally and internationally.

Current R&D&i requires greater investment, as well as innovation policies that focus their efforts on building enterprise innovation capacities and promoting the ability of enterprises to undertake cooperative projects with knowledge agents.

Insufficient national funding together with the insufficient public incentives addressed to the University to promote collaboration with the industry, remain a barrier in KT at the national level.

It is necessary to develop a clearly defined funding public strategy and devise all the processes required to implement it.

## 7. Megadata analysis for France

### 7.1. Funding policies supporting KT in France

This section aims to bring information about France public support to business R&D and innovation to provide information for further analysis regarding international comparison. Furthermore, regional policies made by public administration on KT are also provided.

#### National context

In fifteen years, financial support for innovation by public authorities has doubled in constant euros. The decision to devote more and more resources to this policy has been maintained over the course of political changes. Ten billion euros, i.e., half a point of GDP, are today devoted to supporting innovation by the various public players.

In 2000, the State and its operators managed nearly 30 national schemes. Their number has risen to 62 in 2015 to which must be added those managed by local authorities. These schemes range from tax relief (research tax credit), innovation subsidies, loans, communication, or innovation incentive schemes (such as i-lab, i-nov...).

The main players in these arrangements are: The National Research Agency, the ministries (higher education and the economy), the Future Investment Programme, ADEME, BPI France, the local authorities (especially regions) are becoming more and more involved in innovation policies.

The General Investment Commission (CGI), which manages the Future Investment Programmes (PIA), and the Public Investment Bank (Bpifrance), which supports and finances companies' innovation efforts. The PIA innovation programmes represent in average annual flows 57% of direct support and Bpifrance funding, in grant equivalent, 37% (including PIA actions managed by Bpifrance). (The Ministry of Higher Education and Research and the Ministry of the Economy are linked to the General Commissariat for Investment).

Tax incentives, mainly the Research Tax Credit (CIR), now account for more than 60% of total support for innovation, with 6.4 billion euros, compared with 17% in 2000 (introduction). Symmetrically, direct aid, mainly in the form of subsidies, has been practically halved in real terms over the period. Subsidies currently account for 19.2% of support, compared with 81% in 2000 [50].

#### MAIN STATE STAKEHOLDERS OF INNOVATION IN FRANCE

The main stakeholders that promote innovation in France are:

- Ministry of Economy [51].
- Ministry of Higher Education and Research [52]

#### FUNDING POLICIES SUPPORTING KT

The “**Programme d’investissement d’avenir » (PIA)**: a French government investment programme for higher education and research and innovation initiated in 2010 and still ongoing in 2021. In 2021, 20 billion € are given to support and create programme that support innovation. A small part of this sum is paid directly in the form of grants, the rest being loans or investments of which only the interest is consumable.

A part of this fund if used by states Innovation agencies (ADEME, BPI...) to launch calls for fit with their policies [53].

## MAIN AGENCIES THAT PROMOTE INNOVATION

**BPI France**: The Banque Publique d’Investissement (BPI) is a French national public investment bank. Its aim is to make the French economy more competitive. BPI France support business development and internationalization through innovation. To do so, BPI France has created several programmes that finance businesses or start-ups to help them to innovate. BPI France also created programme that stimulate knowledge transfer between the public research and the private sector [54].

**Agence Nationale de la Recherche (ANR)**: The French National Research Agency (ANR) is a public administrative institution under the authority of the French Ministry of Higher Education, Research, and Innovation. The agency funds project-based research carried out by public operators cooperating with each other or with private companies [55].

**L’ADEME**: ADEME is active in the implementation of public policy in the areas of the environment, energy, and sustainable development. ADEME provides expertise and advisory services to businesses, local authorities and communities, government bodies and the public at large, to enable them to establish and consolidate their environmental action. As part of this work the agency helps finance projects, from research to implementation, in its areas of action [56].

## FUNDING POLICIES SUPPORTING KNOWLEDGE TRANSFER IN FRANCE

Numerous measures have been put in place by the state, its agencies, and local authorities to encourage the transfer of knowledge between public and private research. Among the devices specifically related to knowledge transfer, we can cite the following:

- **CIFFRE**: The Cifre scheme enables the company to receive financial assistance to recruit a young doctoral student whose research work, supervised by a public research laboratory. This policy is managed by the Ministry of Higher Education and Research [57].
- **The Satt programme**: The Satt programme is aimed to create technology transfer acceleration company (SATT) in several French universities. A technology transfer acceleration company (SATT) is a subsidiary created by one or more institutions (universities and research organisations), responsible for detecting and evaluating inventions originating from public research laboratories to support them until they are transferred to companies.
  - Its mission: to translate the discoveries and skills of public research into concrete applications and meet the needs of companies.



- Its activity: patent registrations, proof of concept operations, start-up creations, licensing, etc.
  - The SATTs were created thanks to the Investments in the Future programme and benefit from a fund of €856 million [58].
- The SIA Deeptech: that is a programme financed by BPI France and that is destined to Business support organisations to help them to better support the creation and development of Deeptech start-ups. The objectives of the SIA Deeptech are to:
- Bring more DeepTech entrepreneurial projects to the surface thanks to action-training modules for research personnel.
  - Accelerate and secure the critical passage from the "laboratory to market" phase through a "DeepTech specific" support programme. Complementary to existing support systems (maturation funds, Emergys Bretagne, French Tech Seed, etc.), it will be steered by the start-up's entrepreneurial roadmap.
  - Strengthen and inject entrepreneurial expertise into DeepTech project teams by surrounding them with a Business Advisory Board as soon as possible.
  - Extend support to DeepTech projects in structuring their business action plan and market access. SIA Deeptech are financed by BPI France but delivered by Technopoles or SATT in the regions of France [59].
- The "French Tech": that is an initiative led by the French government. French Tech is a major collective mobilisation movement of France's most dynamic territorial ecosystems for the growth of their start-ups and digital companies. Private players (entrepreneurs, companies, investors) who can invest time, energy, and money in the growth of their ecosystems and in the acceleration of digital businesses are the driving force behind it. French tech missions are:
- To mobilize all the innovation ecosystem of local territories.
  - To accelerate start-ups growth.
  - To improve the international attractiveness of the French start-up eco-system.
- To do so, French tech could deliver several actions:
- *Programmes for access to digital competencies*: Programmes bringing together students with complementary profiles (sales engineers, designers, computer scientists, etc.), entrepreneurs and innovation players to work on concrete innovation or product creation projects, using design thinking, making, rapid prototyping, etc. methodologies. These programmes offer companies easier access to talent, especially young graduates.
  - *Fablabs (Fabrication laboratory) creation*: Open spaces for design and pro-totyping with a complete machine park for machining, measuring, and testing.
  - *Competition*: Selection tool for entrepreneurs providing emulation, often with international visibility, and depending on the case, financing, and support for the winners.
  - Implement incubators,
  - Implement accelerators,
  - Acceleration programmes on international market [60].
- Initiatives let by financed by BPI France such as the "concours d'innovation" "i-Phd": "i-phd" is made for young researchers or PhD students who wish to create or co-create a deeptech start-up through a technology transfer based on research results. The selected participants will benefit

from individual and collective support over 12 months. This support will be provided by entrepreneurs, investors, and professionals from the Deeptech and entrepreneurship sectors, with the aim of inspiring young PhDs and, above all, multiplying the business potential of each project. This support will be punctuated by several highlights:

- Collective immersive experiences to inspire young doctors and enable them to confront their projects with the realities of the market,
- Individual mentoring by a Deeptech contractor, adapted to the maturity and needs of each project.
- Practical workshops and training sessions led by entrepreneurs and business development experts to enable young doctors to take their project to the next level [61].

## Regional context

### REGIONAL AUTHORITIES THAT PROMOTE INNOVATION

Regions are local's authorities that have competencies in economy and innovation. The Bretagne region have created several programs to support innovation in their territories [62].

### REGIONAL PROGRAMMES THAT KNOWLEDGE TRANSFER IN FRANCE

Some regions can create programmes that support knowledge transfer such as the region of Brittany such as the “Innovation collaborative au croisement de filière” grant. This programme gives grants to businesses, research centres, or universities etc. to [63]:

- Create synergies and strengthen the dynamics between the public and private research sectors.
- To support, at the crossroads of regional economic sectors, innovations that are highly valuable, by supporting collaborative projects carried out by SMEs/ETIs.

## Barrier for effective knowledge transfer

Following are listed the main barriers identified for effective knowledge transfer within France funding policies:

- Appears to exist many policies (62), making it difficult to understand.
- There are many different actors currently in France that acts in this sense.
- Transfer of competences from the state to the regions is under way (decentralisation), making it more difficult to read the programmes.
- A large part of the actions is managed at the state level, few actions are managed at the regional level.

- Centralised innovation policies reducing the possibilities of different initiatives... deconcentrated policies.
- Autonomy of the universities recent therefore new competences and few financial resources.
- Few programmes carried, created directly financed by the universities.
- Few programmes carried by private groups.
- Still strong separation between universities and the private sector.

## Recommendations

Following are listed the main recommendations for effective knowledge transfer within France funding policies:

- Develop relations between large groups and SMEs, as well as the weak links between SMEs and the world of public research (universities, *grandes écoles*, public research organisations) and, more generally, the relative lack of cooperation between these public laboratories and businesses.
- Raising awareness among doctoral students and researchers about entrepreneurship in private research.
- Create links between local research laboratories and SMEs/small businesses.
- Enable universities and economic development agencies to propose initiatives to better link public research and the private sector.
- Valorise entrepreneurial experience or work in private laboratories in the criteria for the advancement of researchers in public research.

## 7.2. Blue skills and resources for KT.

Regional, national actions or private (associations...) to promote talents and their employability. “Spain has high rate of high education graduates that suffer from a very strong underutilisation of their skills”.

One of the main problems in France regarding the employability of researchers is the strong separation of public research institutions and the private sector. Historically, doctoral students have been employed in public research centres. The private sector as well as entrepreneurship have become increasingly important opportunities for the employment of researchers.

Several actions have been set up by French institutions to develop the employability of doctoral students or researchers' profiles, by promoting jobs in the private sector and fostering entrepreneurship. We can cite as an example:

### National context

**Reseau C.U.R.I.E:** The C.U.R.I.E Network is an organisation that is bring together professionals to promote transfer of technology and innovation stemming from public research for 29 years. With its 190 members, the C.U.R.I.E Network ensures a mission of promotion, development, and professionalization of the transfer of technology, know-how and skills from the public sector to the socio-economic world. The C.U.R.I.E. is at the heart of a public-private ecosystem serving economic performance and social progress.

#### My research and After:

“My research and after” is a training programme on entrepreneurship made by “Reseau C.U.R.I.E on topics related to the fields of promoting public research, technology transfer and innovation stemming from public research. This program covers a wide field ranging from "junior" training on the fundamentals of promoting research to "expert" modules on intellectual property strategy or remuneration for transfer.

**Les Innopreneurs:** “Les Innopreneurs” provides different training sessions and workshop to sensibilise PhD students and researchers to innovation such as:

*An entrepreneur in a lab:* According to the principle of open innovation and co-creation, an entrepreneur with a given problem meets the participants (doctoral students, doctors, researchers) so that they can bring him new avenues of reflections, which go beyond the framework.

- Apply the principle of open innovation.
- Bring in entrepreneurs from the territory who have a problem.
- Brainstorm participants to find avenues for reflection and / or solutions.
- Develop reflexes of innovation, identification.

#### Innovons Meet up:

Raising awareness of entrepreneurship: To offer a first approach to innovative entrepreneurship and an introduction to intellectual property:

- Encourage vocations of entrepreneurs.

- Bringing together participants from public research, entrepreneurs, and the territory's ecosystem
- Raising awareness of intellectual property
- Discuss local actions and support for entrepreneurs.
- Sharing time with researcher-entrepreneurs

### Barrier for effective knowledge transfer

Following are listed the main barriers identified to have in consideration for developing skills for knowledge transfer in France:

- Lot of talents lack of private investment to enable the promising start-up to grow compared to US where they have big investments funds that detect the promising start-up early.
- Low wages for PHD
- Not so many programmes to promote employability for PHD students.
- Not so many programmes that promotes entrepreneurship for PhD.
- Not so many jobs after PhD with a high wage
- Not so many researchers' job after PhD in the private sector (*travail de commercialisation*)

### Recommendations

Following are listed the main recommendations to have in consideration for developing skills for knowledge transfer in France:

- Develop programmes and actions that promotes employability of PhD in the private sector (start-up, PhD...)
- Meeting programmes between PhD students and ex-PhD that works in the private sector or that have created their start-up or that works in a private company.

### 7.3. Key stakeholders acting as interface for KT in France

There are several institutions that promotes cooperation actions to transfer research outcomes. Such as:

#### LOCAL UNIVERSITIES

The programme “Disrupt campus”: Disrupt campus is an initiative led by the Ministry of the economy that is aimed to develop training courses in entrepreneurship and innovation that are delivered in a “start-up” mode by French universities and that closely associate businesses engaged in digital transformation initiatives. Ministry of the economy launched a call in 2017 to selected projects carried out by universities that were aimed to implement trainings in digital innovation and entrepreneurship.

“Disrupt campus” programmes aim to raise awareness about entrepreneurship amongst students and researchers, improve networking between universities and businesses, and provide to people the right skills and knowledge to create and manage businesses.

18 French universities have joined the “Disrupt Campus” initiative and delivers the “Disrupt campus” training programme [64].

The programme “Deeptechtour”: The Deeptech Tour is part of the Deeptech plan that is an initiative maid by BPI France and that is aimed to tie links between start-up ecosystem and the French research environment. One the main aim of this initiative is to raise awareness about entrepreneurship amongst researchers. The Deeptech Tour aims to bring together on campus the university ecosystem, local economic players, and support structures to:

- Show through concrete examples and testimonies the bridges that exist between the academic world and that of start-ups.
- Provide operational tools for the creation of start-ups.
- Highlight the richness of an ecosystem that works for the success of deeptech start-ups with new means (Financial, Pact law).
- On the Deeptech Tour program.

Over half a day, the Deeptech ecosystem will be able to participate in:

- A plenary with testimonials from researcher-entrepreneur / coach duos
- 40-minute workshops on topics such as "who to contact in the ecosystem? »; "What are the key points before starting a business? »; "how to find my market?"
- Networking moments.

More than 12 French universities already hosted a Deeptech tour to sensibilise students, researchers, and business to innovation [65].

### **BPI France:**

The Banque Publique d'Investissement (BPI) plays the role of financier of some actions works also as an actor on some actions such as:

#### **The “Concours innovation I-PhD”:**

“I-phd” is made for young researchers or PhD students who wish to create or co-create a deeptech startup through a technology transfer based on research results. The selected participants will benefit from individual and collective support over 12 months. This support will be provided by entrepreneurs, investors, and professionals from the Deeptech and entrepreneurship sectors, with the aim of inspiring young PhDs and, above all, multiplying the business potential of each project. This support will be punctuated by several highlights [61]:

- Collective immersive experiences to inspire young doctors and enable them to confront their projects with the realities of the market,
- Individual mentoring by a Deeptech contractor, adapted to the maturity and needs of each project.
- Practical workshops and training sessions led by entrepreneurs and business development experts to enable young doctors to take their project to the next level.

#### **The Technopoles:**

Technopoles local organisations that are aimed at supporting innovative businesses (support to business creation/development, networking...), bring together the economic environment around a common challenge of innovation, provide activities that enable knowledge transfer (training, networking events...).

- As an example of activities undertaken by a technopole to promote knowledge transfer we can quote: The Ocean Hackathon that brings together students, researchers, professionals, and businesses of the sea during a 48-hour non-stop event during which small teams (of engineers, researchers, students...) works solely from a range of marine digital data to develop a prototype and examine possible issues. Teams are supported by coaches from business, research, or institutional sector to improve the projects that proposed.
- Technopoles are also the local institutions that implement the SIA Deeptech and the French tech at the local areas.
- Technopoles also drive the Start-ups or SME on every potential European, national, or regional funds that they could use for innovation [66].

#### **The SATT:**

A technology transfer acceleration company (SATT) is a subsidiary created by one or more institutions (universities and research organisations), responsible for detecting and evaluating inventions originating from public research laboratories to support them until they are transferred to companies.

- Its mission: to translate the discoveries and skills of public research into concrete applications and meet the needs of companies.

- Its activity: patent registrations, proof of concept operations, start-up creations, licensing, etc.
- The SATTs were created thanks to the Investments in the Future programme and benefit from a fund of €856 million [58].

Research Centre such as IFREMER with “Octopouss’ programme”:

The Octo'pousse programme gives to anyone that has a great an innovative idea the means (financial, technical, human) to move from the idea to the structuring of your project, and thus create your start-up in optimal conditions. Participants will receive [67]:

- an 18-month employment contract on the Ifremer site most relevant to your project.
- funding of € 60k to facilitate the implementation of the project access to test facilities, access to the sea, laboratories, etc. from Ifremer and a collaboration with an Ifremer research team.

### Barrier for effective knowledge transfer

Following are listed the main barriers identified for effective knowledge transfer within France key stakeholders:

- A high number of actors split between different institutions and many different programmes making it difficult to understand.
- Public research centre and public universities have just started to implement Knowledge transfer programmes.
- Difficult possibilities for local institutions to propose and create programs as they do not have the financial resources to do so.
- Technopole, SATT, and valorisation services of universities could propose the same programme of Knowledge transfer at the same time.

### Recommendations

Following are listed the main recommendations for effective knowledge transfer within France key stakeholders:

- Promote interrelations between valorisation services of universities, technopole and SATT to create joint programs.
- Programme created to promote knowledge transfer are quite new but implemented by many different actors at the same time in the same areas. It would be important to share good practices between the implementation of these programmes to improve them.



## 7.4. IP and legal framework for KT in France

This section aims to bring information about France IP management support for universities and companies. Furthermore, provides an evaluation of knowledge transfer and innovation activities in French universities.

### National and local level

#### The SATT:

A technology transfer acceleration company (SATT) is a subsidiary created by one or more institutions (universities and research organisations), responsible for detecting and evaluating inventions originating from public research laboratories to support them until they are transferred to companies [58].

- Its mission: to translate the discoveries and skills of public research into concrete applications and meet the needs of companies.
- Its activity: patent registrations, proof of concept operations, start-up creations, licensing, etc.
- The SATTs were created thanks to the Investments in the Future programme and benefit from a fund of €856 million.

### Barrier for effective knowledge transfer

- Created in 2011, the first evaluations of the SATTs show that they are partly successful. Their procedures are said to be complex, and the decision-making process is said to be too slow; actions are said to have not enough links with the laboratories...
- The SATTs overlap with many other valorisation services, particularly those present in universities.
- The procedures put in place to select projects and ensure their follow-up still seem too complex and the decision-making process too long.

### Recommendations

- The investment committee, which determines the projects to be matured, plays a key role. The quality of the recruitment of the experts who make up the committee and who are external to the SATT is decisive.
- Close relations must be further developed with the researchers, so that detection is carried out "as close to the bench" in the laboratory as possible. Moreover, certain sectors still seem to be under-exploited because they are more difficult to develop, such as the human and social sciences.
- The researcher should also be present at all stages of the valorisation process, from the presentation of his project to the investment committee to the meetings with companies.

- Put in place voluntary shareholders who facilitate the rise of SATTs; a coherent ecosystem into which the structure manages to integrate; an undisputed, independent chairman who can manage a private company and who has a good knowledge of the economic world and even, ideally, experience in the sector.
- Efforts to develop relations between public research and the economic sector must be continued. Thus, some researchers remain reluctant to valorise the results of their research or simply ignore the interests and issues at stake.
- Efforts to raise awareness must be continued, particularly in the framework of training modules that can be planned during their courses, and they must be better trained in this very particular aspect of their activity. It is also necessary to publicise success stories to arouse desire. At the same time, procedures must be simplified, and approaches made easier because the priority of researchers is to save time to carry out their projects.
- Valorisation and innovation are currently based on several structures that are still very important. A simplification and rationalisation of the valorisation and innovation landscape is necessary.
- It is essential to provide all the guarantees for the success of the projects resulting from the SATT. Thus, at the time of the commercialisation phase, the creation of a start-up should not necessarily be favoured. Above all, it is advisable to rely on the existing economic fabric, to grant licences to companies, particularly small and medium-sized enterprises (SMEs), in search of innovation [68]

## 7.5. Conclusions and key findings for France

The public research sector and the industry sector are culturally quite separated in France, there are not lot of interactions. Between 2000 and 2015, the budget allocated to R&D by France has doubled as the numbers of programmes associated to the promotion of R&D making it difficult to understand.

The government has created the “SATT” in 2011, that was meant to be the institution dedicated to knowledge transfer between public research and the industry. Their role is to patent and protect public research and then develop it through incubators or businesses’ partnerships. 14 SATT have been created in France. However, their results are quite mitigated as this structure are quite complex in their procedure, distant from the laboratories and the researchers.

Another institution that is important to mention in terms of knowledge transfer is the “Banque Publique pour l’Investissement” (BPI France) created in 2012 and that is aimed to support businesses to innovate or business creation. They have created several programmes that promotes knowledge transfer especially through programmes that finances and promotes start-up creation from the research.

Several institutions such as research centres or universities have implemented programmes of knowledge transfer like “IFREMER” with “Octopuss programme”, universities with the programmes “deeptechtours” and “disrupt campus”. Organisations such as the “Reseau C.U.R.I.E” creates programmes dedicated to raise awareness of the public research sector to innovation and knowledge transfer.

The number of policies and organisation dedicated to innovation have increased in the last years in France, however there are few training programmes only dedicated to raising awareness of the researchers of the public sector to the commercialisation of technology and that explain what could be the road to market of an innovation created in laboratories (licensing, partnership, business creation...).

## 8. Megadata analysis for Ireland

### 8.1. Funding policies for effective Knowledge Transfer in Ireland

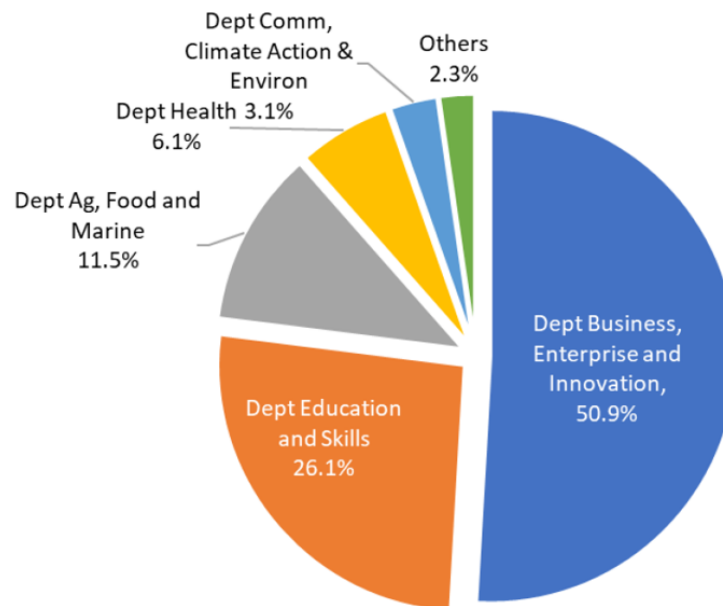
Ireland Geographically speaking is a small country at the edge of Europe. It covers a land area of 84,400 km<sup>2</sup>, and has a coastline of roughly 3,200km. The country is roughly 8 times smaller than France and 7 times smaller than Spain. At the last census in 2016 it had a population of 4,761,865. Due to the size of the Country and its population, means that National policy is generally accepted as regional policy.

In this section we venture to inform the reader about Research, Development and Innovation supports and incentives available to businesses sector to allow further analysis and comparison with other countries. Identifying ways and means of improving research and development for the business environment Ireland is linked specifically to the EU's Blue Economy and the Atlantic Strategy.

#### National context

Government Budget allocations for Research and Development in Ireland has remained consistent for the last 4 years. However, it has taken a significant hit in financial support from the high of €890.4m in 2009. In the 2016 the investment fell by more than 19% to €718.9 million. Since then, it has risen steadily year on year to €802.2 million in 2019.

In 2019, the Department of Enterprise, Trade and Employment was responsible for the largest proportion of Government investment in R&D at €408.4m or 50.9% of total GBARD. For DETE, this represents 42.9% of its total budget<sup>5</sup>. The Department of Education and Skills had an R&D outturn in 2019 of €209.2m or 26.1% of GBARD. The Department of Agriculture, Food and the Marine invested €92.3m or 11.5% of total GBARD in 2019 [69].



*Figure 2 - Percentage Breakdown of Irish Government Budget Allocations for Research and Development by Government Departments, 2018*

For international comparison, data is only available up to 2018 (Figure 2). The EU 28 average for 2018 was 1.34% of total Government expenditure spent on R&D while Ireland's percentage was 0.93%. Therefore, Ireland is below the EU averages for this indicator [69].

### MAIN STATE STAKEHOLDERS OF INNOVATION IN IRELAND

The Stakeholders that promote innovation and entrepreneurship in Ireland. This is evident from the allocation and spending of funds as shown in the breakdown from Government departments.

- The Department of Enterprise Trade and Employment.
- Department of Education and Skills.
- Department of Agriculture and Marine.
- Department of Health.

## **FUNDING PROGRAMMES AND AGENCIES THAT PROMOTE KNOWLEDGE TRANSFER AND INNOVATION IN IRELAND**

State Agencies and its subsidiaries have put a lot of programs in place that benefit both the institutions and business alike in Ireland. Funds vary depending on the purpose of its application, but they encourage the Transfer of Information.

### **HEA Innovation and Transformation fund to help Higher Education institutions throughout Ireland.**

The fund was launched in 2018 as a recommendation of the Review of the recurrent funding allocation model for higher education. Out of the applications received and assessed by an independent panel, 21 successful proposals include partnerships amongst the seven universities, the three IOT's which now compose the TU Dublin, ten institutes of technology, two specialist colleges, one Further Education College and five other state and non-state bodies [70].

### **IDA.**

Is a leading stakeholder in the Research, Development, and Innovation in Ireland. The IDA work closely with companies to ensure that they have all necessary facilities and supports to establish and expand the Research, Development and Innovation supports.

### **KTI Knowledge Transfer Ireland.**

Knowledge Transfer Ireland (KTI) is the national office that helps business to benefit from access to Irish expertise and technology by making it simple to connect and engage with the research base in Ireland.

KTI takes a national perspective on the knowledge transfer (KT) system in Ireland. KTI works with business, investors, universities, Institutes of Technology, State research organizations, research funders and government agencies to maximize State funded technology, ideas and expertise getting into the hands of business to drive innovation. KTI is in Enterprise Ireland (EI) and funded by EI with co-financing from the Irish Universities Association (IUA) [71].

### **Department of Agriculture Food and the Marine:**

Knowledge Transfer Programme was designed to upskill farmers for continual improvement their enterprise. Farmers must attend Knowledge Transfer Meeting and events. It was designed to inform and educate Farmers for post 2020 Common Agriculture Policy (CAP) as part of the programme farmers are required to complete Farm Improvement Plan [72].

### **Bord Iascaigh Mhara (BIM)**

BIM's vision is to lead the Irish Seafood sector through our effective support and deep expertise so that Ireland becomes the international leader in high value differentiated products that satisfy the growing demand for healthy, safe, responsibly, and sustainably produced seafood [73].

### Údarás Na Gaeltachta

Údarás Na Gaeltachta is the regional authority responsible for economic, social, and cultural development of the Gaeltacht. The Gaeltacht areas are generally on the coast of Ireland. The communities are in rural decline, lessening employment opportunities with great damage to the language and heritage. The Údarás is responsible for enterprise development and job creation initiatives and by supporting strategic language, cultural and community-based activities [74].

## FUNDING PROGRAMMES SUPPORTING KNOWLEDGE TRANSFER IN IRELAND

### Enterprise Ireland

The **Innovation Vouchers** initiative was created to develop links between the higher education institutes and small businesses. There are several methods to use that these vouchers can be used [75]:

- Standard vouchers – where €5,000 may be available to a company to allow them to explore a business opportunity with a registered Knowledge Provider.
- Co-funded voucher – where the voucher is co-funded with the company on a 50/50 basis. Where the company contributes €5,000 along with the €5,000 from Enterprise Ireland.

**Technology Gateway / Technology Centre Capital Call** the purpose of the fund is to increase the interaction between companies and Learning Institutes.

## REGIONAL AUTHORITIES THAT PROMOTE INNOVATION

Due to the size of the country all most regional authorities that promote innovation would be under state promotion.

### Barrier for effective knowledge transfer

- Companies not knowing that opportunities are available to them to carry out investigations.
- Much research has been undertaken in the past with people not knowing how to access this information.
- With the current global pandemic COVID 19 and the new method of working, decentralisation and working from home, it has shown that the requirement to gain information and knowledge is much more difficult.
- The level of funding to support Research Development and innovation is far too little to promote the EU average funding spending is 1.34% of GDP but Ireland is only 0.93% of GDP [69].
- SME and companies have limited experience and knowledge of dealing with Universities and Institutes. Likewise, some institutions have limited experience in dealing with SME.

## Recommendations

Some recommendations from our findings would be as follows:

- Create synergies between SME and Universities and learning institutions.
- Create clear learning pathways between policy makers, Learning Institutions and SME.
- Raise awareness between Institutions, researchers and SME and the benefits of mutual collaborations.
- Funding is vital. The only way that Institution and SME can benefit from the Knowledge Transfer is with adequate funding.
- Clear understanding of who owns the information and knowledge that is gathered.

### 8.2. Skills for KT in Ireland

#### National context

Sharing knowledge gained and passing information efficiently and effectively is the key to successful knowledge transfer. This can happen with supports from government. A lot of incentives have been created by the government with a view to investigate Research, Development, and Innovation proposals. Here are some incentives that the State provide.

#### **Research and Development Tax credit programme.**

The programme is open to Irish based companies for Research and Development activities carried out in science and technology, Agriculture, and food processing. The tax credit is to include the qualifying expenditure is relative to the amount spent on R & D in an accounting year [76].

#### **National Marine Research and innovation Strategy 2017-2021 (MRIS).**

MRIS was identified as a key enabling action in Irelands Integrated Marine Plan – Harnessing Our Oceans Wealth. It investigated the European & national policies in relation to the Marine & Blue Economy. Fifteen major themes were investigated under the scheme. “The MRIS aims to provide a framework within which funding for marine research can be targeted most effectively to areas of strategic importance. It allows research funders, working in partnership with the Marine Institute, to assess the impact and likely return to the state from research investment in marine related research. It is also designed to ensure that state support for marine research results in Irish researchers being able to compete at an international level and participate fully in transnational research projects” [77].

#### **Frontiers for the future Programme.**

This programme is supporting 71 projects funded in 12 higher education institutes valued at €53m. This programme is covering a large variety of topics. With one such topic including “the assessment of pollution and its impact in aquatic ecosystems” [78].

#### **BIM – Knowledge Gateway Scheme.**

“The Strategy for Sustainable Development of Aquaculture specified in section 3.1 of the EMFF OP, the objective of this Scheme is to promote knowledge, innovation and technology” [79].



## Barrier for effective knowledge transfer

Ireland has a high level of students graduating from each year. The following are some of the elements that have been identified as barriers for effective skill and knowledge transfer in the Blue Economy.

- With most of the Multinationals based in and around Dublin, Galway, and Limerick it is difficult and expensive for students to continue their research if is not funded properly.
- The lack of affordable accommodation in the large cities mean that many students may not be able to afford to complete their research and studies.
- Low wages that are paid to PHD students upon graduation.
- Not enough job opportunities for researchers in the private sector.
- Typically, jobs are lower paid in the rural / coastal areas of Ireland.
- Lack of infrastructure and broadband in rural areas mean that it is not practical or possible for students to complete their studies remotely.
- Inadequate transport services to allow for the movement of people throughout the country.
- Lack of investment in Blue Economy with most of the investment being focused in the large urban areas.
- Companies not aware of the benefits of R&D&I and the schemes and opportunities available to them.
- Lack of research jobs available to graduates.

## Recommendations

Most recommendations require a large injection of cash to resolve them. For example:

- Improved infrastructure and Broadband
- More collaborations with institutions to develop training methods.
- More investment in the Blue economy
- Better communication to inform private sector companies of the opportunities that are available to them.
- Educate Private Sector companies on the benefits of R&D and the return on investment that is achievable.
- COVID 19 has thought everybody that a new way of thinking is required for companies to succeed. With many people now wanting to leave the large cities and work remotely from home or with the use of Data hubs shows the importance of a thriving Blue Economy.

### 8.3. Key stakeholders acting as interface for KT in Ireland

There are many institutions that promote the process of Knowledge Transfer along the Atlantic areas of Ireland.

#### Local universities

##### **National University of Ireland Galway (NUIG)**

The Innovation Office at NUI Galway is the knowledge-transfer and entrepreneurial hub for the University. We drive impact by supporting collaborations and exchanges between our research community and industry.

NUI Galway's Business Innovation Centre provides business supports and excellent facilities including labs and co-working spaces. This community of entrepreneurs are creating jobs and attracting investment [80].

##### **University of Limerick (UL)**

The Technology Transfer Office (TTO) is responsible for supporting and developing the university's innovative activity. The TTO's primary mission is the commercialization of the university's expertise for the benefit of UL and the wider community.

This is delivered through: promoting and supporting the initiation, growth and development of campus companies facilitating and strengthening research and partnering contacts with industry developing the university's intellectual property working with the development agencies to enhance the competitive position of existing industry in the mid-west, and to attract mobile investment to this region [81].

Services provided by UL's Technology Transfer Office include:

- Facilitating University-industry research collaborations.
- Supporting inward investment in the mid-west regions.
- Enabling knowledge transfer to industry and society.
- Commercializing University of Limerick Intellectual Property.
- Facilitating new campus company formation and development.
- Providing support for new high potential start-up businesses at the [Nexus Innovation Centre](#).
- Negotiating and drafting research agreements for industry engagement with UL.

##### **Munster Technological University (MTU) (121)**

###### **Technology Transfer**

The Research Office at IT Tralee manages the Institute's valuable intellectual property (IP) portfolio arising from its research activities and facilitates the technology transfer of potentially commercially

valuable IP into the hands of Industry. Our technology transfer activities are supported by the Technology Transfer Office (TTO) at University College Cork (UCC) via the Bridge Network Consortium the UCC led consortium ensures common technology transfer practices exist both regionally and nationally [82].

### **University Collage Cork**

[The Office of Technology Transfer \(OTT\)](#) plays an important role in developing a globally competitive knowledge economy in Ireland.

The OTT's role is to provide the necessary resources and services to bring research and commercial expertise together to address market needs whilst providing a return to the university to further advance its research mission.

The OTT was established in 2007 expanding upon the role played by the Industrial Liaison Office which operated in UCC for almost 25 years. The OTT manages the commercial opportunities arising from the research activities of the university. Successful licensing provides royalty income, which is shared between UCC, the inventor's department/center as well as the inventor [83].

### [Barrier for effective knowledge transfer](#)

Ireland has a fantastic educational base with some of the top-ranking Universities and educational institutes. However Irish businesses are not benefiting from the wealth of knowledge that the Educational institutes have at their disposal. As you can see above all the institutions have fantastic knowledge transfer facilities. These need to be utilised better for the benefit of all. Some of the barriers:

- Carrying out research that is of use to all parties.
- Worry or fear of engagement with institutions.
- Not knowing that the research carried out could benefit all parties.

### [Recommendations](#)

Capitalise on the opportunities that are available Academically and Commercially. Better channels of communication need to be explored to avail of the benefits. Vast amounts of time, money and effort is spent on generating knowledge the next step is to get it to the target audience.

- Promote initiatives that can benefit all parties.
- Promote participation in programmes and projects nationally and internationally.
- Support initiatives that promote business growth
- Create local incentives, and initiatives. There is a fantastic sense of community in rural areas and Atlantic Areas. This community involvement creates a great sense to succeed.
- Create synergies between companies and learning institutions to benefit all in the Blue Economy.

#### 8.4. IP for KT in Ireland

##### National and local level

What is Intellectual property? The Intellectual Property Office of Ireland states:

“Intellectual Property (IP) is the product of someone's mental efforts. Thus, an individual's creativity and innovation can be owned in much the same way that they can own physical property. National and International laws and conventions recognize the product of a person's mental efforts as an Intellectual Property right (IPR). ... it is often the case that more than one type of intellectual property right can be applied to the same creation” [84].

##### **Bord Iascaigh Mhara:**

The EMFF Knowledge Gateway Scheme funds not-for-profit research intended to generate knowledge for public good purposes and as such expects that outputs/findings should be widely disseminated and made publicly available. Where there is a reasonable potential for commercial exploitation of research outputs, BIM applies the principles of the document “Inspiring Partnership – the national IP Protocol 2016” to ensure that knowledge arising from its funded research is translated for public benefit [79].

##### **Enterprise Ireland Intellectual Property Strategy Offer:**

It follows the Enterprise Ireland Research Development and Innovation Strategy. It further supports companies to develop an IP strategy. “This offer seeks to assist companies to address common issues of (a) low IP awareness, (b) limited internal IP management capability and (c) the cost of obtaining external IP expertise. These capability and resource constraints are commonly reported by SMEs as key barriers to undertaking IP activity” [85].

##### **Ireland's National IP Protocol 2019**

Produced by Knowledge Transfer Ireland on behalf of the Department of Business, Enterprise and Innovation, the new Protocol includes a dedicated section on best practice in the formation of spin-out companies. It also includes a summary of the issues relating to state aid in the commercialization of research [86].

The National IP Protocol 2019 comprises two documents [86]:

1. The policy document which sets out the framework underpinning research collaboration and access to intellectual property from state-funded research.
2. The resource guide which provides an overview of the national IP management guidelines and links to a wealth of resources that support these guidelines. It also provides an overview of the knowledge transfer structures in Ireland and the kinds of agreements that can be used to formalize research-industry engagements. It also provides a suite of model agreements and guides relating to spin-out companies.

The Protocol remains a framework for best practice, guiding on what is the expected norm for research-related engagements between industry and research performing organizations [86].

### Barrier for effective knowledge transfer

- Understanding the value of intellectual Property. The mind-set that IP rights are individuals or private rights. This is not the case and individuals need to be protected from the exploitation of this.
- Understanding the law surrounding Intellectual property and the patenting laws. It is a very specialised area of expertise and as a result carries with it large expense.
- The time and cost associated with a patent.
- Wanting to develop and promote a patent in a wide scale international level.

### Recommendation

- Develop IP policies to promote the necessary technological advances of knowledge Transfer.
- Greater understanding of the law surrounding.
  - Intellectual Property.
  - Patents.
  - Company and individual rights.
  - Greater clarity from the outset of projects.

## 8.5 Conclusions and key findings for the Ireland

### From the Academic point of View:

The Universities and Institutions around our small country offer some wonderful opportunities. The chances to further careers and education, gain experience and knowledge that is of huge benefit to, businesses, Local Authorities, Health services and Governments. Collaboration amongst partner organisations drawing on the experience of the different regions, will build a consensus approach to identifying similar opportunities and how to manage common issues and find ways to overcome them.

The possibilities for progressing the Blue Economy in the Atlantic Areas are endless but as shown there are many conflicting interests at play. SME and industry start-ups are largely influenced by profits and turnover, which is understandable, this is needed to survive. Whereas students and educational institutions are largely based on studies, reporting, findings, and experience. However, a collaborative approach empowers us in agreeing a common approach to answer regional challenges in the fields of innovation, resource efficiency, environmental and cultural assets, while supporting regional and sustainable growth in the Blue Economy.

### From an Industrial point of View:

Academia and research are of a major benefit to industry. But many are unaware of the benefits that are available to them, for some of the following reasons:

- Lack of information about the opportunities available to them.
- Many of the opportunities on offer may not be focused on the company and business needs.
- Depending on the enterprise, could highlight the different methods of working and communicating and in turn make it difficult to open and maintain a working relationship.

- Not knowing the proper channels to explore and how to go about acquiring them.
- Location. Many of the institutes may be far from the business location. Perhaps having regional centres or options to use facilities nearby should be explored.

#### **From a government point of view.**

The government needs to be to the forefront of policy and decision making. It needs to invest in the blue economy and the Atlantic areas to halt the rural decline. Most employment opportunities are based in the cities and access to the higher paid jobs is a huge draw for many of the young college graduates. Incentives need to be put in place in collaboration with the Universities and Business to grow the Blue Economy, to incentivise start-ups and possibly decentralisation and promotion of the Atlantic Areas. The promotion of the Wild Atlantic Way revitalised the tourist industry along the West coast of Ireland. If the COVID 19 pandemic has thought us anything it is that further thinking like this is required to keep a sustainable rural economy where localities/regions are not totally dependent on single seasonable industries.

## 9. Megadata analysis for Portugal

According to the 2020 edition of the [European Innovation Scoreboard](#) Portugal was classified as a **Strong Innovator** country for the first time after 10 years classified as Moderate Innovator, in the [European innovation scoreboard 2020 - main report](#) . Portugal is positioned in the group of “strongly innovative” countries in the EU that includes Germany, France, Austria, Belgium, Ireland, and Estonia, occupying the 12th place. The favourable environment for innovation and attractive research systems are pointed out as the main factors for Portugal being now one of the frontline countries and one of those that moved up the table the most between 2012 and 2019. The importance of policies favourable to small and medium enterprises (SMEs), specifically those that encourage the protection of assets such as industrial property rights, has a direct impact on technological development and innovation.

The 2020 edition of the innovation scoreboard highlights that the EU's innovation performance continues to increase at a steady pace, with growing convergence between EU countries. On average, the innovation performance of the EU has increased by 8.9% since 2012. Performance increased in 24 EU countries since 2012, with the biggest increases in Lithuania, Malta, Latvia, Portugal, and Greece.

Portugal scores particularly well on SMEs innovating in-house, Broadband penetration, SMEs with product or process innovations, and Foreign doctorate students. Sales impacts, Linkages and Intellectual assets are the weakest innovation dimensions. Portugal's lowest indicator scores comprise Exports of knowledge-intensive services, R&D expenditures in the business sector, Private co-funding of public R&D expenditures, and Public-private co-publications.

Portugal shows the highest positive difference to the EU in Total Entrepreneurial Activity, FDI net inflows and Enterprise births, and the biggest negative difference in Top R&D spending enterprises, Employment shares high and medium high-tech manufacturing and GDP per capita.

## 9.1. Funding policies supporting KT in Portugal

### National context

In order to consolidate Portugal in the Europe of Knowledge, and in line with the recommendations resulting from the OECD evaluation process, the legal regime for R&D institutions has been updated and modernized. The **Decree-Law n.63/2019** establishes the legal regime for institutions dedicated to scientific research and development. The revision of this legal regime aims to:

- strengthen the institutional context, namely the scope, organization, diversification, and connection to the territory of the entities of the national science and technology system.
- the human capital, promoting its strengthening and qualification and striving for the existence of appropriate conditions for the development of scientific employment.
- social, cultural, institutional, and scientific responsibility associated with R&D activities and the promotion of scientific and technological culture.
- internationalization, including the absolute need to strengthen international scientific and technological cooperation, the participation of national R&D institutions in international organizations and advanced training of scientists in the Portuguese language; and
- the role of the State in the areas of evaluation and funding of the national scientific and technological system and the observation and recording of data on science and technology.

This Decree-Law also establishes a set of rules about scientific research and technological development (R&D) institutions. The national science and technology system is integrated by the entities, structures and networks dedicated to the production, dissemination, and transmission of knowledge, namely:

- R&D institutions: R&D units, State laboratories or Associated laboratories
- Collaborative laboratories
- Technological interface centres
- Science and technology infrastructures
- Science and Technology Networks and Consortia

The main entities that provide support in the areas of science and technology and technology transfer are:

- Fundação para a Ciência e a Tecnologia (FTC)
- Agência Nacional de Inovação (ANI)
- IAPMEI - Agência para a Competitividade e Inovação, I.P.

Thematic Programmes for Portugal in areas of Blue Growth:

- Mar 2020
- Fundo Azul

Other programmes

EEA grants – Blue Growth

### **Fundação para a Ciência e Tecnologia (FCT) [87]**

Fundação para a Ciência e a Tecnologia is the Portuguese public agency that supports science, technology, and innovation, in all scientific domains, under responsibility of the Ministry for Science, Technology and Higher Education. Founded in 1997, FCT succeeded the Junta Nacional de Investigação Científica e Tecnológica (JNICT). Since March 2012, FCT has coordinated public policies for the Information and Knowledge Society in Portugal, after the integration of the Knowledge Society Agency-UMIC. In October 2013, FCT took over the attributions and responsibilities of the Fundação para a Computação Científica Nacional (FCCN), [Foundation for National Scientific Computation].

FCT's mission is to continuously promote the advancement of knowledge in science and technology in Portugal, attain the highest international standards in quality and competitiveness, in all scientific and technological domains, and encourage its dissemination and contribution to society and to economic growth. FCT pursues its mission through the attribution, in competitive calls with peer review, of fellowships, studentships and research contracts for scientists, research projects, competitive research centres and state-of-the-art infrastructures. FCT ensures Portugal's participation in international scientific organisations, fosters the participation of the scientific community in international projects and promotes knowledge transfer between R&D centres and industry. Working closely with international organisations, FCT coordinates public policy for the Information and Knowledge Society in Portugal and ensures the development of national scientific computing resources. The results of FCT accomplishments are, in essence, the outcome of the work carried out by individual scientists, research groups and institutions that are funded by FCT.

### **Agência Nacional de Inovação (ANI) [88]**

The ANI - Agência Nacional de Inovação aims to develop actions to support technological and business innovation in Portugal, contributing to the consolidation of the National Innovation System (NIS) and to strengthening the competitiveness of the national economy in global markets.

ANI is responsible for pursuing the guidelines for a technological and business innovation strategy for Portugal, 2018-2030. ANI aims to stimulate private investment in research and development (R&D), promoting partnerships between science & technology system and business entities, and increasing international programme participation by the national science & technology system's companies and entities, specifically Higher Education Institutions and Interface Centres. This is all aimed at promoting their skills & competences, and the results of the innovation support policy.

ANI's aims to contribute to consolidate Portugal in the group of "strongly innovative" countries in the European Union. R&D and innovation are fundamental to the long-term development of societies. The approval of the technological and business innovation strategy for Portugal 2018-2030 (RCM 25/2018) shows the government's commitment to using innovation as the engine of the country's economic growth, stimulating higher levels of productivity, more qualified employment and promoting higher levels of quality of life in Portugal. The targets set in this strategy for private R&D investment (1.8% of GDP by 2020 and 3% by 2030, tended to be 2/3 supported by companies) and for the creation of



qualified employment (25,000 new jobs in science and technology companies, until 2030) are the challenges for which the ANI must be prepared, through an adequate and qualified internal organisation and the definition of ambitious and mobilising objectives in terms of action.

**IAPMEI - Agência para a Competitividade e Inovação, I.P. [89]**

IAPMEI - Agência para a Competitividade e Inovação, I.P. is a public agency responsible for promoting competitiveness and business growth, ensuring support to the design, implementation and evaluation of policies aimed at industrial activity, with a view to strengthening innovation, entrepreneurship, and business investment. IAPMEI's mission is to promote competitiveness and business growth, to ensure support to the design, implementation and evaluation of policies aimed at industrial activity, with a view to strengthening innovation, entrepreneurship and business investment in companies operating in the areas under the Ministry of Economy, namely small and medium-sized companies, with the exception of the tourism sector and the monitoring powers in this area attributed to the Directorate General of Economic Activities.

Aligned with national and EU public policies on entrepreneurship, innovation, and competitiveness of SMEs, IAPMEI promotes a wide range of programs, initiatives, and services to support this segment. IAPMEI's intervention in this area focuses on supporting entrepreneurship, fostering business innovation and innovation management, and promoting and monitoring the dynamics of collective efficiency, namely clusters, collaborative networks, and technology transfer.

**Mar 2020 [90]**

The European Commission (EC) formally approved the Operational Program MAR 2020 through the Implementing Decision of 30<sup>th</sup> of November 2015 approving the Operational Program "European Maritime Affairs and Fisheries Fund (EMAFF) - Operational Program of Portugal" to support the European Maritime Affairs and Fisheries Fund in Portugal. MAR 2020 aims to implement in Portugal as support measures within the framework of the European Maritime Affairs and Fisheries Fund (EMFF) and its Strategic Priorities are:

- Promote defence based on innovation and knowledge.
- Ensure the economic and environmental sustainability of the fisheries and aquaculture sector, contribute to the good environmental status of the marine environment, and promote the Integrated Maritime Policy.
- Contribute to the development of coastal areas, increase employment and territorial cohesion, as well as increase the capacity and qualification of professionals in the sector.

The new Operational Program includes new priority intervention areas, which were previously managed directly by the EC, such as the Data Collection Program, the Control and Surveillance of Fisheries Activity, a Common Organization of Markets for Fishery Products and Aquaculture, the Compensation Plan for the Outermost Regions and, under shared management, the Integrated Maritime Policy.

The MAR 2020 mission structure, in addition to its capabilities under the EMAFF will ensure adequate surveillance of the Program, ensuring control and monitoring of operations, preventing, and detecting

irregularities, promoting the reduction of intervention of deadlines, response and giving greater reliability to the results obtained.

### **Fundo Azul [91]**

Fundo Azul (FA) was created by Decree-Law no. 16/2016, of 9 March and is a financial incentive mechanism designed to:

- POWERING the development of the sea economy.
- SUPPORT scientific and technological research.
- ENCOURAGE the protection and monitoring of the marine environment.
- INCREASING maritime safety.

The strategic management of the FA is the responsibility of the members of the Government responsible for the areas of Finance and the Sea, and is carried out through guidelines, general or specific, in any area of intervention of the Fund, these guidelines being binding on performance within the framework of their Fund Management Regulation. The annual activity plan is the planning instrument for allocating the Fund's resources, which is prepared by the Management Board, in conjunction with the Advisory Board, and submitted for approval by the members of the Government responsible for the areas of Finance and the Sea. The annual activity plan, after approval, is published on this website, under the terms of paragraph 2 of article 12 of the Blue Fund Management Regulation, approved by Ordinance No. 344/2016, of 30 December.

### **EEA grants [92]**

Through the European Economic Area (EEA) Agreement, signed in the city of Oporto in May 1992, Iceland, Liechtenstein, and Norway are partners, in the internal market, of the Member States of the European Union.

As a way of promoting a continuous and balanced strengthening of the economic and trade relations, the parties of the European Economic Area Agreement have established a Multiannual Financial Mechanism, known as the EEA Grants, through which Iceland, Liechtenstein and Norway provide financial support to Member States of the European Union with the greatest deviations from the European average GDP per capita, which includes Portugal.

EEA Grants support to Portugal: Since the entry into force of the Agreement in 1994, Iceland, Liechtenstein, and Norway, as donor States, have contributed to Portugal's economic and social development.

### **Programme – Blue Growth**

The Blue Growth Programme's main objective is to increase value creation and sustainable growth in the Portuguese blue economy. In addition, the intention is to increase research and promote education and training in marine and maritime areas. The Programme will contribute to the overall objective of reducing economic and social disparities and strengthened bilateral relation through funding of different projects within five outcomes under the following three Programme areas:

- Business development, Innovation and SMEs.
- Research
- Education, Scholarships, Apprenticeships and Youth Entrepreneurships.

The five outcomes are:

- 1) Increased competitiveness for Portuguese enterprises within the focus area of Blue Growth.
- 2) Resource efficiency of enterprises in marine sector supported.
- 3) Enhanced performance of Portuguese research organisations.
- 4) Education, training, and cooperation in marine and maritime issues enhanced and:
- 5) Enhanced collaboration between the beneficiary and the donor states involved in the programme.

The synergy between the business, research and education and a holistic approach in the programme will contribute to a sustainable Blue Growth in Portugal. The research will support businesses with a research, development, and innovation component, strengthening their competitiveness in the market. The education component will promote the improvement of human resources skills and awareness in marine and maritime issues.

This Programme aims at increased value creation and sustainable growth, including long-term marine and maritime economic growth, social cohesion (in terms of local communities and maritime activities), and marine environmental protection. The Programme will contribute to the overall objectives of the EEA Grants by financing initiatives to increase competitiveness and profitability among Portuguese SMEs and bring more innovation in their products, services, and processes. Also, the programme will strengthen the cooperation between donor and beneficiary countries, through joint projects and ventures.

### **Thematic agendas for research and innovation**

Following the spirit of the Council of Ministers Resolution no. 32/2016 of 3 June FCT ensures the elaboration of fifteen Thematic Agendas for R&I.

The Thematic Agendas for Research and Innovation aim to mobilize experts from R&D institutions and companies to identify challenges and opportunities in the national scientific and technological system, particularly in the medium and long term. It is expected that the agendas may also contribute to the development of research and innovation contributing to address problems or needs of different sectors of society.

The inclusive and dynamic process of developing the agendas, involving experts from academia, research centres, companies, public entities, and citizens, in a framework of dialogue between different national actors, allows specifying the areas that are emerging and promising for Portuguese Research and Innovation, in a medium- and long-term perspective, until 2030.

### **Thematic Agendas**

- Agri-Food, Forests and Biodiversity
- Climate Change

- Portuguese Architecture
- Urban Science and Cities for the Future
- Culture and Cultural Heritage
- Circular Economy
- Space and Earth Observation
- Social Inclusion and Citizenship
- Industry and Manufacturing
- **Sea**
- Health, Clinical and Translational Research
- Cyber-Physical Systems and Advanced Forms of Computing and Communication
- Sustainable Energy Systems
- Labour, Robotization and Employment Qualification
- Tourism, Leisure and Hospitality

The SEA R&I Agenda aims to promote research and development in the areas of Marine Sciences and Technologies, considering the strengths of the national scientific and technological community, the conditions and challenges that differentiate Portugal's position in the Atlantic.

The agenda is developed based on four dimensions of reflection to reach the challenges and lines of research and innovation relevant to the country in a medium- and long-term perspective (2030):

- Integrated ocean knowledge.
- Marine resources.
- Global change and natural and anthropogenic risks.
- Oceans and society.

### Barriers for effective KT

- Lack of funding and human resources mechanisms to enable Academia to develop the data package it needs to make technology attractive to Industry and private investment.
- Lack of mechanisms to maintain IP records made by the Academy and which are necessary to maintain until industry interest.
- Ignorance of IP and its management, as well as legal procedures, both by Industry and administration when setting up financing mechanisms.
- Lack of career incentives for researchers to collaborate with industry - based on numerical indicators rather than marketable products and solutions.
- Lack of more and adequate funding for networks.
- The process of obtaining funding is very time consuming - investing in projects – two phase process.

## Recommendations

- Funding from the government/Europe for concrete objectives in technology transfer.
- Innovation and investment policies that ultimately lead to Industry collaborating with Academia.
- Simplification of financing processes and funding for riskier projects.
- Voucher funding for start-ups to use scale-up, for example market acceptance vouchers.
- Allocation of innovation funds to all regions in Portugal – strategy seems to be confusing and untargeted – both regionally and nationally.
- Ocean illiteracy from the policy makers.
- Funding should be provided for research merit and not region wise.

## 9.2. Skills for KT in Portugal

### National context

The human element is a crucial factor to unlock the Blue Growth potential. Furthermore, human capital constitutes an overarching condition to achieve the region's economic, knowledge and technology priorities, in terms of research and innovation.

The available funding supporting skills in KT are the following:

1. PhD scholarships under FCT
2. Open calls for Scientific Employment Stimulus

Advanced Training has a pivotal importance for a National Science and Technology System of excellence with renewed critical mass, rejuvenated and creative. FCT supports advanced training through the awarding, funding, and management of different research grants. Pursuing the aforementioned purpose, FCT annually launches public tenders for the award of research grants for doctoral degrees in all scientific domains, with high levels of competitiveness and the participation of evaluation panels of recognized scientific merit. To address the societal challenges in priority scientific areas, FCT celebrates program contracts and protocols to support advanced training with institutions that foster or directly dedicate to scientific research and technological development [93].

FCT has other instruments that support institutions that want to hire new researchers and for the development of scientific employment plans and scientific careers by public or private institutions.

Furthermore, there are several programmes and initiatives which aim to support different sectors within blue economy. This is the case of Bluetech Accelerator. Bluetech is an accelerator program designed for start-ups working on solutions in the areas of shipping, ports and digital. The program is powered by the Portuguese Republic Ministry of the Sea and will allow for the start-ups to showcase their solutions in major events like the European Maritime Day and to work alongside with world class partners.

Bluetech Accelerator is taking applications from start-ups with a product working prototype or MVP, in product testing phase and with established working teams. The selection will be made by the Beta-i team and experts of all Partners of the Bluetech Accelerator. Bluetech Accelerator will take place in Lisbon, Portugal.

## Barriers for effective KT

Uncertainty, errors and risk of loss of know-how and experience are among the biggest challenges. Within the Portuguese ecosystem, the main barrier for an effective KT is the lack of stable and permanent contracts for post PhD researchers.

In this context, it is not reasonable to keep people whose work the institutions themselves have successively valued in precarious situations indefinitely. And it is not reasonable to say that this process is against university autonomy, since it was the academy that chose the scholarship holders and precarious researchers and has benefited from their work for years on end. On the other hand, the position of the leaders of the institutions that they do not want to commit themselves to paying the future salaries of these grant holders if they take on permanent jobs, without previously guaranteeing the necessary resources to meet these commitments, seems straightforward. Therefore, it is important that the government not only expresses its intention to regularise the precarious workers, but that it accompanies these intentions with the necessary resources for their fulfilment.

Furthermore, there are also other issues to consider, for example, the need for rejuvenation in many universities, as the restrictions on hiring in the last two decades have created an ageing faculty in many institutions. This would advise a policy of hiring new assistants to be trained and to be the teachers of the future. But this process takes time, which in some cases does not exist. In other words, it is necessary to think about the transition, to which the scholarship holders, if integrated, can make a positive contribution.

## Recommendations

Following the aforementioned purpose, a possible solution would be the government providing research institutions with the resources they need. Thus, the problem of precarious grant holders and researchers could be resolved in a socially just manner and in the interest of the country and the institutions, without violating the basic principle of career entry and promotion through merit. It should also be stressed that it is important not to repeat the mistakes of the past, so that in the future Portugal would not have a problem of precarious workers in research.

It is necessary to define the rules so that grant holders or researchers with doctorates know where they stand and not allow situations to go on forever, as happened with many of the current precarious workers.

### 9.3. Key stakeholders acting as interface for KT in Portugal

#### National context

The **INTERFACE Programme** [94] aims to add value to Portuguese products through innovation, increased productivity, value creation and the incorporation of technology in the production processes of national companies. INTERFACE accelerates technology transfer from universities to companies, boosting product certification, increasing the competitiveness of the Portuguese economy and of companies in national and international markets.

The **XXI Constitutional Government's Programme** and the **National Reform Programme** highlight the promotion of innovation in the Portuguese economy as a fundamental instrument to increase company competitiveness. The main initiatives of the INTERFACE Programme:

- Support for Technology Interface Centres (TICs)
- Competitiveness Clusters
- Collaborative Laboratories
- Suppliers Club

The **Interface Centres (CIT)** [95] are entities that connect higher education institutions and enterprises, which are dedicated to the valorisation of products and services and technology transfer. This initiative aims to empower CITs and companies, especially SMEs, in R&D and innovation activities, enhancing the connection of entities in the innovation system and facilitating the access of these entities to highly qualified human resources, promoting scientific and qualified employment, and increasing access to knowledge.

The Interface Centres have been playing an important role in the articulation between institutions of the scientific system and companies in various areas, including certification processes, quality improvement, efficiency improvements in production, support for innovation activities, access to technologies under development and training of human resources.

The INTERFACE Programme pays special attention to the capacity building of Interface Centres, fundamental entities of the national innovation system and agents of valorisation of scientific and technological knowledge, enhancing its transfer to companies.

**ANI** [88] is responsible for the recognition process of the Interface Centres. Today, there are **31 entities recognised as Interface Centres**: AEMITEQ, AIBILI, CATIM, CCG/ZGDV, CEIIA, CENTIMFE, CeNTitvc, CITEVE, COTHN, COTR, CTCOR, CTCV, CTIC, CVR, IBET, INEGI, INESC TEC, INL, INOV INESC Inovação, IPN, ISQ, IT, ITeCons, PIEP, RAIZ, UNINOVA, WavEC Offshore Renewables, IEP, INESC-MN and BLC3.

## ASSOCIATIONS

**WavEC Offshore Renewables** [96] was founded in 2003 - under the name Wave Energy Centre - as a private non-profit association aiming to develop wave energy and support companies and research centres in the area, through technical and political strategies. In 2013 WavEC changed its name to WavEC Offshore Renewables due to the extension of activities into offshore wind and prospect of expansion to other fields. WavEC defined as its mission to develop offshore renewable energy through the creation and transfer of knowledge, innovation, and dissemination. More recently WavEC extending the scope of activities to offshore aquaculture and ocean engineering projects.

## CLUSTERS

The portuguese sea cluster **Cluster do Mar Português** [97] aims to strengthen the dynamics of strategic cooperation between actors such as companies, RTD centres, Public Administration bodies and other associations and to promote the competitiveness of the main value chains that use the Sea and the marine resources as central elements of their activity, in order to contribute, in a sustainable

way, to economic growth, exports and employment, and to increase the relative importance of the Economy of the Sea in the national economy.

The Cluster do Mar Português is managed by **Fórum Oceano - Associação da Economia do Mar** [98]. Fórum Oceano is a private non-profit corporate body, which aims to promote the Blue Economy. The Association has more than 100 members covering different sectors of activity of Blue Economy, such as the more traditional ones:

- Seafood Conservation, Processing and Commercialization
- Shipbuilding, Ship repair and maintenance
- Nautical activities and Marine Tourism
- Maritime construction
- Fisheries and Aquaculture
- Ports, Transport and Logistics

The complementary areas are:

- Maritime Culture
- Maritime Defence and Security
- Services

And the emerging sectors are:

- Marine Bioresources and Biotechnology
- Marine Renewable Energy
- Offshore and Oil & Gas

### **COLLABORATIVE LABORATORIES (CoLAB)**

In recent years, the process to stimulate diversification and institutional innovation was launched by introducing the concept of "**Collaborative Laboratory**". Under the Interface Programme the **Collaborative Laboratories (CoLAB)** [99] was created. The main goal of CoLABs is to create skilled employment and scientific employment directly and indirectly in Portugal through the implementation of research and innovation agendas aimed at creating economic and social value.

The programme has been implemented through the competitive selection after evaluation by international experts, of research and innovation agendas oriented towards the creation of economic and social value, including processes of internationalisation of national scientific and technological capacity, in relevant intervention areas and the implementation of R&D activities that enhance the strengthening of synergies with scientific and higher education institutions, namely within the scope of specialised, professional or advanced training programmes in close collaboration.

The **Collaborative Laboratories** should consolidate and promote the capacity and potential that the scientific, academic, and business communities present to face the opportunity to relate knowledge with well-being and social and economic development in Portugal. It is the opportunity for scientific and academic institutions, in close collaboration with economic, social, and cultural actors, to contribute to the construction of projects of international relevance, with an effective impact on society, stimulating the creation of qualified jobs in Portugal.



It is also intended that the Collaborative Laboratories reinforce the current structure of technological interface centres and other intermediary institutions in Portugal, diversifying and complementing the existing structure and the action of the R&D units and Associated Laboratories, aiming to stimulate the active participation of the scientific and academic system to understand and solve complex and large-scale problems, which generally cannot be solved within the scope of a single disciplinary, scientific, technological or institutional component. They imply the coordination of different scales and an entrepreneurial, social, and cultural intervention aiming at the implementation of effective solutions with socioeconomic impact. The Collaborative Laboratories thus have a complementary and supplementary action to that of the R&D units, including Associated Laboratories.

ANI is the entity that will monitor the implementation of the research and innovation agenda of all CoLABs, in accordance with the approved applications that sustained the awarding of the Collaborative Laboratory titles.

The most relevant CoLABs to the **Blue Economy** sector are the following:

#### **Blue Bioeconomy Lab [100]**

The Blue Bioeconomy Collaborative Laboratory (B2E CoLAB) is a private non-profit association operating full speed since 2020, focused on helping to shape a new blue bioeconomy, by bringing together research, education, innovation, and business – for a better and more sustainable world. The creation of CoLABs was an initiative of the Ministry of Science, Technology and Higher Education with the aim of implementing research and innovation agendas, creating economic and social value. Collaborative Laboratories are recognized by FCT and the monitoring process is conducted by ANI, the National Innovation.

#### **CoLAB+ Atlantic (<https://colabatlantic.com/>)**

The Atlantic plays a key role in the strategy to face major societal challenges: Climate Change, Environmental Sustainability, and Energy and Food availability. +ATLANTIC aims at advancing knowledge on the interactions between the Ocean, Atmosphere, Climate and Energy in the Atlantic, through an integrated and holistic approach from deep sea to space. By developing a better understanding of the Atlantic system, we prepare for the sustainable use of its resources and create a framework to unleash its potential for Society, promoting blue growth and highly qualified employment.

#### **CoLAB BIOREF [101]**

BIOREF - Collaborative Laboratory (CoLAB) for the Biorefineries - is a private, non-profit, association that will deploy highly qualified knowledge and innovation to the market, identifying industrial needs in biorefining technologies and promoting the bioeconomy and bioenergy. CoLAB BIOREF's core research & innovation (R&I) practices target the development of a variety of technological activities considered essential to promote the deployment of advanced biorefineries, to improve the competitiveness of the biorefinery sector, and to contribute to a low carbon economy. These activities aim at generating new value chains, job creation and boosting the bioeconomy through an integrated biorefinery approach thus supporting our founding private members and any other European public or private entities that contract us as a high-tech service provider.

#### **GreenCoLab [102]**

GreenCoLab is a non-profit private organization, a collaborative platform between research and industry, whose research & innovation agenda is based on the exploration of micro- and macroalgae as an essential component for the food, feed, nutraceutical, bioenergy, wastewater, and cosmetic industries. GreenCoLab aims to be a catalyst for sustainability and good economic performance by congregating the agendas of both research and industry stakeholders and boosting innovation and economic diversification in the broad field of algal biotechnology.

### Barriers for effective knowledge transfer

- Low collaborative culture.
- Decision and definition of what type of collaboration to establish – contract research, licensing, spin-off.
- Lack of proactivity and ecosystem knowledge to know where to look.
- Lack of efforts to disseminate research findings.
- Lack of knowledge of the work other parties are doing.
- Lack of commitment or dialogue towards problem solving.
- Missing actors who can take research to a level where Industry can adapt research – e.g., spin-offs.
- Difficulty in obtaining market information and market opportunities.

### Recommendations

- Creation of evaluation departments of the technology.
- Existence of facilitators, events and mobilizing projects.
- Tendency of entrepreneurship mindset taking place in Academia.
- Willingness to create synergies between Academia and Industry – specific and tailormade mapping is needed.
- Professionalisation of TT professionals to foster collaborations.
- Focused platforms for direct connections.

## 9.4. IP for KT in Portugal

### National context

In Portugal context, Agência Nacional para a Inovação (ANI) coordinated two main studies related to Knowledge transfer and both studies reveal that the scientific infrastructures are robust, however, point out the need for a greater economic valorisation of knowledge generated by the scientific community that culminates in new companies, innovative products and services [103].

Portugal is above the European average in the number of scientific publications co-authored outside the European space, in the number of international students in PhDs, in the registration of community brands, in employment in companies with high growth in innovative sectors, among other indicators monitored by European Innovation scoreboard.

This is what the study “Analysis of the Activity of Knowledge Transfer Offices and Infrastructures in the 2017-18 Period” reveals, which maps and surveys information on activity indicators of these key players for the connection between academia and companies. This conclusion is based on the consultation of close to 100 national entities. A survey was carried out with more than 100 entities

that make the connection between higher education and the national economic fabric reveals that, although in 2018, more than 500 patents were registered, revenues in intellectual property still have a huge potential for growth.

The survey carried out on the Knowledge Transfer Offices and Infrastructures (GITC) shows that the maturity of the national scientific and technological system in terms of valuing knowledge still has a great margin of progress and that there are still few institutions that integrate it that present good results. dynamics in the transfer and valorisation of knowledge and in the incubation of ideas and businesses.

Even so, there are already a significant number of higher education institutions, research centres and research units with their knowledge valorisation offices (TTO), therefore, the conditions for this progression are met.

The creation of academic spin-offs is, for now, an uncommon result in auscultated GITCs, with only three being created in 2017 and 2018. In turn, there is a much more intense dynamic in the creation of technological start-ups.

The study also showed that, despite the GITC's human resources staff being highly qualified (doctorate rate is 25%), there are still few employees trained in management and finance who are part of it. On the other hand, more than 40% of people do not have any business experience, which makes dialogue and constant relationship with the business fabric difficult.

In addition, the financing model for these TTOs is still very dependent on public support (around 40%) since revenues from intellectual property are still low (even though more than 500 patents were registered in 2018).

The analysis carried out in the second study on academic-based national spin-offs and start-ups estimates that the number of companies of this nature is 380, of which 104 were surveyed in the scope of this study. Ten of these spin-offs were the subject of case studies that deepened the genesis of the business and the entire process of creating and developing the company.

The concentration in the ICT sector is more significant in the group of technological start-ups (50% vs 33% in academic spin-offs), while the weight of academic spin-offs is higher in the health and life sciences sectors (10% vs 5 % in technological start-ups) and biotechnology (10% vs 2%).

Most of the companies analysed are in the stages of scale-up and growth and consolidation, showing a strong capacity for innovation. A quarter of academic spin-offs claimed to have introduced radical innovations (in addition to the state of the art internationally) and 17% of technological start-ups also reached this level. The profile of the founder of these companies is that of highly qualified people, with an average age of 36 years, but not always with strong business experience, especially in the case of academic spin-offs. Despite the higher level of qualifications of the founders of academic spin-offs (doctorate rate around 50%), the founders of technological start-ups end up better balancing the academic experience with the business experience.

The main motivating factor for the creation of these companies is the "identification of a market opportunity" (76%), followed by the "application of personal skills of the entrepreneurs / founders" (57%), the "prospect of future economic gains" (54 %) and "interest in spreading the technology and seeing it applied in practice" (50%).

Respondent companies indicated the financing of the business as the main handicap, both in terms of the financial availability of the entrepreneurs and in obtaining financing in the market. The source of financing most frequently used by companies is the equity of entrepreneurs (especially in technological start-ups), followed by the financial incentives available to R&D and entrepreneurship (51%).

Some of the difficulties identified in the first study can be overcome through the creation of a basic financing mechanism for the GITC for the creation of interface teams “higher education institutions - companies” and knowledge transfer activities, dedicated to the evaluation of potential economic impact of R&D results in the GITC, but also the creation of a national GITC network or the promotion of collaborative entities to increase the average dimension and create critical skills for greater dynamics of knowledge transfer and valorisation.

On the other hand, the creation of public mechanisms to stimulate GITCs must be accompanied by greater accountability and results orientation, supported by a mandatory mechanism for the provision of information and accounts by national GITCs regarding the transfer and valorisation of knowledge, analysis and dissemination of results would oversee an Observatory on the Reality of Valorisation and Use of Knowledge in the National Scientific and Technological System.

Finally, it is considered that the development of the risk finance market is fundamental to foster the creation of spin-offs and start-ups and to allow their development and to scale the pioneering businesses at an international level.

### Barriers for effective KT

According to the studies in Portugal related to the IP for the knowledge valorisation there are some bottlenecks as follows:

- creation of a basic financing mechanism for the GITC.
- creation on specific mechanisms to leverage the value of IP the new ones and existing ones (patent maintenance).
- creation of the funding for the proof of concept to leverage the IP generated on the universities and R&D organisations.
- inability of start-ups, spin-offs and small-medium companies (SME) as well as academic entities to protect their intellectual assets due to the high costs of their protection and maintenance.
- strengthen capacity at national level to define the route for the protection of IP as well as the market.

### Recommendations

According to the latest studies in Portugal, it is crucial to continue to enhance and maintain the appreciation of knowledge, especially that supported by intellectual property:

- To create a long-term mechanism to leverage the IP generated either in companies (and SMEs) and generated in research entities.
- Reinforce the IP policies for the knowledge valorisation at national level.
- To create mechanisms to help in the IP strategy and route for the commercialisation.

- To reinforce the last Funding programmes at national level for knowledge valorisation with the objective of sustaining what was created until today and to consolidate the mechanisms created for the industry - university relationship. To have a long-term pathway to consolidate the relation between industry and academia (it is not possible under 7 years as the funding programmes). Despite the previous investments it is still needed to keep this trend in the further national funding programmes.
- Encourage research and scientific institutions to intensify cooperation and exchange with public authorities and industry.
- Enhanced capacity of IP professionals at academic institutions and suitable mechanisms to reinforce these structures.
- Extend the disclosure of IP protection system means to all actors interested in the valorisation of knowledge, explaining from the process, costs, capital gains, difficulties, etc.
- Supporting the creation of technology-based spinoffs and start-ups and helping in seeking the capital and investments.

### 9.5. Conclusions and key findings for Portugal

Universities, as producers of knowledge, have adopted in the last decades a third mission to promote socio-economic development. Encompassing a set of activities that give relevance to knowledge transfer as a process of dissemination, sharing, exchange and commercialisation of knowledge, this mission includes but is not limited to the strict vision centred on patenting and creating spin-offs.

One of the Portuguese strategic priorities is qualifying Research and Innovation infrastructures, i.e., technology centres, technology transfer centres, new technology institutes, science, and technology parks, as well as technology-based company incubators, with the final objective of promoting an action that is increasingly close and oriented towards the effective needs of the Portuguese business ecosystem.

Studies coordinated by ANI reveal that the infrastructures of the Science and Technological System in Portugal are robust, however, they lack the need of a larger knowledge economic valuation, resulting in new companies, products, and innovative services. According to the European Innovation Scoreboard, Portugal is above the EU average in terms of number of scientific publications in co-authority and in the number of international students enrolled in PhD, among others. It seems that the issue is not the lack of production of knowledge, but its appropriate transfer to the market. It is necessary to communicate better with the companies, and one of the ways for this communication to exist is for the companies themselves to intervene in the process. Portugal has improved its performance a lot.

Furthermore, and aligned with the premise, enabling more stable and long-lasting work contracts with researchers, would heavily increase the commitment and motivation levels. This would ultimately potentially result in higher achievements and recognition of the national research as one of the best in Europe.

In this context, along with aiming to tackle this issue, it is necessary that the government, academia, and industry (which should integrate an increasing number of doctorate holders, to promote innovation and improve competitiveness) work towards a mindset of rethinking the funding of research and the employment of doctorate holders in industry and, in some respects, adopt more

sustainable models and practices than those of recent years. In other words, it is necessary to think about the future of research and researchers, in academia and industry, in the short, medium, and long term. Solving the problem of current precarious conditions in research can and should be the result of a comprehensive reflection and not of more one-off measures that essentially postpone problems without solving them in a lasting way.

## 10. Megadata analysis for United Kingdom

According to the Briefing Paper on the “Research & Development spending” from the House of Commons released on June 2020 [104], in 2018 the total expenditure on R&D was £37.1 billion, that is equivalent to £558 per head, or 1.7% of GDP. R&D investment has risen steadily over the past few decades, from £18.5 billion in 1981 to the current total of £37.1 billion (in 2018 prices). This is a real term increase of 101%. But as a proportion of GDP, R&D expenditure has fallen over this period (it was the equivalent of 2.0% of GDP in 1981).

The UK government's Industrial Strategy includes a target to raise the total R&D investment to reach 2.4% of GDP by 2027 [105].

The **business sector** performed R&D worth £25.0 billion in 2017, 68% of the total, while the **public sector** (including research councils and devolved higher education) performed £11.2 billion of R&D, 30% of the total [104].

### **Business/enterprise sector**

The business/enterprise sector performed £25.0 billion of R&D in 2018:

- £19.8 billion of this was funded by the business/enterprise sector.
- £6.0 billion was funded by overseas sources.
- £1.2 billion was funded by the government.

### **Public sector**

The total public sector performed £11.2 billion of R&D in 2018:

- Excluding research and higher education funding councils, the government funded £3.1 billion of R&D, where it is included funds performed by the government itself and by the business/enterprise sector.

*Adapted from House of Commons Library, 2020*

The most representative sectors, who most invest in R&D are the pharmaceutical industry and the automotive manufacturing industry.

- Pharmaceutical industry performed the most R&D in the UK – worth £4.5 billion.
- Automotive manufacturing industry performed the second most R&D - worth £3.8 billion.

When comparing with data from other countries, according to the [OECD](#) [16], the UK's R&D expenditure is 1.7% of GDP, below the OECD average of 2.4%.

### 10.1. Funding policies supporting KT in the UK

Knowledge Transfer (KT) encompass multiple activities to support mutually beneficial collaborations between Academia, Industry, and the Government. It aims to transfer intellectual property, expertise and skills between academia and the non-academic community. According to European Commission report on Open Innovation and KT in EU evidence suggests there is still some gaps on KT due to significant differences between European countries, reflected also in the professionalism of their Knowledge Transfer Office (KTO) functions [106].

Difficulties accessing long-term finance have been a persistent barrier to commercialising the UK's scientific and technological breakthroughs. A handful of UK universities have been at the forefront of developing the 'patient capital' model to address this funding gap [107].

In the Blue Economy, as an example, marine and maritime research plays an important role for understanding the seas and creating technology and management techniques for their sustainable use. However, the results are not always successfully transferred or fully exploited. It is important to improve and create new methodologies for knowledge capture and transfer focusing on creating impact from existing research and transforming how the marine and maritime community interacted and collaborated for mutual benefit.

#### National context

##### UKRI - United Kingdom Research and Innovation

UKRI is an integrated body that works in partnership with universities, research organisations, businesses, charities, and government to flourish research and innovation. It is an upstream mechanism that funds research and innovation in the UK, being critical on knowledge transfer and value creation. Since 20108, UKRI has integrated academia and industry, including the 7 thematic Research Councils, Research England, and Innovate UK.

UKRI supports projects from academia, by funding universities, non-profit distributing Research & Technology Organisation (including Catapults), Public Sector Research Establishments and Research Council Institutes.

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>- UKRI objectives are foster research and innovation providing sustained funding and resources.</li> <li>- Large scope and long-term support to tackle difficult and novel challenges.</li> <li>- It benefits multidisciplinary research, through transparent and open competitions.</li> <li>- For business funding applications it has into consideration the added value (e.g., novelty and levels of risks beyond the normal activity of the business).</li> <li>- Universities perceive UKRI as mechanism to encourages engagement outside of academia, such as with the community.</li> </ul>	<ul style="list-style-type: none"> <li>- Identify the issues which can accelerate the speed of change to create a sense of what success looks like, focusing on outputs rather than inputs.</li> <li>- Improve alignment between academia and industry to improve access to capital, leveraging strong capabilities into a stronger ecosystem.</li> <li>- A principal metric from the academic research is paper public publications and citations. The pressure to publish disincentivise UK researchers to develop aligned with the requisites from industry. Industry avoids disclosing market-sensitive information.</li> <li>- Increase the success rate on knowledge transfer by understanding what the best practices are but also what can be critical steps with high chances of failure (i.e., by decreasing outputs failure rates).</li> </ul>



## Innovate UK

Innovate UK is the United Kingdom's innovation agency. It is a non-departmental public body operating at arm's length from the Government as part of the United Kingdom Research and Innovation organisation.

Knowledge Transfer Partnerships is a UK-wide programme that has been helping businesses to improve their competitiveness and productivity through the better use of knowledge, technology and skills that reside within the UK Knowledge Base by Knowledge Transfer Network (KTN).

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>- Sufficient funding from Innovate UK.</li> <li>- Funding support from Innovate UK can be fundamental to mitigate projects' risks.</li> <li>- Knowledge Transfer Network - links new ideas and opportunities with expertise, markets, and finance through our network of businesses, universities, funders, and investors.</li> </ul>	<ul style="list-style-type: none"> <li>- A KTP is part-funded by a grant and with fixed cost. Business must contribute to the salary of the Associate who will work with your business, plus the cost of a supervisor who will oversee the scheme.</li> <li>- Innovate UK timeline usually is not aligned with market timings (e.g., open calls and grant decisions). When there is an imminent market opportunity, to have the financial support from Innovate UK, it is needed to wait for the opening calls for certain thematic.</li> <li>- Highly demanding in terms of bureaucracy and paperwork – it demands time from the team to comply with paperwork.</li> </ul>

## The Catapult Network

Catapult centres are organisations set up from 2011 by Innovate UK to promote research and development through business-led collaboration between scientists and engineers to exploit market opportunities. They receive grants from public funds but are also expected to seek commercial funding. The Catapult centres are a network of world-leading technology centres designed to transform the UK's capability for innovation in specific areas and help drive future economic growth.

Catapults are collectively developing ambitious programmes aimed at growing vital sectors and markets for the national economy, nurturing talent, delivering job creation, and economic and societal prosperity within the regions and throughout the nation.



The vision of the Catapult Network not only supports individual business, local and regional growth but will also address major national and global challenges.

Catapults are physical centres with cutting-edge R&D infrastructures including hubs, laboratories, testbeds, factories, and offices as well as technical experts that prove and adopt breakthrough products, processes, services, and technologies.

Catapults work with innovative businesses across a wide range of sectors such as: manufacturing, space, health, digital, energy, transport, telecoms, the urban environment, and many others. The current thematic Catapults are the following:

- Offshore Renewable Energy
- Energy Systems
- Medicines Discovery
- Cell and Gene Therapy
- Connected Places
- Compound Semiconductor Applications
- Digital
- High Value Manufacturing
- Satellite Applications

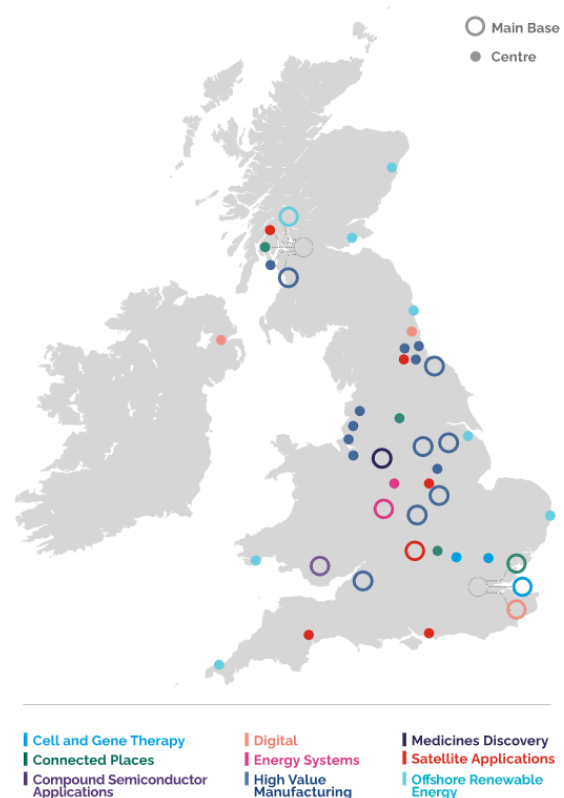


Figure 3 - The UK Catapult Network

The very best of the UK's businesses, scientists, technical specialists, and engineers work side by side on late-stage research and development, helping industry get high potential ideas to market, fuelling business growth and increasing productivity.

By bridging the gap between research and industry, the Catapult Network is helping tackle the biggest challenges that society and industries face today. Through their knowledge, infrastructure, and collaborations,

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>- Independent physical centres for connecting businesses, for providing regional studies.</li> <li>- Each Catapult is focused on a specific area of technology and expertise for turning commercial ideas into reality</li> <li>- Network</li> <li>- Impactful initiative, especially for high-risk and investment intensive technological areas.</li> <li>- Ideal for areas with few market players that benefit collaborating alongside.</li> </ul>	<ul style="list-style-type: none"> <li>- Relatively limited R&amp;D resources as the project is based on commercial ideas.</li> <li>- For areas with many competitors already in the market it might not bring much value. The presence of many competitors in the same place exposes competitors.</li> <li>- Lack of commercial outputs</li> <li>- The end of national endowment has restricted the financial sustainability of certain Catapults. Some Catapults had been merged to continue operating.</li> </ul>

## KTP - Knowledge Transfer Partnership

The KTP programme aims to help UK businesses to improve their competitiveness and productivity through the better use of knowledge, technology and skills that reside within the UK Knowledge Base i.e., higher education institutions, colleges, or research organisations. The programme originated some 40 years ago and has since become well embedded within the UK's knowledge transfer and business support infrastructure. Innovate UK is the lead funding organisation for KTP, in partnership with the Research Councils, the Devolved Administrations, Department of Health, Department for Environment, Food and Rural Affairs as well as the Nuclear Decommissioning Authority and RSSB (formerly known as the Rail Safety and Standards Board), both of whom have been one off funders of calls for KTPs on specific themes.

An independent review of the Knowledge Transfer Partnership and an assessment of its impact on the UK economy and other benefits reveals [108]:

- Every **£1 of KTP grant invested** results in **up to £8** of net extra gross value added.
- 94% of associates (i.e., recently qualified graduate who works at the company) said KTP had had a positive impact on their personal/career development.
- Over a third said the impact has been transformational for their development and career.
- 99% of knowledge base organisations would recommend the KTP programme.
- 95% of KTP associates would recommend it to other graduates / postgraduates.

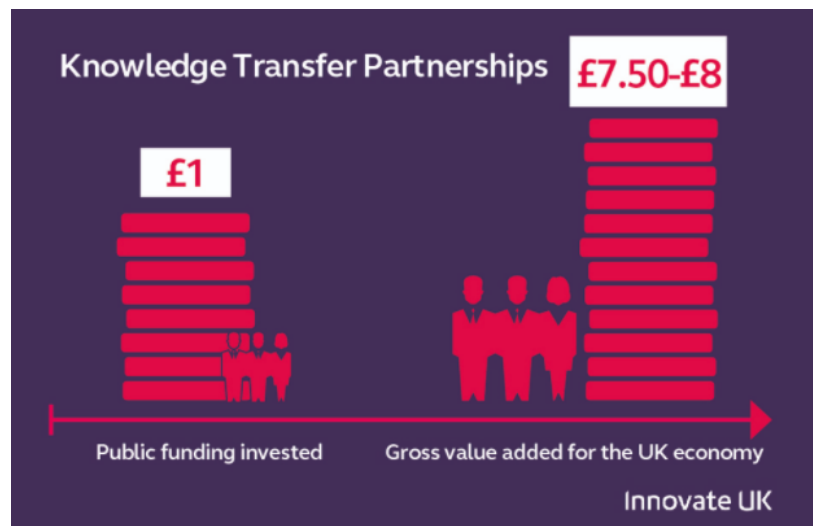


Figure 4 – Knowledge Transfer Partnerships in the UK [108]

As described in EMPORIA4KT's National Bootcamp UK report, the **UK Research Councils** and **Catapults** collaborating with Government Science Office and different governmental departments and authorities (e.g., Department for Transport), encourage the unknown to the established. Examples of actions that encourage science and industry to collaborate include:

1. Researcher in Residence programme allowing the researchers to work with Catapults and industrial partners on the selected topics which deems important for TH players.

2. Business Fellowship programme in which the heads of research offices from the UK universities are invited to work with Catapults centres to address the industrial and governmental research needs by using their university research strengths in an individual or a collaborative way.
3. Research councils and Catapults industrial case PhD programme.
4. Research network events by research councils and Catapults including research café by catapults and research roadshows by research councils.

## Sectors strategy

### **“The Grand Challenges” - Supporting the strategic long-term key sectors.**

On the Industry Strategy white paper, released in 2017, are established long-term **Grand Challenges** that UK will identify, support and fund [105]. Scientific leaders of the Government Office for Science, UK Research, and Innovation (the Research Councils and Innovate UK), the Council for Science and Technology and the National Academies, have identified four Grand Challenges:

1. AI & Data-Driven Economy - Put the UK at the forefront of the artificial intelligence and data revolution.
2. Clean Growth - Maximise the advantages for UK industry from the global shift to clean growth.
3. Future of Mobility - Become a world leader in shaping the future of mobility.
4. Ageing Society - Harness the power of innovation to help meet the needs of an ageing society.

The government aims to identify, support, and fund a range of promising projects. The UK's government is available to back a broad portfolio of risky initiatives rather than be constrained by the possibility of individual failures.

To respond to the Grand Challenges, business, academia, civil society, and the government must work together, bringing their expertise and entrepreneurial spirit.

### **Shipbuilding strategy**

The National Shipbuilding Strategy is a case example where the UK have begun work to understand how UK shipbuilding can maximise prosperity for the UK and its constituent nations and regions [109].

The forthcoming “Transforming Infrastructure Performance programme” and “Transport Infrastructure Efficiency Strategy”, along with the “Transport Infrastructure Skills Strategy” will support the increase in innovation, skills, businesses growth and earning power, and ensure these interests inform decision-making. They will help the government and its agencies in building long term collaborations with industry, reducing procurement transaction costs, maximising innovation, and exploiting digital technologies such as the adoption of off-site construction techniques and smart infrastructure [105].

### **Clean Growth**

The framework for achieving clean growth and affordable energy was set out in the recent Clean Growth Strategy.

The shift to clean growth and the spread of digital technology are particularly significant, as infrastructure decisions in these areas are already shaping the evolution of markets and encouraging the emergence of new technologies. These trends will affect the way people live, work and travel, and

will disrupt business models and markets across multiple sectors over coming decades. The UK will invest in infrastructure that enables the country to flourish and maximises economic opportunities [105]. Innovation in clean growth will be important for low cost, low carbon infrastructure systems, as well as for realising industrial opportunities.

The UK government aims to use all the government tools available to support innovation in a low carbon economy including market design, taxation, and regulation, besides to accelerate private investment and promote market growth.

### **Moving towards a regenerative circular economy**

Energy and materials are considered essential contributions to the production of goods and services, and a healthy society depends on a healthy environment. The UK supports an approach to raise the resource productivity of businesses [105], including through the promotion of recycling and strong secondary materials markets where products are designed with efficiency and recyclability in mind, by:

- Working in partnership with food businesses ‘from farm to fork’, through the Courtauld Commitment to deliver a 20 per cent per capita reduction in food waste by 2025.
- Supporting innovative and highly efficient precision agriculture through the Industrial Strategy programme: ‘Transforming food production, from farm to fork’
- A new Bioeconomy Strategy to set out a framework for growth in the sector to develop new low carbon bio-based products and processes.
- A national ambition of zero avoidable waste and a doubling of resource productivity by 2050, including through the 25-year Environment Plan and a new strategy for resources and waste.

The UK will support businesses’ long-term productivity through innovative approaches to resource efficiency. The goal is to position the UK as a world leader in sustainably maximising the value extracted from resources, while minimising the negative impacts of their extraction, use and disposal. The UK will take further measures to strengthen the markets for secondary materials and explore options to introduce electronic tracking of waste. This will support the development of new markets for waste materials and improve the efficiency of enforcement, creating a level playing field for the waste and resources sector. This builds on the foundations set out in the 25 Year Environment Plan [105].

### **Energy efficiency**

One of the UK’s goal is to enable business and industry to improve energy efficiency by at least 20% by 2030 [105].

In a more immediate term, energy efficiency and reforms to the retail energy market will provide the opportunity to lower bills. Up to £6bn could be saved in 2030 through investment in cost effective energy saving technologies in the industrial and commercial sector [110]. The UK’s government aims to encourage greater investment in energy efficiency measures and technologies, including by developing a scheme to support investment in industrial energy efficiency, to help large businesses install measures that will cut their energy use and bills, as improve their productivity. The UK is

developing a wider package of measures to support businesses to improve their energy productivity and increase their energy efficiency by at least 20% by 2030 [105].

The Industrial Strategy white paper also sets goals to reduce costs for the UK by making intelligent use of oil and gas assets and expertise. While the move towards clean growth is clear, oil and gas remain one of the most productive sectors of the UK economy, supporting 200,000 jobs directly and in the supply chain [111], and generating £24bn in annual exports [112]. Competition in contracts for clean power generation is already driving down costs: the costs of offshore wind have fallen by half since 2015 [113].

The emerging shale gas industry or offers the prospect of creating jobs, enhancing the competitiveness of downstream sectors, and building up supply chains, like technologies such as carbon capture, use and storage, and the hydrogen economy. Under the Clean Growth Strategy an invest was made in low carbon innovation by 2021.

The UK aim to explore further opportunities to support innovation and cost reduction through the Industrial Strategy Challenge Fund, through the negotiation of Sector Deals, and through the implementation together with industry of the 2050 Decarbonisation Action Plans that we have agreed with seven of the most energy intensive industrial sectors.

### **Digital infrastructures**

Digital connectivity has rapidly become an essential requirement for the way people live and do business. This is even more evident in the sequence of the Covid-19 pandemic. As set out in the Digital Strategy [114], the UK is taking action to improve connectivity for UK businesses and consumers and is working with industry and Ofcom, the communications regulator, to ensure there is connectivity where people live, work, and travel. An additional investment in digital infrastructure was established from the National Productivity Investment Fund and public investment [105].

The 5G Strategy outlines the policies that aim to forefront the next generation of mobile technology by creating the conditions for the market to develop and to deploy 5G in a timely and efficient manner. Fundamental to this success is the 5G Testbeds and Trials Programme. The programme aims to harness areas where the UK has a competitive advantage, by helping deliver projects in phases, starting with an initial competition for projects.

A trial to test 5G applications and deployment on roads will also help to test to maximise future productivity benefits from self-driving cars, building on the work already progressing on connected and autonomous vehicle trials in the West Midlands. The National Infrastructure Commission will also launch a new innovation prize to determine how future roadbuilding should adapt to support self-driving cars.

### **Data**

The UK has world-class data, from the highest quality geospatial and climatic analysis to company information. UK is committed to make this data available to innovators and businesses throughout the UK to create products and services capable to transform the economy and society. The UK sets the ambitions to be the best place to start and run a digital business. Strengthening public confidence

in data, and giving greater clarity to business, will support measures to help the tech industry to flourish, reinforcing the UK's position as one of the world's leading digital economies.

As an example, the UK is working to improve collaboration on data sharing between agencies, like the HM Revenue and Customs, the Department for Business, Energy and Industrial Strategy, Local Enterprise Partnerships and Growth Hubs to support the objectives of the industrial strategy [105].

The UK has some of the best geospatial data in the world, much of it held by public bodies. To make the most of the value of this data, support the growth of the digital economy and consolidate the UK's position as the best place to start and grow a digital business, the government will establish a new Geospatial Commission to provide strategic oversight of the various public bodies that hold this data.

To further boost the digital economy, the government is working with Ordnance Survey (OS) and the new Commission, to establish how to open freely OS MasterMap data to UK-based small businesses, under an Open Government Licence or through an alternative mechanism, while maintaining the OS's strategic strengths.

Supporting the Grand Challenge on data and artificial intelligence (AI), the UK is establishing a new Centre for Data Ethics and Innovation to enable and ensure safe, ethical, and ground-breaking innovation in AI and data-driven technologies.

### **Funding policies at regional level**

The Industrial Strategy [105] has a significant regional and local dimension. There is a lively debate as to whether the UK's centralised governance limits lagging regions' capacity to take effective action to address productivity disparities. For example, the methodology used to select and prioritise infrastructure projects has been accused of contributing to the concentration of infrastructure investment around London (Coyle & Sensier, 2018). The Industrial Strategy focuses on regional projects such as the "Northern Powerhouse" and "Midlands Engine". Local industrial strategies, which aim to create alliances to develop local development potential, are the latest step in the more decentralised approach initiated in 2010 with City Deals, Devolution Deals and Local Enterprise Partnerships [115].

### **Funding policies via Higher Education Innovation Funding (HEIF)**

The UK's Government has already made clear its long-term commitment to supporting Knowledge Exchange (KE), including through HEIF. We acknowledge the crucial role this funding has in helping universities develop their capabilities for commercialisation and other forms of Knowledge Exchange.

HEIF recognises the important role that universities will play in delivering the Government's Industrial Strategy and will enable the sector to accelerate the commercialisation of knowledge from our world-class research base.

### **Private Funds**

The access to private funds is a common challenge to European countries. Hence, this is even more evident to early-stage technologies and business projects with its origin in the university. Although Technology Transfer seed investments in Europe are in the radar of some investors, academic research is often considered to be 'too new' or 'too high-risk' to be transferred out of the research laboratory and financed by the traditional investors. New discoveries and technologies may fail to realise their potential unless they become attractive to industry or downstream investor.

Though the UK has an excellent record in creating businesses, however, many of them face barriers to scaling up. The Government's Industrial Strategy white paper identifies one part of the challenge as improving access to finance for businesses looking to grow. There is also some evidence that the supply of **equity finance varies between different parts of the UK and is concentrated in London and the South East**. In response the Government has launched a Patient Capital Review, led by the Treasury. It considers the availability of long-term finance for growing innovative firms and assess what changes in the Government's policy, if any, are needed to support the expansion of long-term capital to support growing innovative firms.

The University research spinouts in the UK are one example of the businesses that can sometimes struggle to get access to finance and we recognise that they are a particularly challenging case. They often involve technologies at the earliest stage of development, and which are a long way, in terms of both time and financial investment, from being able to sell products and services.

### Barriers for effective KT

The European Commission in the Country Report for the UK 2019 does an economics analysis to the UK that teases some barriers to the UK's Productivity and Innovation, that can impact effective KT [115]:

- UK productivity has long been quite low, due partly to low investment. The UK is an open economy with a high employment rate and a business environment featuring many positive aspects, including relatively free and efficient product, labour, and capital markets. It ranks ninth among 140 countries in the World Bank's classification of the 'friendliness' of national business environments (World Bank, 2019). However, these positive microeconomic conditions do not seem sufficient to improve UK productivity, which is significantly lower than that of other developed economies.
- Markets are competitive but management and technology diffusion are relatively weak. The 'churn rate' (i.e., the proportion of all firms entering and leaving markets) is higher than in the US, entry and exit barriers are low and markets remain competitive. Nevertheless, many loss-making firms remain in the market.
- UK R&D investment intensity has been around 1.7 % of GDP for the past decade, below the EU average. In 2017, it rose to 1.69 % of GDP, still well below the EU and OECD averages (2.07 % and 2.4 % respectively).
- R&D investment is concentrated in a limited number of companies and regions. Three quarters of all private R&D investment is concentrated in 400 companies (HM Government, 2017). South-East England and East England are responsible for 20 % and 17 %, respectively, of all R&D investment in the UK, with current R&D intensities (2.4 % and 3.4 %) at or above the proposed 2027 target. In contrast, Northern Ireland, Wales, and North-East England each



account for barely 2 % of UK R&D investment, with R&D intensity currently around 1 % of GDP in the latter two regions (ONS, 2018h & Eurostat, 2018).

Moreover, on the mechanisms to support an effective knowledge transfer in the UK, one observation raised by the Science and Technology Committee in 2017 [107], is that the Government's efforts to increase technology transfer have been disproportionately targeted at the university, rather than business, sector.

## Recommendations

Recommendations for effective KT suggested by the Science and Technology Committee [107] could be the following:

- The review by the Government's the R&D tax credits to carefully consider how the qualification and claims process for both the SME, and large company, schemes could be simplified so that they **explicitly support business R&D in collaboration with higher education institutions**.
- A review of the Small Business Research Initiative (SBRI), that as consistently underperformed against the Government's own targets, to consider what mechanisms could be put in place to **encourage small businesses to collaborate with research institutions** as part of the SBRI scheme.
- More dissemination of Konfer platform (developed by the National Centre for Universities and Business) that **supports the journey from finding a research partner and funding to planning and co-creation**. A business engagement team should also be established alongside Konfer to work with businesses and help develop the potential partnerships identified by the platform.
- **Revise VAT rules** on the income from academic buildings in a way that facilitates greater **collaboration with business**. We encourage the Office for Tax Simplification to examine the VAT rules on shared academic buildings with business as part of its current VAT review and consider how they could be revised to enhance collaboration opportunities.
- The lack of a 'one-size-fits-all' approach to successful technology transfer does not preclude the sharing of best practice. It would be recommended to the UKRI to work with Praxis Unico to develop and share best practice in identifying and nurturing opportunities for technology transfer. **Guidance should be developed with the needs of smaller technology transfer offices** in mind and take account of regional and sectoral differences.
- Science and Innovation Audits have focused on mapping the UK's existing scientific strengths. This is valuable information, but the Government also needs to know where the weaknesses lie, and where innovation and technology transfer are being held back. The gap analysis to date has uncovered weaknesses within existing sectors, however, rather than identifying where **new sectors** need to be developed. The Government should task UKRI to identify where research and innovation gaps lie, especially where they are holding back technology transfer, and consider how these can be addressed.
- The Government should use the opportunity presented by the Industrial Strategy to oblige all **Local Enterprise Partnerships to work with their local universities** and build on the strengths of the university enterprise zones or else reassign a proportion of their funding sufficient to roll-out a national university enterprise zones programme.



- Efforts to simplify the innovation landscape are slowly moving in the right direction. The UK Government remains concerned, however, that while Innovate UK has streamlined its funding schemes, the proposed shift away from awarding grants, and towards loans, could undermine the progress that has been made to date. **Funds should be disbursed in the form of grants.** A small proportion of the Fund should be set aside to provide support for business training and mentoring, to maximise the success rate of the awards that are made.

## 10.2. Skills for KT in the UK

### Sector deals - Government & Industry

Partnerships between the government and industry on sector specific issues can create significant opportunities to boost productivity, employment, innovation, and skills.

These partnerships have been working from previous experiences such as the Auto Council and the Office for Life Sciences, to more recent collaborations including tourism, creative industries, space, and professional and business services. In the Green Paper it is suggested to build on this model of collaborative working, where specific sectors could come together under clear leadership and make a compelling case to negotiate a Sector Deal with the government to boost the earning power and productivity of that sector.

#### Life Sciences Sector Deal

The government and the life sciences sector have agreed to a transformative, multi-billion-pound Sector Deal, ensuring that the UK remains at the forefront of innovation in this sector.

The Sector Deal will help ensure new pioneering treatments and medical technologies are produced in the UK, improving patient lives, and driving economic growth. The deal involves substantial investment from private and charitable sectors and significant commitments in research and development from the government.

The UK is home to world-leading businesses such as GSK and AstraZeneca, a strong small and medium-sized business sector, major health charities such as the Wellcome Trust and Cancer Research UK, and the globally recognised NHS.

This deal is committed to helping life sciences clusters flourish, such as the Oxford-Milton Keynes-Cambridge corridor where the government is investing in housing and infrastructure projects. Further regional approaches, including in the north of England via the Northern Health Science Alliance, are expected for further phases of the deal.

#### Artificial Intelligence Sector Deal

The government and the artificial intelligence (AI) sector have agreed a Sector Deal to boost the UK's global position as a leader in developing AI technologies. This deal will anchor the UK as the go-to destination for AI innovation and investment. AI's extraordinary potential is already well known by one estimate it could add £232bn to the UK economy by 2030 [116].

The UK is a recognised world leader in developing AI: Deepmind, Babylon and Swiftkey – which was backed by Innovate UK – are all globally renowned companies founded in the UK.

The deal will establish an enduring partnership between industry, academia, and the government through the UK Artificial Intelligence Council, where all partners will work together to promote the safe, fair application of this technology. The deal contains mutual commitments to encourage the responsible sharing of data to develop new value, and to ensure that the UK produces and retains the best global talent.

This deal contains commitments to work collaboratively in three key areas:

- Realising the Potential of Data
- A Skilled and Diverse Workforce
- Coordination and Uptake

### **Industrial Digitalisation and the Made Smarter Review**

The UK manufacturing sector makes a significant contribution to the UK economy (£177bn GVA in 2016) [117]. Manufacturing accounts for over 50% of UK exports [118] and over 70% of R&D [119]. The productivity of the sector has increased four times faster than the rest of the economy [120]. But with the potential for growth and to build on the strength of our exports, the UK must not be complacent; digital technology presents the sector with a huge opportunity to increase productivity and growth as well as create new markets.

### **National context**

The UK has a rich heritage with world-leading businesses located around the country. Our cities, towns and rural areas have competitive advantages that will be essential to shaping our economic future. Yet many places are not realising their full potential.

The UK has greater disparities in regional productivity than other European countries [121]. This affects people in their pay, their work opportunities, and their life chances. Every region in the UK has a role to play in boosting the national economy.

Strong local economies around the world tend to have some key attributes. UK recognises that different policies will be needed for different places. United Kingdom has greater disparities in regional productivity than in other European countries [121].

**Local Enterprise Partnerships** across the country have played an important role in supporting local growth.

### **Regional context**

**Northern Powerhouse and Midlands Engine** is an encouraged collaboration to address shared challenges over regional corridors. Such regional approaches can help to deepen pools of skilled labour, drive competition, and increase market access.

**Cambridge–Milton Keynes–Oxford corridor** have agreed an ambitious programme of infrastructure, housing, business investment and development.

Four Local Enterprise Partnerships – Swindon and Wiltshire, Cornwall, and the Isles of Scilly, Heart of the South West and Dorset – have come together through the South.

West Rural Productivity Commission developed proposals for rural growth. This collaboration also exists across sectors.

We also recognise the need to have policy flexibility below the regional or Local Enterprise Partnership level. That could support innovation in economic clusters or to ensure that inner city boroughs, or small towns and their rural hinterlands, are able to contribute to, and benefit from, wider economic growth.

### Policy makers and Institutions supporting the Blue Economy

Following there is a summary of the policy makers, executive and non-executive institutions that support the Blue Economy.

Policy makers, executive and non-executive institutions supporting (directly or indirectly) the Blue Economy	
<b>Energy Systems Catapult</b>	<ol style="list-style-type: none"> <li>1. Help innovators identify market gaps and overcome systemic barriers to deliver the products, services, and value chains to transform the energy system.</li> <li>2. The Catapult works with individual companies, in partnerships or as part of consortia. The Catapult collaborate on CR&amp;D and bid funding opportunities; connecting with industry partners, investors, or test facilities; and convene with domestic and international stakeholders including governments and regulators.</li> <li>3. Areas: Transport, Renewables, Nuclear, Networks and Energy Storage, CCS, Industry and Hydrogen, Bioenergy, Future Power Systems Architecture, Energy System Integration Guides, etc.</li> <li>4. Strategic Objectives <ul style="list-style-type: none"> <li>- Creating demand pull for energy systems innovation by working to remove existing barriers and open new markets for the sector.</li> <li>- Supporting UK innovators to test and commercialise new processes, products, services, and business models for the sector.</li> <li>- Connecting UK innovators to international expertise and markets to accelerate routes to export.</li> <li>- Providing greater understanding of the risks and opportunities associated with transitioning to a low carbon energy system.</li> </ul> </li> </ol>
<b>Catapult Medicine Discovery</b>	<ol style="list-style-type: none"> <li>1. Help UK SME biotech's, academics and innovators have access to the laboratory facilities, knowledge, data, technologies, and networks they need to be able to progress their programmes of medicines research and development. Our objective is to work collaboratively as part of a Syndicate to bring new proven therapies to patients faster and more cost-effectively.</li> <li>2. Areas: <ul style="list-style-type: none"> <li>- Discovery Science</li> <li>- Informatics</li> <li>- Virtual R&amp;D</li> </ul> </li> </ol>
<b>Catapult Offshore Renewable Energy</b>	<ol style="list-style-type: none"> <li>1. UK's leading technology innovation and research centre for offshore renewable energy.</li> <li>2. Testing and Validation; Research and Innovation; Operation and Performance</li> <li>3. Providing innovation challenges, advisory and testing services</li> <li>4. Levenmouth Demonstration Turbine (LDT) - Unique Among Offshore Wind Testing Facilities.</li> </ol> <p>7MW Machine is an advanced, open-Access offshore wind turbine dedicated to research and plays host to some of the industry's most exciting new technologies for testing and validation. Since 2016, LDT has attracted 119 SMEs for technology</p>

	<p>development, testing or demonstration; 45 projects completed or under contract at the facility.</p> <p>5. Training and academy - spark local children's interest in offshore renewable energy as a future career</p>
<b>UK centre for maritime innovation and technology ("MarRI-UK")</b>	<p>1. Collaborative innovation vehicle for UK industry and academia to jointly tackle innovation and technology challenges.</p> <p>2. Focus on research and innovation within mid TRL (3 – 7) levels to address the opportunities between "discovery and research" and "commercialisation" of Maritime Technologies and Systems</p> <p>3. Focus on shipping research; collaborative focus is Clean Maritime.</p>
<b>EMEC – The European Marine Energy</b>	<p>1. Marine energy industry</p> <p>2. Objectives: Reducing the time, cost, and risk associated with the development of marine energy technologies.</p> <p>3. Ready-made and cost-minimising test and demonstration facilities in major wave and tidal resources. Operations are spread over five sites across Orkney (Scotland)</p> <p>4. Provides a wide range of consultancy and research services and is working closely with Marine Scotland.</p> <p>5. Links with a range of different developers, academic institutions and regulatory bodies while remaining independent.</p>
<b>NERC - the Natural Environment Research Council</b>	<p>1. NERC funds excellent, world-leading research across the environmental sciences.</p> <p>2. Priority areas: Environmental solutions Productive environment Healthy environment Resilient environment Digital environment Global environment Best environment for research and innovation</p> <p>3. NERC investment by UK region: <a href="https://nerc.ukri.org/about/whatwedo/region/">https://nerc.ukri.org/about/whatwedo/region/</a></p>
<b>Environment Agency</b>	<p>1. EA is an executive non-departmental public body, sponsored by the Department for Environment, Food &amp; Rural Affairs.</p> <p>2. Create places for people and wildlife and support sustainable development.</p> <p>3. Established in 1996 to protect and improve the environment. Head office is in Bristol and another office in London. EA have offices across England.</p> <p>4. Responsibilities: - regulating major industry and waste - treatment of contaminated land - water quality and resources - fisheries - inland river, estuary, and harbour navigations - conservation and ecology</p>
<b>Department for Environment Food &amp; Rural Affairs</b>	<p>1. UK government department responsible for safeguarding our natural environment, supporting our world-leading food and farming industry, and sustaining a thriving rural economy. Our broad remit means we play a major role in people's day-to-day life, from the food we eat, and the air we breathe, to the water we drink.</p> <p>2. Defra is a ministerial department, supported by 33 agencies and public bodies.</p> <p>3. Priorities - a smooth and orderly exit from the EU - a cleaner, healthier environment, benefiting people and the economy - a world leading food and farming industry - a rural economy that works for everyone, contributing to national productivity, prosperity, and wellbeing - a nation better protected against floods, animal and plant diseases and other hazards, with strong response and recovery capabilities</p>

<b>Maritime &amp; Coastguard Agency</b>	<ol style="list-style-type: none"> <li>1. Prevent the loss of life on the coast and at sea. Produce legislation and guidance on maritime matters and provide certification to seafarers.</li> <li>2. MCA is an executive agency, sponsored by the Department for Transport.</li> <li>3. Headquarters are in Southampton and we have offices and co-ordination centres around the UK coast.</li> <li>4. Responsibilities <ul style="list-style-type: none"> <li>- the safety of everybody in a vessel in UK waters</li> <li>- the safety of all seafarers on UK flagged vessels</li> <li>- making sure all equipment on UK vessels is fit for purpose</li> <li>- making sure all seafarers on UK vessels have correct documentation</li> <li>- the environmental safety of UK coast and waters</li> <li>- the accuracy of hydrographic data on UK charts</li> <li>- overseeing coastal rescue volunteers, hydrographics, seafarer certification and the port state control inspection regime</li> </ul> </li> </ol>
<b>Medicines and Healthcare products Regulatory Agency</b>	<ol style="list-style-type: none"> <li>1. Regulates medicines, medical devices, and blood components for transfusion in the UK.</li> <li>2. MHRA is an executive agency, sponsored by the Department of Health and Social Care.</li> <li>3. Some responsibilities: <ul style="list-style-type: none"> <li>- promoting international standardisation and harmonisation to assure the effectiveness and safety of biological medicines</li> </ul> </li> <li>4. Some priorities: <ul style="list-style-type: none"> <li>- making our regulation more supportive of safe innovation</li> </ul> </li> </ol>
<b>Centre for the Environment Fisheries and Aquaculture Science</b>	<ol style="list-style-type: none"> <li>1. Tackling the serious global problems of climate change, over-fishing, and pollution to secure a sustainable blue future for all.</li> <li>2. Government's marine and freshwater science experts. We help keep our seas, oceans, and rivers healthy and productive and our seafood safe and sustainable by providing data and advice to the UK government and our overseas partners.</li> <li>3. As an executive agency of Defra we are fully compliant with UK government standards and requirements.</li> <li>4. Science areas: <ul style="list-style-type: none"> <li>- Marine Monitoring</li> <li>- Ocean and coastal processes</li> <li>- Ecosystem understanding</li> <li>- Marine Biodiversity</li> <li>- Aquatic Animal Health</li> <li>- Emergency Response</li> <li>- Climate change</li> <li>- Valuing nature</li> <li>- Assessment and advice</li> <li>- Sustainable fisheries</li> <li>- Food safety</li> <li>- Technology and data</li> </ul> </li> </ol>
<b>Marine Scotland</b>	<ol style="list-style-type: none"> <li>1. Marine Scotland is a Directorate of the Scottish Government and is responsible for the integrated management of Scotland's seas.</li> <li>2. Policies <ul style="list-style-type: none"> <li>- Aquaculture</li> <li>- Fish Health Inspectorate</li> <li>- Marine and fisheries compliance</li> <li>- Marine and fisheries grants</li> <li>- Marine and fisheries licensing</li> <li>- Marine environment</li> <li>- Marine planning</li> <li>- Marine renewable energy</li> <li>- Salmon and recreational fisheries</li> </ul> </li> </ol>

	- Sea fisheries
<b>Defence Science and Technology Laboratory</b>	<ol style="list-style-type: none"> <li>1. Manages customer work through programmes, using external suppliers where possible.</li> <li>2. Dstl brings together the defence and security S&amp;T community, including industry, academia, wider government, and international partners, to provide sensitive and specialist S&amp;T services to the Ministry of Defence and wider government.</li> <li>3. Dstl's programmes of work: <ul style="list-style-type: none"> <li>- Above Water Systems Programme</li> <li>- Contested Electromagnetic Environment Programme</li> <li>- Emerging Technology for Defence Programme</li> <li>- Missile Defence and Strategic Systems Programme</li> </ul> </li> </ol>
<b>Scottish Association for Marine Science (SAMS)</b>	<ol style="list-style-type: none"> <li>1. Independent non-profit membership organisation</li> <li>2. undertake research into all aspects of the marine system and exchange our new understanding with society, policy makers, business, and the next generation.</li> <li>3. Science areas: Ocean systems: dynamic coasts and blue economy (applied science e.g., related to aquaculture, marine biotechnology, ocean energy, fisheries).</li> </ol>
<b>Marine Energy Wales</b>	<ol style="list-style-type: none"> <li>1. Brings technology developers, the supply chain, academia, and the public sector to establish Wales as a global leader in sustainable marine energy generation, making a significant contribution to a low carbon economy.</li> <li>2. EU structural funding prioritised for marine energy in Wales over the next 5 years, two wave and tidal stream Demonstration Zones, seabed agreements in place for three separate wave and tidal stream projects.</li> </ol>
<b>Transition Bro Gwaun</b>	<ol style="list-style-type: none"> <li>1. Transition Bro Gwaun is a community group with registered Company and Charity status. The key aims are the reduction of carbon emissions in response to global climate change, and the promotion of economic and social resilience of the local community in response to resource depletion.</li> </ol>
<b>Wave Energy Scotland (WES)</b>	<ol style="list-style-type: none"> <li>1. Wave Energy Scotland (WES) is driving the search for innovative solutions to the technical challenges facing the wave energy sector. Through our competitive procurement programme, we support a range of projects focused on the key systems and sub-systems of Wave Energy Converters.</li> <li>2. o. The aim of WES is to ensure that Scotland maintains a leading role in the development of marine energy.</li> </ol>
<b>Loughs Agency</b>	<ol style="list-style-type: none"> <li>1. Loughs Agency is an agency of the Foyle, Carlingford, and Irish Lights Commission (FCILC). It was set up as one of the cross-border bodies under the 1998 Agreement between the Government of the United Kingdom of Great Britain and Northern Ireland and the Government of Ireland.</li> <li>2. The Agency provides sustainable social, economic, and environmental benefits. We do this through the effective conservation, management, promotion and development of the fisheries and marine resources of the Foyle and Carlingford areas.</li> <li>3. The Agency took over the fisheries protection functions of the Foyle Fisheries Commission.</li> <li>4. Responsibility of developing aquaculture and marine tourism.</li> <li>5. Report to the North South Ministerial Council and our government sponsor departments – Department of Agriculture, Environment and Rural Affairs (DAERA) in Northern Ireland and the Department of Communications, Climate Action and Environment (DCCAE) in Ireland.</li> </ol>

## Barriers for effective KT

UK universities are regarded as global research powerhouses producing excellent scientific outputs. However, the business sector does not seem to be able to capitalise on this scientific strength. Science-

business linkages are relatively weak, both in terms of scientific co-production and business-funded public R&D. As a result, the UK scores poorly on knowledge diffusion in international rankings [115].

## Recommendations

Different sector deals have been created, and connections between companies and universities in different sectors could be made compulsory in these sector deals. For example, specific numbers of KTP are needed to be included in a sector deals for encouraging knowledge transfer.

Catapult Network could also be expanded to enhance business linkages by building up an integrated network between different sectors, including companies and universities. From the blue economy perspective, it is good to approach some high relevance catapults. Offshore Renewable Energy Catapult creates clean growth opportunities by accelerating the creation and growth of UK companies in offshore renewable energy, and Energy Systems Catapult accelerates the transformation of the UK's energy systems, identifying priorities and market barriers for decarbonisation. Also, Connected Places Catapult can provide acceleration for cities, transport, and places, and Digital Catapult drives the early adoption of advanced digital technologies to make UK businesses more competitive and to grow the UK economy.

### 10.3. Key stakeholders acting as interface for KT in the UK

## National context

### **Alliance of Technology Transfer Professionals (ATTP)**

ATTP's mission is to promote and maintain global standards in knowledge and technology transfer. ATTP does this via the Registered Technology Transfer Professional (RTTP) designation, the international professional standard for knowledge transfer and commercialization practitioners working in universities, industry, and government labs.

On the support to KT this alliance of fourteen knowledge and technology transfer associations provides training events for technology transfer, share of methodologies and best practices among TTO professionals and provides access to specific knowledge to support TT activities (grants, IP protection, software protection, marketing, finance, etc).

### **National Centre for Universities and Business (NCUB)**

The NCUB, financially supported by Innovate UK, the develops, promotes, and supports collaboration between universities and business across the UK. It promotes business-university collaboration for a prosperous and inclusive economy.

Under one of the activities of NCUB, it was developed the Konfer as an intelligent brokerage platform for UK universities and businesses.



### **Local Enterprise Partnerships (LEP)**

The 39 Local Enterprise Partnerships in England are potentially well placed to help connect local businesses and universities. It acts as the lead commentator and negotiator for LEPs at a national level with government, advisers, businesses, academia, think tanks and other target audiences. It also acts as a central source of information and data on LEPs at a national level.

Enterprise Zones: established in 2012, those are at the heart of the Government's long-term economic plan, supporting businesses to grow. They are designated areas across England which provide tax breaks and Government support and they are great places to do business for both new and expanding firms. There are Enterprise Zones in most LEP areas and below is a list of each with links to Enterprise Zones.

The weakness of this network is the currently lacking any firm obligation to support local businesses and universities.

### **University Enterprise Zones (UEZs)**

The UEZs are specific geographical areas where universities and business work together to increase local growth and innovation.

The zones aim to:

- Encourage universities to strengthen their roles as strategic partners in local growth to engage with Local Enterprise Partnerships (LEPs), building on existing capabilities and partnerships.
- Stimulate development of incubator or 'grow-on' space for small businesses in locations that encourage businesses to interact with universities and to innovate.

UEZs have access to business support packages and the specialist facilities and expert knowledge offered by universities. **UEZs also work with the Department for International Trade (DIT) to promote inward investment.**

### [Relevant entities promoting knowledge transfer in the Blue Economy](#)

#### **UK centre for maritime innovation and technology ("MarRI-UK")**

They are a collaborative innovation vehicle for UK industry and academia to jointly tackle innovation and technology challenges. They focus on research and innovation within mid TRL (3 – 7) levels to address the opportunities between "discovery and research" and "commercialisation" of Maritime Technologies and Systems. The first area of collaborative focus is Clean Maritime.

### [Networking tools](#)

#### **Konfer**

It is innovation brokerage and opens research, researchers and services in UK universities and research institutions, and for academics, it is a way to find impact partners.

Anyone can search for an expert, a research paper, a piece of equipment, funding, or business-university collaboration opportunities. Konfer was created by the National Centre for Universities and



Business (NCUB) and UK Research and Innovation (UKRI). It harvests data from multiple sources including:

- University web pages
- RSS News Feeds
- Gateway to Research (GtR)
- REF Case Studies
- ORCID
- Equipment.data.ac.uk
- Video (YouTube)
- Latest funding opportunities from Innovate UK.

### KTN - Knowledge Transfer Network

KTN exists to connect innovators with new partners and new opportunities beyond their existing thinking – accelerating ambitious ideas into real-world solutions.

Established by Innovate UK, KTN helps people and companies reach the full potential of their innovative capabilities by connecting them with each other. Its members include:

- Large and small companies
- Government agencies and public funding bodies
- Universities and research organisations
- Tech hubs and start-ups

### Other Stakeholders supporting KT in the Blue Economy

Following there is a summary of the stakeholders that support the Blue Economy in the UK.

Stakeholders, which include organisations that directly or indirectly, that support the Blue Economy in the UK	
<b>Wave Hub</b>	<ol style="list-style-type: none"> <li>1. Wave Hub facility and facilitate testing of a range of offshore technologies including large scale wave energy devices, wave energy arrays, floating wind, hybrid wind/wave devices, major subcomponents and associated subsea equipment.</li> <li>2. Funded by the European Regional Development Fund Convergence Programme and the UK Government.</li> <li>3. Wave Hub Ltd also actively engages in knowledge transfer through international research collaborations and the provision of consultancy services.</li> <li>4. Pembrokeshire Demonstration Zone (Wales) Comprises a 90 sq. km area of seabed with water depths of between 50-62 metres. It is located between 15-21kms offshore. Management of the zone is provided by Wave Hub Ltd, the operating company of Wave Hub in Cornwall.</li> <li>5. Cornwall and South West England have invested £170 million to provide world leading research and demonstration facilities.</li> <li>6. Wave Hub Ltd is the operating company for Wave Hub, the pre-consented and purpose-built test facility located off the North Cornwall coast, and the seabed leaseholder and Third-Party Manager for the Pembrokeshire Demonstration Zone.</li> </ol>
<b>Offshore Wind Innovation Hub</b>	<ol style="list-style-type: none"> <li>1. Mission is to coordinate across the entire innovation landscape for offshore wind in the UK, presenting innovation priorities, supply chain growth potential and a comprehensive view of the funding opportunities available.</li> </ol>

	<p>2. Inform government of sector priorities and provide evidence base for funding opportunities.</p> <p>3. Areas: Turbines, wind turbine (fixed and floating), electric infrastructure, O&amp;M, and windfarm life</p>
<b>Plymouth Marine Laboratory</b>	<p>1. PML became an independent company limited by guarantee with charitable status in 2002; governed in accordance with charity law by a Board of Trustees, who are also Directors under company law.</p> <p>2. Charity we aim to develop and apply innovative marine science to ensure a sustainable future for our ocean.</p> <p>3. Evidence based environmental solutions to societal challenges by applying cutting-edge, interdisciplinary research that benefits society and promotes stewardship of marine ecosystems.</p> <p>4. The impact of science is far-reaching ranging from highly cited scientific papers, to providing scientific evidence for policy and training the next generation of marine scientists.</p> <p>5. Contributing to UN Sustainable Development Goals to promote healthy, productive, and resilient oceans and seas.</p>
<b>Dunstaffnage Marine Laboratory</b>	<p>1. Scottish Association for Marine Science (SAMS) belongs to the first generation of European marine laboratories. It is now located at Dunstaffnage Marine Laboratory near Oban, in the West Highlands of Scotland, on the Firth of Lorne, one of the largest fjord / sea loch systems in Scotland.</p> <p>2. Research: 4 departments: Biogeochemistry and Earth Science, Ecology, Microbial and Molecular Biology and Physics Sea Ice and Technology. 4 thematic areas: Arctic Seas, Dynamic Oceans, Marine Renewables and People and the Sea.</p> <p>3. the National Facility for Scientific Diving (NFSO) and applied Research Centres Marine Bioenergy Scotland, Centre for Sustainable Coasts, Centre for Industrial Ocean Impacts and Centre for Smart Observation Techniques.</p>
<b>Met Office</b>	<p>1. The Met Office is the national meteorological service for the UK. We provide critical weather services and world-leading climate science, helping you make better decisions to stay safe and thrive.</p> <p>2. Pioneered the science of meteorology and its application. Continue to push the boundaries of science and technology.</p> <p>3. We help government, businesses, emergency responders and public to make informed decisions and collaborate with organisations around the world to provide vital services and advance global understanding through research.</p>
<b>Centre for Ecology and Hydrology</b>	<p>1. Independent, not-for-profit research institute. 500 scientists provide the data and insights that researchers, governments, and businesses need to create a productive, resilient, and healthy environment.</p> <p>2. The UK Centre for Ecology &amp; Hydrology (UKCEH) is a registered Charity.</p> <p>3. Objects are for the benefit of the public, within the United Kingdom and overseas. They are to advance science; to advance education in the environment and environmental sciences, and sustainable development; and to promote sustainable development for the benefit of the public.</p>
<b>European Centre for Medium-Range Weather Forecasts</b>	<p>1. Independent intergovernmental organisation supported by 34 states. Advancing global NWP through international collaboration</p> <p>2. the Centre provides:</p> <ul style="list-style-type: none"> <li>- global numerical weather forecasts four times per day</li> <li>- air quality analysis</li> <li>- atmospheric composition monitoring</li> <li>- climate monitoring</li> <li>- ocean circulation analysis</li> <li>- hydrological predictions</li> <li>- fire risk predictions</li> </ul>

	<p>3. We are both a research institute and a 24/7 operational service, producing global numerical weather predictions and other data for our Member and Co-operating States and the broader community. The Centre has one of the largest supercomputer facilities and meteorological data archives in the world. Other strategic activities include delivering advanced training and assisting the WMO in implementing its programmes.</p> <p>4. Located in Reading, UK.</p>
<b>Agri-Food and Biosciences Institute</b>	<p>1. Multi-disciplinary organisation with 650 staff involved in high technology research and development, diagnostic and analytical testing for DAERA and other Government departments, public bodies, and commercial companies in Northern Ireland, and further afield.</p> <p>2. Areas of work are:</p> <ul style="list-style-type: none"> <li>- Natural and marine environment</li> <li>- Animal, plant and human health and welfare</li> <li>- Sustainable livestock production</li> </ul>
<b>Game &amp; Wildlife Conservation Trust</b>	<p>1. Charity company</p> <p>2. To promote for the public benefit, the conservation of game and its associated flora and fauna.</p> <p>3. Use science to promote game and wildlife management as an essential part of nature conservation. Develop scientifically researched game and wildlife management techniques.</p> <p>Promote our work to conservationists, including farmers and landowners and offer an on-site advisory service on all aspects of game and wildlife management, so that Britain's countryside and its wildlife are enhanced for the public benefit.</p> <p>Influence government policy with sound science that creates progressive and effective policies.</p> <p>We support best practice for field sports that contribute to improving the biodiversity of the countryside.</p> <p>4. Fisheries blog: <a href="https://www.gwct.org.uk/blogs/fisheries-blog/">https://www.gwct.org.uk/blogs/fisheries-blog/</a></p>
<b>BirdLife International</b>	<p>1. Global partnership of conservation organisations (NGOs) that strives to conserve birds, their habitats and global biodiversity, working with people towards sustainability in the use of natural resources. Together we are over 100 BirdLife Partners worldwide – one per country or territory – and growing.</p> <p>2. The BirdLife Partnership has 6 Regional Coordination Offices throughout the world and a Global Office based in Cambridge, UK.</p> <p>3. The offices, known as “The BirdLife International Secretariat”, coordinate and facilitate the BirdLife International Partnership strategies, programmes, and policies.</p>
<b>Marine Conservation Society</b>	<p>1. Charity. Major successes in protecting special wildlife, tackling sewage problems, helping the seafood-buying public, and influencing Government and industry.</p> <p>2. The Marine Conservation Society is the UK's leading marine charity. We work to ensure our seas are healthy, pollution free and protected.</p> <p>3. Mission: To lead political, cultural, and social change for healthy seas and coasts that support abundant marine wildlife, sustainable livelihoods, and enjoyment for all.</p> <p>4. MCS will work to ensure sustainable use of the seas by minimising harm when we harvest resources, for example through fishing. Work to prevent and clean up marine litter and pollution, and to minimise damage from development and climate change.</p>
<b>Wildfowl and Wetlands Trust</b>	<p>1. WWT is a charity. The charity was founded in 1946 and converted to a charitable company limited in 1993.</p> <p>2. WWT we conserve, restore, and create wetlands, save wetland wildlife, and inspire everyone to value the amazing things healthy wetlands achieve for people and nature.</p> <p>3. WWT save critically endangered species from extinction, work with communities around the world who depend on wetlands and inspire people to take care of nature.</p> <p>4. Projects: <a href="https://www.wwt.org.uk/our-work/projects/">https://www.wwt.org.uk/our-work/projects/</a></p> <p>5. 10 WWT wetland reserves. Location: Gloucestershire</p>

<b>Fauna &amp; Flora International</b>	<p>1. As the world's oldest international wildlife conservation organisation, Fauna &amp; Flora International (FFI) has built a reputation for its pioneering work and science-based approach to conservation.</p> <p>2. Our focus is on protecting biodiversity (the diversity of life on Earth), which underpins healthy ecosystems and is critical for the life-support systems that humans and all other species rely on.</p> <p>3. Trusts and Foundations based across the UK, Europe, Australia, and the USA provide Fauna &amp; Flora International (FFI) with generous grants that enable us to deliver projects that directly contribute to conserving biodiversity. Every year, around £9m from Trusts and Foundations directly supports several diverse projects from across FFI's portfolio.</p>
<b>National Lobster Hatchery</b>	<p>1. The National Lobster Hatchery is a marine conservation, research and education charity based in Padstow, Cornwall, UK. What makes us unique is that our work is specifically related to a commercial species – The European Lobster and in the last few years we have successfully established ourselves as a centre of expertise on a global scale.</p> <p>2. Lobster is worth a huge amount in terms of both its economic and social importance. Consequently, they are subject to considerable fishing pressure and vulnerable to catastrophic stock collapse. Both the Scandinavian and Mediterranean stocks have completely collapsed and not recovered to this day.</p> <p>3. The species is the most valuable fish caught in the UK and is part of a major export industry. This one species alone is worth £30m each year.</p> <p>4. Charity</p>
<b>Cabi Bioscience</b>	<p>1. CABI is an inter-governmental, not-for-profit organization established by a United Nations treaty-level agreement between 49 Member Countries. Each member country has an equal role in the organization's governance, policies, and strategic direction, in addition to enjoying several privileges and services relating to our scientific expertise, products and resources.</p> <p>2. CABI's science centre at Egham was established in 1992, but CABI has had a scientific base in the UK since its very beginning. Over the years its work has supported hundreds of CABI projects and reached thousands of farmers in countries across the world. Much of the team's current work is for national government departments, in particular Defra and DfID.</p> <p>3. Focus areas:</p> <ul style="list-style-type: none"> <li>- Economic development</li> <li>- Climate change and biodiversity</li> <li>- Food and nutrition security</li> <li>- Gender and youth</li> </ul> <p>4. The centre collaborates extensively with both public and private sector organizations, NGOs, universities, governments and many more, to work in the most effective and sustainable way.</p> <p>5. CABI Centres: Brazil, China, Ghana, India, Kenya, Malaysia, Pakistan, Switzerland, Trinidad and Tobago, United Kingdom, United States of America, Wallingford, Zambia</p>
<b>Yorkshire Wildlife Trust</b>	<p>1. Yorkshire Wildlife Trust is an independent, autonomous charity with its own Board of Trustees. We are part of The Wildlife Trusts movement, which operates as an umbrella organisation for all individual Trusts and helps to coordinate campaigns at a national level.</p> <p>2. For over 70 years, we have been protecting Yorkshire's wildlife and wild places.</p> <p>3. Committed to creating a Yorkshire rich in wildlife for everyone. From saving our wildlife and wild places to bringing people closer to nature, we have a vision of a wilder future.</p>
<b>International Seismological Centre</b>	<p>1. Set up in 1964 with the assistance of UNESCO.</p>

	<p>2. Main purpose of the ISC is to compile the ISC Bulletin, regarded as the definitive record of the Earth's seismicity. Data is collected from over 130 agencies worldwide and is available online soon after being received.</p> <p>3. Open to any scientific academy, governmental agency, research institution or other non-profit organisation. All members are represented on the Governing Council, which determines the general policies of the Centre.</p>
<b>Cornwall Wildlife Trust</b>	<p>1. Protect Cornwall's wildlife and wild places on land and in our seas.</p> <p>2. Run by a group of elected Trustees, volunteers who hold the financial and legal responsibility for everything Cornwall Wildlife Trust does.</p> <p>3. Our Trustees bring a wide range of knowledge, expertise, and experience to the charity.</p>
<b>British Geological Survey</b>	<p>1. Leading provider of applied geoscience services and has an extensive international programme of research, survey and monitoring, data management and dissemination, including major institutional strengthening programmes in the developing world.</p> <p>2. Knowledge in Marine geoscience.</p> <p>Participating in the International ocean Discovery Program (IODP)</p>

## Barriers for effective knowledge transfer

Due to the different objectives and goals of industry (profit orientated) and academia (education/research orientated), various aspects of collaboration and relationships were discussed. As stakeholders supporting KT in the Blue Economy are professionals with different expertise, lack of integration was also considered a primary barrier to collaboration between stakeholders, including lack of strategies and coherent authority. From a national context, Brexit and the UK leaving the EU will have foreseen difficulties for upcoming co-operation between the UK and the other countries. The UK-EU trade deal will give UK researchers, and businesses access to Horizon Europe funding on equivalent terms as EU counterparts, including eligibility to lead projects. However, the UK will also be excluded from the new European Innovation Council Accelerator fund, which was expressly set up to provide equity investments to start-ups, university spin-offs, and SMEs [122].

## Recommendations

Communication plays an essential role in mitigating the gap between stakeholders in KT and facilitating the discussion during the boot camps and in practical collaboration has boosted these efforts. The government should take the lead role in providing more integrated platforms, (rather than just Konfer and KTP), to encourage effective and productive collaboration between stakeholders from different sectors. Facing the changing business climate inside and outside the countries, the UK government should put the financial support for entrepreneurs, such as start-ups, university spin-offs, and SMEs, at a higher priority. The government also needs to build up new international research platforms, including specifically on Blue Economy, to cooperate with European countries.

#### 10.4. IP for KT in the UK

##### National context

The UK is rated one of the most innovative countries in the world – an ‘innovation leader’ in the 2017 European Innovation Scoreboard and 23% above the EU average performance. The UK is recognised as a global leader in science and research, top in measures of research excellence [123] and home to four of the top ten universities in the world [124].

While UK score well on measures of research and innovation, it is needed to do more to ensure that translates into improvements in earning power. According to the UK Innovation Survey, **just over half of businesses are classed as innovative** [125].

**Over half of UK firms are innovative**

Of those firms:

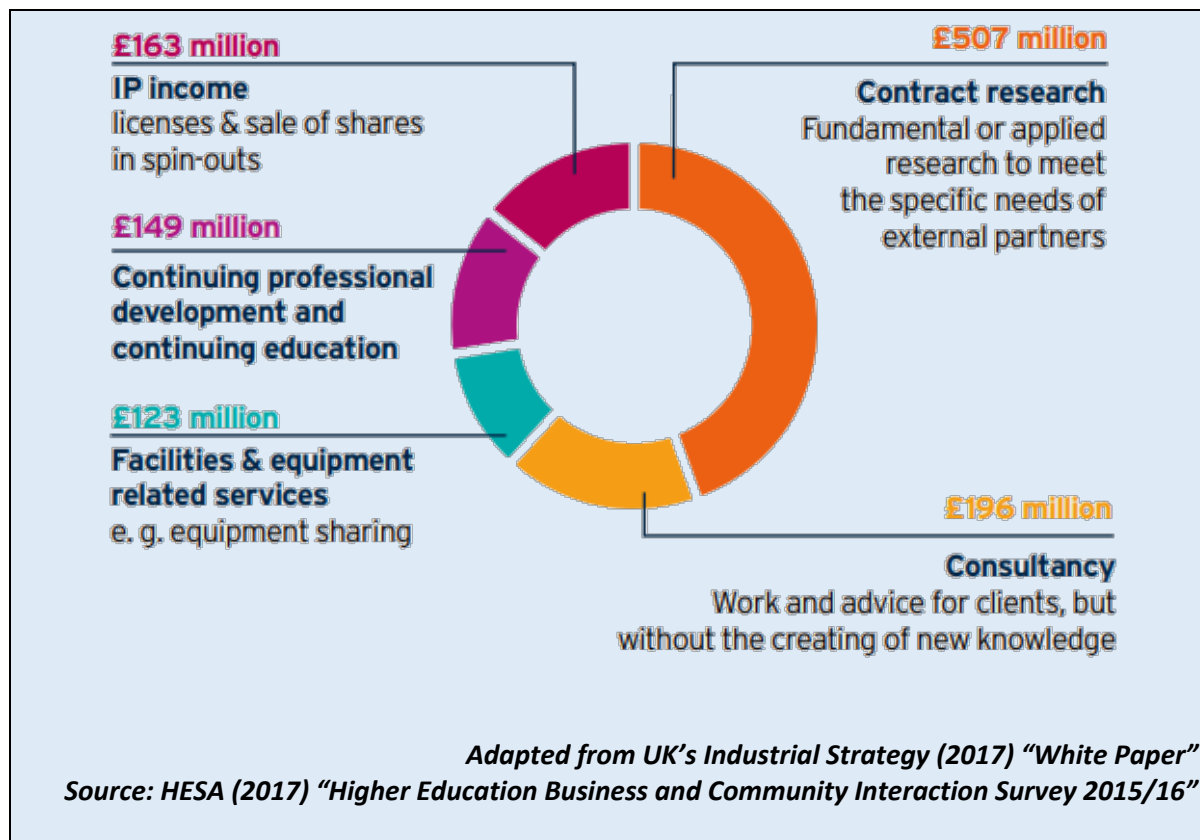
- 51% used new business practices.
- 38% used new methods of organising their work.
- 30% changed their marketing concepts or strategies.
- 25% innovated in their processes.
- 36% introduced new products.

*Based on the UK Innovation Survey Data 2015.  
Survey only includes enterprises with 10+ employees.*

**University patents, licence income and industrial collaboration are increasing** [126], and there is scope – and demand from business. The UK has a range of public research organisations that bridge the gap between business, academia, and the public sector, bringing together the best people in their fields to work side-by-side on later-stage research and development a transform high potential idea into new products and services.

**Universities earn £1.1bn from their collaboration with business.**

Income of higher education institutions from Knowledge Transfer activities with businesses



### Intellectual Property Office (IPO)

In the UK, the IPO is the official UK government body responsible for intellectual property rights including patents, designs, trademarks, and copyright. IPO is an executive agency, sponsored by the Department for Business, Energy & Industrial Strategy.

### IP Assessment of the UK Higher Education Institutions

The licencing of intellectual property and the creation of spin-out businesses have been highlighted as possible approaches that universities may wish to take to commercialise their research. It is evident that in addition to business collaborations, to maintain the UK's position as one of the world leaders in research and innovation, international collaborations will be necessary to help push scientific frontiers.

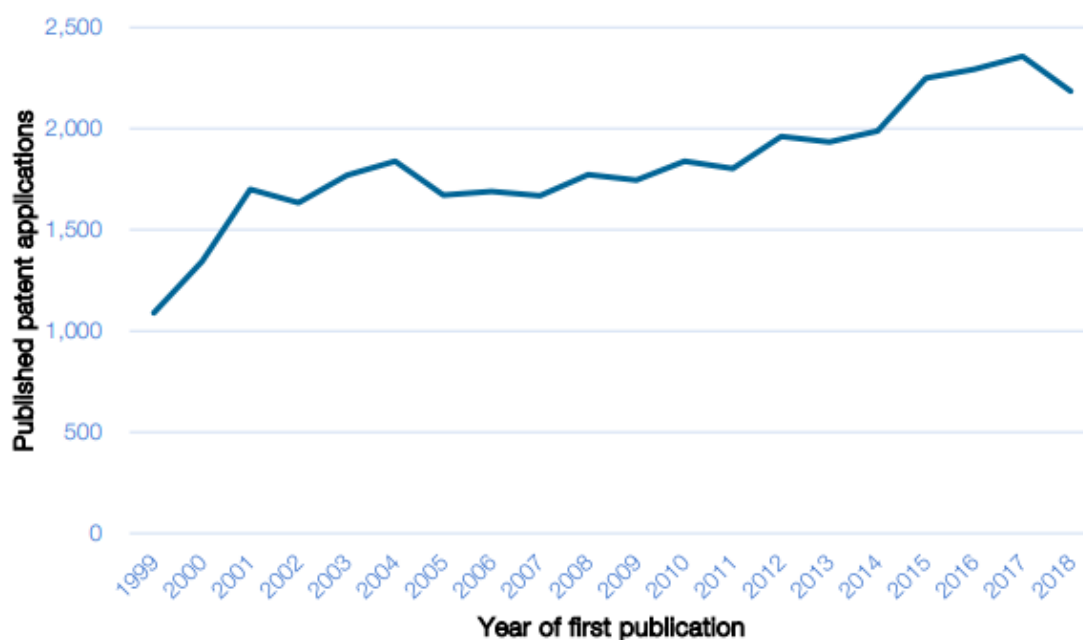
During the 1999 – 2018 period, the UK Higher Education Institutions (HEIs) were responsible for:

- 1.1% of published patent applications
- 0.3% of trademark registrations
- 0.1% of design registrations

Although the relative numbers seem low, the number of patent **collaborations between UK HEIs and businesses increased** during such period. From the period 1999 – 2008 to 2009 – 2018 there was a

17% increase the number of published patent applications featuring a UK HEI and a business as co-applicants [127].

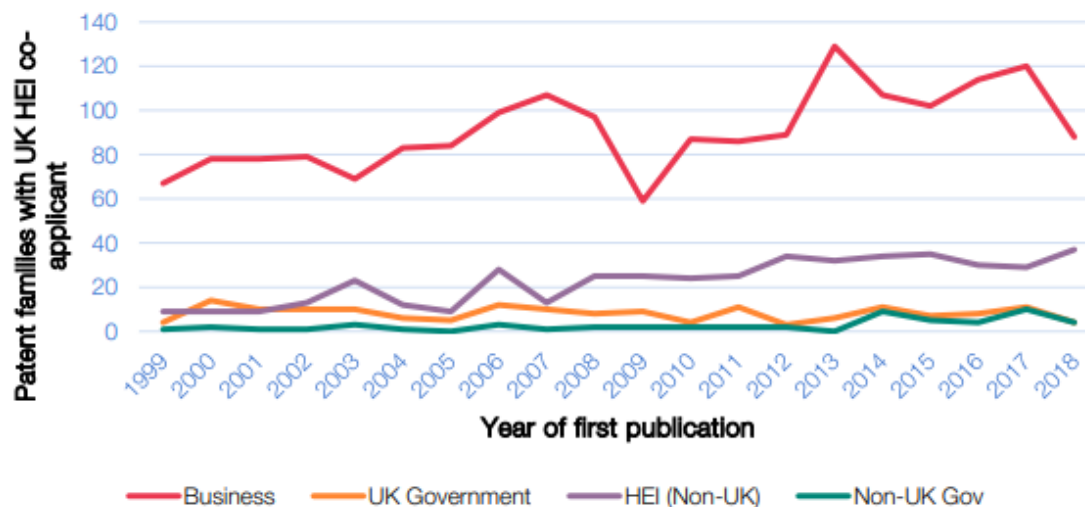
Regarding the **international collaborations** for UK HEIs have been increasing, with 62% of UK HEI patents with an international collaboration during the period 1999 – 2018 occurred since 2009, with the most noticeable increase being collaborations with the USA [127]. Other relevant countries with whom HEIs submit patents as co-applicants are Germany, France, Japan, and Canada.



Source: European Patent Office – PATSTAT

Figure 5 - UK HEI patent applications by year of first publication from 1999 to 2018.





Source: European Patent Office – PATSTAT

Figure 6 - Count of patent families from UK HEIs with a co-applicant split by the organisation type of the co-applicant from 1999 to 2018.

To maximise the potential of a patent, an applicant may wish to seek protection for their invention in multiple jurisdictions. **UK HEIs have sought protection internationally for 91% of their patent families** that were first published between 1999 and 2018.

### IP valorisation via spin-out companies from HEIs

A possible **route to maximise the impact of a university's IP is to create a spin-out business**. A university spin-out is a new company that is created to commercialise IP originating from within the university. Universities often remain stakeholders in the company and the company may benefit from having access to university workspace facilities and other resources.

The UK HEIs are increasing the rate at which they produce spin-out businesses. Of the 947 spinouts incorporated during the period 2000 – 2016, 59% have been incorporated since 2011 [128].

Approximately half of the spinouts with a registered office in London are from UK HEIs that are not based in London. The University of Oxford and The University of Cambridge have a greater tendency than other non-London based universities to produce spinouts with a registered office address in London [127].



Source: Beauhurst – Spinouts UK

Figure 7 - Count of UK HEI spinouts by incorporation year from 2000 to 2016

Of the **1095 UK HEI spinouts** incorporated since 2000, 421 (~38%) have at least 1 patent application.

Of the ones with at least 1 patent application:

- 102 of those have had a patent application before their incorporation date.
- 135 spinouts have had their first patent application within 2 years of their incorporation.

It generally takes 18 months before a patent application is first published, which suggests that the decision to pursue a patent is made early in the life of a spin-out business or that the university assigns its patent to the spin-out. Alternatively, a university may license their patent to the spin-out business.

According to the **European Innovation Scoreboard** [44], the UK was classified in 2020 as **Strong Innovator**. Over time, performance of the UK has increased relative to that of the EU in 2012. The strongest innovation dimensions are:

- Attractive research systems
- Human resources
- Employment impacts

The UK scores particularly well on Innovative SMEs collaborating with others, foreign doctorate students, venture capital expenditures, and new doctorate graduates.

The weakest innovation dimensions are:

- Intellectual assets
- Innovation-friendly environment
- Firm investments

Overall, the UK's lowest indicator scores comprise R&D expenditures in the public sector, private co-funding of public R&D expenditures, design applications, and SMEs innovating inhouse [129].

### Barriers for effective KT & Recommendations

Universities and research institutions in the UK are regarded as some of the best in the world and are set to play key roles in ambitious targets to make the UK the most innovative country in the world by 2030.

Since 2000, UK HEIs have increasingly used spinouts as a means of commercialising their IP. Most spinouts are situated close to their founding HEI. It may be worth exploring the economic impact these businesses have on the local area, and this could be done by linking the data to HM Revenue and Customs records [128]. Specifically, for the Blue Economy, utilising IP as a tool for cross sector collaboration could be extremely useful to ensure that there is no overlooked technology. Often, due to the perceived 'inaccessibility' of the maritime and marine sector, technologies from automotive or pharmaceutical industry could also be utilised in a way that has never been previously considered.

It would be recommended that Technology transfer offices should be focused on taking a long-term approach to developing IP. By also establishing long term partnerships it increases and develops a further relationship of trust and sharing of information; however, these kind of relationships are only successful when also supported at an institutional governance level. Some look primarily for short-term revenue, though the extent to which this influences Technology transfer offices practices is unclear [107]. Moreover, Technology transfer offices are often situated in the middle of complex IP negotiations, balancing competing priorities, with varying degrees of support. The relationship between the university and industry partnerships should be established with suitable staffing competency (from both sides) with extensive commercial awareness and knowledge of IP and market experience.

## 10.5. Conclusions and key findings for the UK

To transform technology transfer in the UK, both industrial, governmental, and academic communities must reflect on their practices in addition to their collaborative efforts.

### **Academic Point of View**

The UK has implemented many different funding policies such as KTPs, Catapult Network, Innovate UK and UKRI. Despite these opportunities, there are still difficulties in technology transfer via KTOs and specifically within universities lie within the inability to effectively disseminate and diffuse knowledge. To continue to valorise and manage IP in HEIs for technology transfer is within the creation of start-ups. The problems surrounding the creation of start-ups has been demonstrated to be with complexities surrounding stakeholders, academic management and those involved in the development of the technologies [130]. A further barrier is the notion of academic priority; where academic interest is driven by producing journal articles and research funding whereas industrial is more profit motivated. Technologies can get lost at an institutional level due to conflicting objectives from TTO and university policy [131]. From an organisational point of view, the bureaucratic nature of HEI can heavily impact industrial relationships. To overcome this, all UK HEIs should be required to have an established and strategic framework and policies which support technology transfer and development [132]. This framework and policies will enable and foster a cohesive, effortless, and mutually beneficial relationship between academia, TTO and industrial partners in projects.

### **Industrial Point of View**


In terms of industry, as previously mentioned (in an academic context), a discrepancy between university-industrial partnerships is a key barrier as the envisaged project for both stakeholders could be completely different. Explicitness in communications between industrial partners and HEI will ensure this barrier is reduced to manage expectations of the project [133]. Another recommendation for both industrial and academic partners is ensuring there is an alignment of strategy, timeliness of tasks and departmental capacity and competency (from both sides) as a mechanism of setting clear and achievable goals for the project [134]. Further examples include more discussion surrounding what funding is required within the sector or what will be available by UKRI and Innovate UK before rolling out the funding call. This will ensure that both industrial partners and HEI are able to sufficiently plan and prepare documents to ensure cohesion within their application.

### **Governmental Point of View**

The government is committed to raising economy-wide investment in R&D to 2.4 per cent by 2027. Innovative businesses require access to growth capital and funding for high-risk, high-reward innovation activities. Innovate UK's grant programmes and the Catapult Network provide critical support for innovative small and medium-sized enterprises, and SR20 provides at least £490 million for Innovate UK's core budgets next year. The government is investing in R&D across a wide range of areas, from 5G through to climate change programmes, driving innovation across the blue economy [135]. Within the UK, the government should take the lead role in providing an integrated platform to encourage effective and productive collaboration between stakeholders from different sectors. The government itself and stakeholders alike there are multiple departments and governmental bodies that will affect technology transfer. Fragmentation of this provides a unique challenge for the government to ensure a successful technology transfer strategy is adhered to. UK researchers will

remain eligible for European research funding despite the country having left the European Union. Therefore, further cooperation between different countries from different continents can be discussed as blue economy is an international issue. It would also be an excellent opportunity to provide a higher amount of KTP funding for implementing new technologies and provide a higher profit for society.

## 11. Key findings at AA level

	<p><b>There is a large and complex legal framework at European level that affects the Blue Economy and its sectors of activity in all Member States.</b></p>
---	--

Concerns about the access to and transfer of knowledge and technology between the triple helix on the national and the regional/international levels are becoming increasingly important, not only because creativity and innovation are crucial for competitiveness and economic growth in the knowledge based economy, but also because they may be part of the solution in some of the issues raised by complex contemporary problems and needs, for example, in the fields of climate change, health, food security or in the attempts to reduce the knowledge and technology gap between countries.

The main sources of funding will be European Structural and Investment Funds, including the future territorial cooperation programme in the Atlantic area and the European Maritime and Fisheries Fund (EMFF). In addition to the national and regional funding, the action plan will also rely on sources such as Horizon Europe, Connecting Europe Facility, LIFE programme and innovative financial instruments managed by the European Investment Bank, such as the InvestEU programme for decarbonisation and the circular economy.

The scientific and technological capacities of the countries will be fundamental to face the current challenges. Yet new organizational capacities will also have to be incorporated to enable collaborative work among multiple actors. Additionally, to achieve a greater distribution of competencies among the population that will adequately train them with the knowledge and skills necessary to participate in a society and labour market that are subject to profound changes.

Therefore, if there is a will to enhance this activity through open collaboration, it is necessary to establish permanent services which support innovation, promote mobility, enhance interaction, and encourage the exchange of ideas and projects between Universities and Business.

The table below summarises the key barriers and gaps identified within the five different areas of analysis in all participating regions, as well as related recommendations to bridge these gaps.

### Key barriers

	SP	UK	FR	IR	PT
<b>Funding</b>	<ul style="list-style-type: none"> <li>-Lack of national funding to promote university collaboration with the industry</li> <li>-Large dependency of the R&amp;D&amp;I system on public funding, also since private financing systems for innovation can be considered still emerging.</li> </ul>	<ul style="list-style-type: none"> <li>-Funds are disbursed in the form of loans.</li> <li>-Lack of mechanisms to foster SME &amp; Large businesses collaborations with research institutions (R&amp;D tax credits, VAT values, lack of assistance in finding research partners, etc.).</li> <li>-Different needs within technology transfer offices from different regions and sectors.</li> </ul>	<ul style="list-style-type: none"> <li>- Many policies (62) and actors making it difficult to understand,</li> <li>- A large part of the actions is managed at the state level, few actions are managed at the regional level.</li> <li>- Few programmes carried, created directly financed by the universities.</li> <li>- Still strong separation between universities and the private sector.</li> </ul>	<ul style="list-style-type: none"> <li>-Low funding goes to support Research Development and innovation.</li> <li>-SME and companies are not aware of the research done by universities, nor how to access to it.</li> <li>-SME, companies, and Universities are not used to collaborate.</li> </ul>	<ul style="list-style-type: none"> <li>- Existence of little investment in science for research and innovation projects (only one funding agency) more devoted to the R&amp;D projects.</li> <li>- There is a lack of funding for the capacitation of the professional of IP and KT in academia.</li> <li>- There is a lack of funding programmes in helping in the IP protection and knowledge valorisation.</li> <li>- The huge bureaucracy of structural funding, the ones that have mechanisms for the relationship between academia and industry.</li> </ul>
<b>Skills for KT</b>	<ul style="list-style-type: none"> <li>-lack of synchronisation between recruitment and obtaining funding to establish a competitive group at European level.</li> <li>- high rate of higher education graduates who suffer from a very strong underutilization of their skills and who receive low pay</li> </ul>	<ul style="list-style-type: none"> <li>-Poor Knowledge diffusion due to relatively weak science-business linkages. Low co-production and low business-funded public R&amp;D.</li> </ul>	<ul style="list-style-type: none"> <li>Lot of talents lack of private investment to enable the promising start-up to grow compared to US where big investments funds detect the promising technology creation.</li> <li>Low wages for PHD students and young researchers and difficult for them to find a position that fits with their skills.</li> </ul>	<ul style="list-style-type: none"> <li>-Lack of infrastructure and broadband in rural areas mean that it is not practical or possible for students to complete their studies remotely.</li> <li>-Low wages are paid to PhD students upon graduation and there is a lack of research jobs available to graduates in the private sector.</li> <li>-Companies are not aware of the benefits of R&amp;D&amp;I and the schemes and opportunities available to them.</li> </ul>	<ul style="list-style-type: none"> <li>- Inability of the industrial players from large to small companies to absorb the doctors of the R&amp;D institutions in addition to the low number of PhD in the business environment.</li> <li>- Doctorates do not find stable positions even in those entities created to stimulate and strengthen relations between academia and industry (the doctoral employment contracts are only listed for the period of the funds granted).</li> </ul>

<b>Exchange of knowledge between Key stakeholders</b>	<ul style="list-style-type: none"> <li>-industry sector does not have the capacity to use what is being researched</li> <li>-Lack of effective methods for transferring technology developed by the private sector or the academia into evidence-based policy</li> <li>-Difficulties in national adaptation and implementation of European guidelines into the national perspective.</li> <li>-interface stakeholders have difficulties in financing its structures and have limited resources, which affect to the main objective of creating and maintaining effective collaboration mechanisms</li> </ul>	<ul style="list-style-type: none"> <li>-Lack of integration amongst the Blue Economy stakeholders leading to a lack of collaboration.</li> <li>-Few strategies and coherent authority that promotes stakeholder collaboration.</li> <li>-Brexit will bring difficulties for upcoming co-operation between UK and other countries.</li> <li>-Exclusion of UK from the European Innovation Council Accelerator fund due to Brexit.</li> </ul>	<p>A high number of actors split between different institutions and many different programmes making it difficult to understand.</p> <p>Public research centre and public universities have just started to implement Knowledge transfer programmes.</p> <p>Difficult possibilities for local institutions to propose and create programs as they do not have the financial resources to do so.</p>	<ul style="list-style-type: none"> <li>-Businesses do not benefit from the wealth of knowledge that the Educational institutes have at their disposal.</li> <li>-Universities do not tend to carry out research that is of use to all parties, and when it is the case, businesses do not know about the benefits of the research.</li> <li>-There is a worry or fear of engagement with institutions.</li> </ul>	<ul style="list-style-type: none"> <li>-Encourage companies to strengthen relations with academic institutions and absorb their research results.</li> <li>-Promote joint programs for both student and life-long training and joint projects in line with the real needs of the industry.</li> <li>-Lack of alignment of national policies and agencies to strengthen the valorisation of knowledge.</li> </ul>
<b>IP for KT</b>	<ul style="list-style-type: none"> <li>-Measurement system to reward, recognize and give prestige to Research, Development, and Innovation (R&amp;D&amp;I) hardly contemplates Knowledge Transfer, discouraging the researcher and research institutions that promote such transfer.</li> <li>-Limited experience in the protection of intellectual property within the Innovation</li> </ul>	<ul style="list-style-type: none"> <li>-The UK universities and research institutions are the commercialising their IP through spinouts created in High Education Institutes. Although they do not study the local impact of that commercialisation, specifically for the blue Economy.</li> <li>-The maritime and marine sector are both 'inaccessible', therefore, there is no</li> </ul>	<ul style="list-style-type: none"> <li>- New organisation (SATT) dedicated to managing IP in universities but also to develop the patents into commercialisation. As there are new Their procedures are said to be complex, and the decision-making process is said to be too slow; and to have to have not</li> </ul>	<ul style="list-style-type: none"> <li>-Establish a better understanding of the value of intellectual property beyond the current mind-set of relating IP rights to individuals or private rights.</li> <li>-Make awareness of the laws surrounding IP and the patenting laws.</li> <li>-Time and costs associated with a patent are high.</li> </ul>	<ul style="list-style-type: none"> <li>- To promote the knowledge valorisation through IP in universities, but not as a simple indicator for the scientific productivity or for the R&amp;D project, but for their introduction in the industry.</li> <li>-There is a lack of long-term mechanism and/or instrument focused on developing IP in the technology transfer offices.</li> </ul>



	and Open Collaboration system -Excessive interest in commercialising results of research as quickly as possible rather than developing a long-term legal protection strategy.	technology transfer between them and other Blue Economy sectors, such as pharmaceutical industry or automotive sector. -There is a lack of long-term instrument focused on developing IP in the technology transfer offices.	enough links with the laboratories... These organisations are said to overlap with many other valorisation services, particularly those present in universities.	Furthermore, there are barriers regarding the development and promotion of a patent in a wide scale international level.	
--	---	--	--	--	--

### Key recommendations

	SP	UK	FR	IR	PT
<b>Funding</b>	<ul style="list-style-type: none"> <li>-Finding support for the process of financing Innovation and coordinate mechanisms for funding search</li> <li>-Identifying new types of private R&amp;D&amp;i investors and analysing the advantages of Business Angels</li> </ul>	<ul style="list-style-type: none"> <li>-Funds should be disbursed in the form of grants.</li> <li>-Promote Local Enterprise Partnerships to work with their local universities.</li> <li>-Boost the identification of new sectors to collaborate.</li> <li>-General guidance for the different technology transfer offices, regardless of the region or sector difference.</li> </ul>	<ul style="list-style-type: none"> <li>-Develop relations between large groups and SMEs and local small businesses, to strengthen links between SMEs and the public research</li> <li>- Raising awareness among PhD students and researchers about the commercialisation process of a technology.</li> <li>-Enable universities and economic development agencies to propose initiatives to better link public research and the private sector through funding programmes that deal with this matter.</li> <li>-Valorise entrepreneurial experience or work in private laboratories in the criteria for the advancement of researchers in public research.</li> </ul>	<ul style="list-style-type: none"> <li>-Create synergies among SME, Universities and Learning Institutions. Raise awareness of the benefits of mutual collaborations.</li> <li>-Generate information channels that gather research, information, and knowledge to promote it and clarify who is the owner.</li> <li>-Create clear learning pathways among policy makers, Learning Institutions and SMEs.</li> <li>-Funding is vital. The only way that Institution and SME can benefit from the Knowledge Transfer is with adequate funding.</li> </ul>	<ul style="list-style-type: none"> <li>-To create a long-term mechanism and/or instrument to leverage the IP generated either in companies (and SMEs) and in research entities.</li> <li>-Reinforce the IP policies for the knowledge valorisation at national level.</li> <li>-Dedicated mechanism and/or instruments for the professionals working in the KT and IP.</li> </ul>
<b>Skills for KT</b>	<ul style="list-style-type: none"> <li>- Close the skills gap between the education on offer and the labour market by increasing cooperation between academia and industry and increasing the attractiveness of the blue sectors</li> <li>-Provision of training programmes that develop blue skills meeting the needs of employers and which</li> </ul>	<ul style="list-style-type: none"> <li>-Compulsory connections between companies and universities in different sectors.</li> <li>-Stablish specific numbers of KTP in a sector deals to encourage knowledge transfer.</li> <li>-Expand Catapult Network by increasing an integrated network among different sectors, including</li> </ul>	<ul style="list-style-type: none"> <li>Develop programmes and actions that promotes the different possibilities of employment for PhD and young researchers in the private sector (R&amp;D departments industries...).</li> </ul>	<ul style="list-style-type: none"> <li>-Make awareness among the private sector companies on the benefits of R&amp;D and the return on investment that is achievable.</li> <li>-Improve and raise collaborations with institutions to develop training methods.</li> </ul>	<ul style="list-style-type: none"> <li>-Promote dedicated programmes for joint R&amp;D projects despite the promotion of hiring doctorates and for the PhD programmes.</li> <li>-Create programmes to stimulate the</li> </ul>

	agree with the national/regional strategies and investments.	companies and universities, making special focus on the Offshore Renewable Energy Catapult.			knowledge valorisation at long-term.
<b>Exchange of knowledge between Key stakeholders</b>	<ul style="list-style-type: none"> <li>- Create tools for an effective dissemination of technological offer in the academia accessible to the industry.</li> <li>-Provide resources to associative initiatives to promote Innovation (Clusters, techno-business incubators, etc.).</li> <li>-Design mechanisms to consider societal and market needs in R&amp;D&amp;I policy making</li> </ul>	<ul style="list-style-type: none"> <li>-Generation of more integrate platforms that promotes communication amongst different stakeholders in KT (rather than just Konfer and KTP).</li> <li>-Create financial instruments for entrepreneurs, such as start-ups, university spin-offs, and SMEs, at a higher priority. The aim should be to support them to face the changes business climate has inside and outside the country.</li> <li>-Design new international research platforms for Blue Economy to cooperate with European countries.</li> </ul>	<ul style="list-style-type: none"> <li>-Promote interrelations between valorisation services of universities, technopole and SATT to create joint programs.</li> <li>-Programme created to promote knowledge transfer are quite new but implemented by many different actors at the same time in the same areas. It would be important to share good practices between the implementation of these programmes to improve them.</li> </ul>	<ul style="list-style-type: none"> <li>- Capitalise on the opportunities that are available Academically and Commercially.</li> <li>- Promote initiatives that benefit all parties and explored channels of communication to avail of the benefits.</li> <li>-Create initiatives that promote business growth by creating local incentives and initiatives.</li> <li>-Generate synergies between companies and learning institutions to benefit all in the Blue Economy.</li> </ul>	<ul style="list-style-type: none"> <li>-Create financial instruments for entrepreneurs, such as start-ups, university spin-offs, and SMEs beside the “usual” acceleration and ideas programmes.</li> <li>- Streamline the recently launched innovation portal, promoting the knowledge valorisation among the various actors and which allows the search for sectors of activity.</li> </ul>
<b>IP for KT</b>	It is necessary to stablish an adequate evaluation framework, that recognizes and reward individual effort in transmission and transfer processes of knowledge produced in universities, compatible and complementary with the one already established	<ul style="list-style-type: none"> <li>- Explore economic impact of spinouts from HEIs on the local area.</li> <li>-Use IP as a tool for cross sector collaboration (i.e., maritime, or marine sectors &amp; automotive or pharma industry).</li> <li>-Establish long term partnerships supported by institutional</li> </ul>	<ul style="list-style-type: none"> <li>- Improve the organisation of the SATT through the creation of “investment committee” that will, determine the projects to be matured, plays a key role. The quality of the recruitment of the experts who make up the committee and who are external to the SATT is decisive.</li> </ul>	<ul style="list-style-type: none"> <li>-Develop IP policies to promote the necessary technological advances of knowledge Transfer.</li> <li>-Generate information instruments that help understand the law surrounding IP, patents, company and</li> </ul>	<ul style="list-style-type: none"> <li>-Enhanced capacity of IP professionals at academic institutions and suitable mechanisms to reinforce these structures.</li> </ul>

	<p>evaluation systems for research activity.</p> <p>-Establishing specialised intellectual property advisory services in different technological areas.</p>	<p>governance level at technology transfer offices.</p> <p>-The relationship between university and industry partnerships should be established with suitable staffing competency (from both sides) with extensive commercial awareness and knowledge of IP and market experience.</p>	<p>- Close relations must be further developed with the researchers, so that detection is carried out "as close to the bench" in the laboratory as possible.</p>	<p>individual rights, and the outset of projects.</p>	<p>-Extend the disclosure of IP protection system to all actors.</p> <p>-To support the creation of technology-based spinoffs and start-ups.</p>
--	---	--	--	---	--

## 12. References

- [1] A. Campbell, C. Cavalade, C. Haunold, P. Karanikic and A. Piccaluga, "Knowledge Transfer Metrics. Towards a European-wide set of harmonised indicators," Karlsson Dinnetz, M., Luxembourg, 2020.
- [2] Commission of the European Communities, "Delivering on the modernisation agenda for universities: Education, Research and Innovation," Brussels, 2006.
- [3] European Commission, "A Digital Agenda for Europe," Brussels, 2010.
- [4] European Commission, "Developing a Maritime Strategy for the Atlantic Ocean Area," 2011.
- [5] European Commission, "Action Plan for a Maritime Strategy in the Atlantic area Delivering smart, sustainable and inclusive growth," 2013.
- [6] European Commission, "An updated action plan for a sustainable, resilient and competitive blue economy in the European Union Atlantic area," 2020.
- [7] European Commission, "Actions being taken by the EU," [Online]. Available: [https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/actions-being-taken-eu\\_en](https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/actions-being-taken-eu_en).
- [8] European Commission, "European Maritime and Fisheries Fund," [Online]. Available: [https://ec.europa.eu/fisheries/cfp/emff\\_en](https://ec.europa.eu/fisheries/cfp/emff_en).
- [9] European Commission, "European Fund for Strategic Investments. EFSI Equity Instrument. BlueInvest Fund.," 2020.
- [1] European Commission, "Funding opportunities. Calls for proposals," [Online]. Available: <https://ec.europa.eu/easme/en/section/european-maritime-and-fisheries-fund/funding-opportunities>.
- [0] <https://ec.europa.eu/easme/en/section/european-maritime-and-fisheries-fund/funding-opportunities>.
- [1] European Commission, "Blue Technology: Transfer of innovative solutions to sea basin economies," 2016.
- [1] European Commission, "Blue Labs: innovative solutions for maritime challenges," 2016.
- [2]
- [1] Bio-based Industries Joint, "BBI JU," [Online]. Available: <https://www.bbi-europe.eu/>.
- [3]
- [1] European Commission, "LIFE programme," [Online]. Available: <https://ec.europa.eu/easme/en/life>.
- [4]

- [1 European Commission, "Investment Plan for Europe," [Online]. Available:  
5] [https://ec.europa.eu/commission/strategy/priorities-2019-2024/jobs-growth-and-investment/investment-plan-europe\\_en](https://ec.europa.eu/commission/strategy/priorities-2019-2024/jobs-growth-and-investment/investment-plan-europe_en).
- [1 OECD, "OECD. Better policies for better lives," [Online]. Available: <https://www.oecd.org/>.  
6]
- [1 COTEC, "COTEC. Fundación COTEC para la innovación.," [Online]. Available:  
7] <https://cotec.es/>.
- [1 Fundación Alternativas, "Informe sobre la ciencia y la tecnología en España," 2017.  
8]
- [1 F. Conesa Cegarra, "Tópicos y realidades sobre la transferencia de conocimiento en España  
9] (I)," 16 October 2019. [Online]. Available: <https://www.universidadsi.es/topicos-y-realidades-sobre-la-transferencia-de-conocimiento-en-espana-i/>.
- [2 Gobierno de España, "Plan Estatal de Investigación Científica y Técnica y de Innovación  
0] 2017-2020".
- [2 Gobierno de España, "Estrategia Española de Ciencia, Tecnología e Innovación 2021-2027,"  
1] Secretaría General Técnica del Ministerio de Ciencia e Innovación.
- [2 CDTI, "Proyectos I+D Transferencia Cervera," [Online]. Available:  
2] <http://eshorizonte2020.cdti.es/index.asp?MP=100&MS=881&MN=2>.
- [2 Ministerio de Ciencia e Innovación, "Programa Estatal de I+D+i Orientada a los Retos de la  
3] Sociedad," [Online]. Available:  
<https://www.ciencia.gob.es/portal/site/MICINN/menuitem.dbc68b34d11ccbd5d52ffeb801432ea0/?vgnnextoid=9214d1072606c610VgnVCM1000001d04140aRCRD>.
- [2 CTA, "WP8: Create a positive influence in public innovation policies and funding  
4] mechanisms for EST KT. Action nr. 1: Assessment of Blue Economy state of the art," Interreg Atlantic Area. EMPORIA4KT, 2020.
- [2 CDTI, "Misiones Ciencia e Innovación," [Online]. Available:  
5] <http://www.cdti.es/index.asp?MP=4&MS=0&MN=1&textobuscado=misiones&tipo=1&TR=A&IDR=38&tipoO=Contenido&id=2901&xtmc=misiones&xtcr=22>.
- [2 Ministro de Ciencia e Innovación, "Ayudas a Plataformas Tecnológicas y de Innovación  
6] 2020," [Online]. Available:  
<https://www.ciencia.gob.es/portal/site/MICINN/menuitem.dbc68b34d11ccbd5d52ffeb801432ea0/?vgnnextoid=a17304aad8ac1710VgnVCM1000001d04140aRCRD>.
- [2 Gobierno de España, "Plan Estratégico de Innovación y Desarrollo Tecnológico. Pesca y  
7] Agricultura. 2014-2020".

- [2 CEI-Mar, “CEI-Mar. Campus de Excelencia Internacional del Mar,” [Online]. Available:  
8] <https://campusdelmar.com/>.
- [2 COTEC, “Informe COTEC 2020,” 2020.  
9]
- [3 V. Larraga and M. Barbacid, “Conclusiones y recomendaciones.,” in *2.º Informe sobre la*  
0] *Ciencia y la Tecnología en España*, 2019.
- [3 European Commission, “020 European Semester: Assessment of progress on structural  
1] reforms, prevention and correction of macroeconomic imbalances, and results of in-depth  
reviews under Regulation (EU) No 1176/2011,” Brussels, 2020.
- [3 F. Trincardi, M. Cappelletto, A. Barbanti, J.-F. Cadiou, A. Bataille, M. Campillo Llanos, C. E.  
2] Chacón and A. Trujillo Quintela, “BLUEMED. Preliminary Implementation Plan D2.9,” 2020.
- [3 Gobierno de España, “Instituto Español de Oceanografía,” [Online]. Available:  
3] <http://www.ieo.es/es/>.
- [3 Clúster Marítimo Español, “Clúster Marítimo,” [Online]. Available:  
4] <https://www.clustermaritimo.es/>.
- [3 Centro Tecnológico del Mar, “CETMAR,” [Online]. Available: <https://cetmar.org/>.  
5]
- [3 European Commission, “Blue Bioeconomy Forum,” [Online]. Available:  
6] <https://webgate.ec.europa.eu/maritimeforum/en/frontpage/1349>.
- [3 ABEMEC, “ABEMEC Mechanisatie Op Maat,” [Online]. Available:  
7] <https://www.abemec.nl/online-info-avond-vantage-agrometius/>.
- [3 European Aquaculture, “EATIP,” [Online]. Available: <http://eatip.eu/>.  
8]
- [3 European Fisheries Technology Platform, “EFTP,” [Online]. Available: <http://eftp.eu/>.  
9]
- [4 European MSP Platform, “MSP-Platform,” [Online]. Available: [https://www.msp-0\] platform.eu/](https://www.msp-0] platform.eu/); .
- [4 Waterborne, “Waterborne,” [Online]. Available: <https://www.waterborne.eu/>.  
1]
- [4 European Community shipowners' Associations, “ECSA,” [Online]. Available:  
2] <https://www.ecsa.eu/>.

- [4] Network of European Regions for a sustainable Competitive Tourism, “Necstour,” [Online].  
3] Available: <https://necstour.eu/>.
- [4] European Commission, “European innovation scoreboard,” 2020. [Online]. Available:  
4] [https://ec.europa.eu/growth/industry/policy/innovation/scoreboards\\_en](https://ec.europa.eu/growth/industry/policy/innovation/scoreboards_en).
- [4] Gobierno de España, “Oficina Española de Patentes y Marcas,” [Online]. Available:  
5] <https://www.oepm.es/es/index.html>.
- [4] Gobierno de España, “Mercado de Tecnología,” [Online]. Available:  
6] [https://www.oepm.es/es/propiedad\\_industrial/transferencia\\_de\\_tecnologia/Mercado\\_de\\_Tecnologia/index.html](https://www.oepm.es/es/propiedad_industrial/transferencia_de_tecnologia/Mercado_de_Tecnologia/index.html).
- [4] RedOTRI Andalucía, “Patentes,” [Online]. Available:  
7] <http://www.redotriandalucia.es/patentes/>.
- [4] Crue Universidades Españolas, “Transferencia del conocimiento. Nuevo modelo para su  
8] prestigio e impulso,” 2018.
- [4] COTEC, “De la transferencia a la cooperación,” [Online]. Available:  
9] <https://cotec.es/proyecto/de-la-transferencia-a-la-cooperacion/>.
- [5] Commission nationale d’évaluation des politiques d’innovation, “Quinze ans de politiques  
0] d’innovation en France,” France Stratégie, Junio 2016. [Online]. Available:  
<https://www.strategie.gouv.fr/publications/quinze-ans-de-politiques-dinnovation-france>.
- [5] Ministère de l’économie des finances et de la relance, “French Ministry for the Economy  
1] and Finance,” September 2012. [Online]. Available:  
<https://www.economie.gouv.fr/welcome-to-the-french-ministry-for-the-economy-and-finance#>.
- [5] Ministère de l’enseignement supérieur, de la recherche et de l’innovation, [Online]. Available:  
2] <https://www.enseignementsup-recherche.gouv.fr/>.
- [5] Secrétariat Général pour l’investissement (SGPI), “Le Programme d’investissements  
3] d’avenir,” Gouvernement, [Online]. Available: <https://www.gouvernement.fr/le-programme-d-investissements-d-avenir>.
- [5] Banque Publique d’Investissement, [Online]. Available: <https://www.bpifrance.com/>.  
4]
- [5] Agence Nationale de la Recherche, [Online]. Available: <https://anr.fr/fr/lanr-et-la-recherche/missions/>.  
5]
- [5] République Française, “ADEME,” [Online]. Available: <https://www.ademe.fr/en/about-ademe>.  
6]



- [5] Ministère de l'enseignement supérieur, de la recherche et de l'innovation, "CONVENTIONS 7] INDUSTRIELLES DE FORMATION PAR LA RECHERCHE (CIFRE)," 2018. [Online]. Available: <https://www.enseignementsup-recherche.gouv.fr/cid22130/les-cifre.html>.
- [5] Ministère de l'enseignement supérieur, de la recherche et de l'innovation, "Les SATT - 8] sociétés d'accélération du transfert de technologies," [Online]. Available: <https://www.enseignementsup-recherche.gouv.fr/cid67054/les-satt-societes-d-acceleration-du-transfert-de-technologies.html>.
- [5] BPIFrance, "Appel à candidatures pour les structures d'accompagnement dédiées aux 9] startups deeptech," [Online]. Available: <https://www.bpifrance.fr/A-la-une/Appels-a-projets-concours/Appel-a-candidatures-pour-les-structures-d-accompagnement-dediees-aux-startups-deeptech-46825>.
- [6] Ministère du redressement productif, "L'INITIATIVE « FRENCH TECH »,," [Online]. Available: 0] [https://www.economie.gouv.fr/files/1\\_french-tech-presentation-generale.pdf](https://www.economie.gouv.fr/files/1_french-tech-presentation-generale.pdf).
- [6] BPIFrance, "Concours d'innovation : i-PhD," [Online]. Available: 1] <https://www.bpifrance.fr/A-la-une/Appels-a-projets-concours/Concours-d-innovation-i-PhD-46818>.
- [6] Région Bretagne, [Online]. Available: <https://www.bretagne.bzh/>.  
2]
- [6] Région Bretagne, "Innovation collaborative au croisement des filières," [Online]. Available: 3] <https://www.bretagne.bzh/aides/fiches/innovation-collaborative-filieres/>.
- [6] Ministère de l'enseignement supérieur, de la recherche et de l'innovation, "Lancement de 4] l'appel à projets "Disrupt' Campus" : soutien des formations à l'innovation numérique et à l'entrepreneuriat," 2016. [Online]. Available: <https://www.enseignementsup-recherche.gouv.fr/pid29941-cid116304/www.enseignementsup-recherche.gouv.fr/cid116304/lancement-de-l-appel-a-projets-disrupt-campus.html>.
- [6] BPIFrance, "Deeptech Tour : la tournée des campus," [Online]. Available: 5] <https://www.bpifrance.fr/A-la-une/Evenements/Le-Deeptech-Tour-47085>.
- [6] Campus Mondial de la Mer, "Ocean Hackathon, 48h pour décoder la mer," [Online]. 6] Available: [https://www.campusmer.fr/Ocean-Hackathon\\_-3367-0-0-0.html](https://www.campusmer.fr/Ocean-Hackathon_-3367-0-0-0.html).
- [6] Ifremer, "Concours d'innovation Octo'pousse : crée ta startup avec l'Ifremer !," [Online]. 7] Available: <https://wwwz.ifremer.fr/Actualites-et-Agenda/Toutes-les-actualites/Concours-d-innovation-Octo-pousse-cree-ta-startup-avec-l-Ifremer>.
- [6] SÉNAT Un Site au Service des Citoyens, "Les SATT : des structures de valorisation de la 8] recherche publique qui doivent encore faire la preuve de leur concept," 2021. [Online]. Available: <http://www.senat.fr/rap/r16-683/r16-68310.html>.

- [6 Government of Ireland, “The Research and Development Budget (R&D) 2018-2019  
9] Government Budget Allocations for R&D,” Department of Business, Enterprise and Innovation, Dublin, 2019.
- [7 Higher Education Authority (HEA), “HEA Innovation and Transformation fund to help Higher  
0] Education institutions throughout Ireland,” Government of Ireland, 2018. [Online]. Available: <https://hea.ie/funding-governance-performance/funding/innovation-call/>.
- [7 Knowledge Transfer Ireland (KTI), “Knowledge Transfer Ireland,” [Online]. Available:  
1] [www.knowledgetransferireland.com](http://www.knowledgetransferireland.com).
- [7 Government of Ireland, “Government of Ireland,” [Online]. Available: [www.gov.ie](http://www.gov.ie).  
2]
- [7 Ireland's Seafood Development Agency (BIM), “Ireland's Seafood Development Agency  
3] (BIM),” [Online]. Available: <http://www.bim.ie/>.
- [7 Údarás Na Gaeltachta, “Údarás Na Gaeltachta,” Government of Ireland, [Online]. Available:  
4] <https://udaras.ie/>.
- [7 Enterprise Ireland, “Innovation Vouchers,” Enterprise Ireland - Where innovation means  
5] business, [Online]. Available: <https://www.enterprise-ireland.com/en/research-innovation/companies/collaborate-with-companies-research-institutes/innovation-voucher.shortcut.html>.
- [7 Revenue, “Research and Development (R&D) Tax Credit,” [Online]. Available:  
6] <https://www.revenue.ie/en/companies-and-charities/reliefs-and-exemptions/research-and-development-rd-tax-credit/index.aspx>.
- [7 Foras na Mara Marine Institute, “National Marine Research & Innovation Strategy 2017-  
7] 2021,” [Online]. Available: <https://www.marine.ie/Home/site-area/research-funding/national-marine-research-strategy/national-marine-research-innovation>.
- [7 L. Ardill, “SFI awards €53m to 71 individual-led research projects,” SILICONREPUBLIC, 02  
8] November 2020. [Online]. Available: <https://www.siliconrepublic.com/innovation/sfi-frontiers-for-the-future-programme-2020>.
- [7 Ireland's Seafood Development Agency (BIM), “Knowledge Gateway Scheme,” [Online].  
9] Available: <http://www.bim.ie/schemes/knowledge,gateway,scheme/>.
- [8 NUI Galway OÉ Gaillimh, “Innovation Office at NUI Galway,” [Online]. Available:  
0] <http://tto.nuigalway.ie/>.
- [8 University of Limerick Ollscoil Luimnigh, “Technology Transfer Office,” [Online]. Available:  
1] <https://www.ul.ie/research/enterprise-and-innovation/technology-transfer-office>.

- [8] Munster Technological University (MTU), “Technology Transfer,” [Online]. Available:  
2] <https://www.ittralee.ie/en/InformationAbout/Research/ServicesToIndustry/TechnologyTransfer/>.
- [8] University College Cork, Ireland (UCC), “UCC Innovation,” Office of Technology Transfer,  
3] [Online]. Available: <https://www.ucc.ie/en/techtransfer/>.
- [8] Intellectual Property Office of Ireland, “Turning ideas into assets,” [Online]. Available:  
4] <https://www.ipoi.gov.ie/en/>.
- [8] Enterprise Ireland, “Intellectual Property Strategy Offer,” [Online]. Available:  
5] <https://www.enterprise-ireland.com/en/funding-supports/Company/Eestablish-SME-Funding/Intellectual-Property-Strategy-Offer.html>.
- [8] Department of Enterprise, Trade and Employment, “Ireland’s National IP Protocol 2019 - A  
6] Framework for Successful Research Commercialisation,” Government of Ireland, 28 March 2019. [Online]. Available: <https://enterprise.gov.ie/en/Publications/Irelands-National-IP-Protocol-2019.html>.
- [8] “FCT is the Portuguese national funding agency for science, research and technology,”  
7] Fundação para a Ciência e a Tecnologia (FCT), [Online]. Available: <https://www.fct.pt/index.phtml.en>.
- [8] Agência Nacional de Inovação, [Online]. Available: <https://www.ani.pt/en>.  
8]
- [8] Agência para a Competitividade e Inovação, “IAPMEI,” República Portuguesa - Economia e  
9] Transição Digital, [Online]. Available: <https://www.iapmei.pt/>.
- [9] República Portuguesa - Mar, “Programa Operacional MAR 2020,” European Union, [Online].  
0] Available: <https://www.mar2020.pt/>.
- [9] República Portuguesa - Mar, “Fundo Azul,” Direção-General de Política do Mar, [Online].  
1] Available: <https://www.dgpm.mm.gov.pt/fundo-azul>.
- [9] EEA Grants Portugal, “Blue Growth,” Iceland Liechtenstein Norway grants, [Online].  
2] Available: <https://www.eeagrants.gov.pt/en/programmes/blue-growth/>.
- [9] Fundação para a Ciência e a Tecnologia, “Studentships and Fellowships,” [Online]. Available:  
3] <https://www.fct.pt/apoios/bolsas/index.phtml.en>.
- [9] Programa Interface, “Capacitar a Indústria Portuguesa,” Programa Nacional de Reformas,  
4] [Online]. Available: <https://www.programainterface.pt/pt>.
- [9] Agência Nacional de Inovação, “CENTROS DE INTERFACE (CIT),” [Online]. Available:  
5] <https://www.ani.pt/pt/valorizacao-do-conhecimento/interface/centros-de-interface-cit/>.

- [9 WavEC Offshore Renewables, “WavEC marine renewable energy, offshore aquaculture and  
6] ocean engineering solutions,” [Online]. Available: <https://www.wavec.org/>.
- [9 IAPMEI, “CLUSTER DO MAR PORTUGUÊS,” [Online]. Available:  
7] <https://www.iapmei.pt/Paginas/Cluster-do-Mar-Portugues.aspx>.
- [9 Associação da Economia do Mar, “Fórum OceanO,” [Online]. Available:  
8] [http://www.forumoceano.pt/?site\\_lingua=en](http://www.forumoceano.pt/?site_lingua=en).
- [9 Agência Nacional de Inovação (ANI), “Laboratórios Colaborativos (COLAB),” [Online].  
9] Available: <https://www.ani.pt/pt/valorizacao-do-conhecimento/interface/laborat%C3%B3rios-colaborativos-colab/>.
- [1 Blue Bioeconomy Collaborative Laboratory (B2E CoLAB), [Online]. Available:  
00 <https://b2e.pt/>.  
]
- [1 CoLABA+ATLANTIC, “Unleashing the potential of the atlantic for the benefit of society,”  
01 [Online]. Available: <https://colabatlantic.com/>.  
]
- [1 GreenCoLab, “Bridging the transfer of knowledge and technology between research and  
02 industry,” [Online]. Available: <https://www.greencolab.com/green-colab/>.  
]
- [1 Agência Nacional de Inovação, “Análise da Atividade dos Gabinetes e Infraestruturas de  
03 Transferência de Conhecimento no Período 2017-18,” June 2020. [Online]. Available:  
] [https://www.ani.pt/media/5796/plusobservat%C3%B3rio-ani-an%C3%A1lise-da-atividade-gitc\\_202007.pdf](https://www.ani.pt/media/5796/plusobservat%C3%B3rio-ani-an%C3%A1lise-da-atividade-gitc_202007.pdf).
- [1 UK Government by Chris Rhodes and Matthew Ward, “Research & Development spending,”  
04 *House of Commons Library*, 2020.  
]
- [1 HM Government, “Industrial Strategy,” *Building a Britain fit for the future*, 2017.  
05  
]
- [1 European commission, “Open Innovation and Knowledge Transfer in the European Union,”  
06 2014.  
]
- [1 Science and Technology Committee, House of Commons, “Managing intellectual property  
07 and technology transfer: Government Response to the Committee’s Tenth Report of  
] Session 2016–17,” House of Commons, 2017.

[1 WECD , “The Impacts of KTP Associates and Knowledge Base on the UK Economy,” 2015.

08

]

[1 MoD (2016), “National Shipbuilding Strategy,” 2016.

09

]

[1 BEIS, “The Clean Growth Strategy,” 2017.

10

]

[1 Oil and Gas UK , “Oil and Gas UK Economic Report,” 2017.

11

]

[1 ONS, “UK trade data,” 2015.

12

]

[1 G. o. t. UK, “New clean energy projects set to power 36 million homes,” [Online]. Available:

13 <https://www.gov.uk/government/>.

]

[1 DCMS, “Guidance - Broadband Delivery UK,” 2017.

14

]

[1 European Commission, “Commission Staff Working Document - Country Report United

15 Kingdom 2019,” 2019.

]

[1 PWC, “How will artificial intelligence affect the UK economy?,” 2017. [Online]. Available: ,

16 [http://www.pwc.co.uk/services/economics-policy/insights/the-impact-of-artificial-](http://www.pwc.co.uk/services/economics-policy/insights/the-impact-of-artificial-intelligence-on-the-uk-economy.html)

]

[intelligence-on-the-uk-economy.html](http://www.pwc.co.uk/services/economics-policy/insights/the-impact-of-artificial-intelligence-on-the-uk-economy.html).

[1 ONS, “GDP Low Level Aggregates,” 2017.

17

]

[1 ONS, “UK Trade in Goods by Classification of Product by Activity and UK Trade,” 2017.

18

]

[1 ONS, "BERD, UK 2016," 2017.

19

]

[1 ONS, "Labour Productivity," 2017.

20

]

[1 M. e. al., Spatially rebalancing the UK economy: The need for a new policy model, 2015.

21

]

[1 Eurostat, "Structural Business Statistics," 2017.

22

]

[1 Elsevier, "International comparative performance of the UK Research Base 2016," 2017.

23

]

[1 QS Top Universities, "QS World University Rankings," 2017.

24

]

[1 BIS, "UK innovation survey 2015," 2016.

25

]

[1 BIS, "Encouraging a British Invention Revolution: Sir Andrew Witty's Review of Universities  
26 and Growth," 2013.

]

[1 T. I. P. Office, "IP filing habits of UK Higher Education Institutions," 2020.

27

]

[1 B. platform. [Online]. Available: <https://www.beauhurst.com/>.

28

]

[1 European Commision, "European Innovation Scoreboard 2020 - United Kingdom," 2020.

29

]

[1 A. M. D. P. M. C. M. K. Alexander, "University–industry collaboration: using meta-rules to  
30 overcome barriers to knowledge transfer," *The Journal of technology transfer*, vol. 45, no.  
] 2, pp. 371-392, 2020.

[1 K. M. M. & M. R. Miller, "The changing university business model: a stakeholder  
31 perspective," *R and D Management*, vol. 44, pp. 265-287, 2014.  
]

[1 J. A. O. P. Cunningham, "Macro, meso and micro perspectives of technology transfer," *The  
32 Journal of Technology Transfer*, vol. 43, no. 3, p. 545–557., 2018.  
]

[1 "Innovation: A knowledge transfer perspective," *Production Planning Planning*, vol. 24, no.  
33 2-3, pp. 208-225, 2013.  
]

[1 E. D. A. W. v. d. W. J. H. a. G. P. M. de Wit-de Vries, "Knowledge transfer in university–  
34 industry research partnerships: a review," *Journal of Technology Transfer*, vol. 44, pp. 1236-  
] 1255, 2019.

[1 HM Treasury, , "Spending Review 2020," 15 December 2020. [Online]. Available:  
35 [https://www.gov.uk/government/publications/spending-review-2020-](https://www.gov.uk/government/publications/spending-review-2020-documents/spending-review-2020)  
] documents/spending-review-2020. [Accessed 13 February 2021].

[1 FANBEST, "FANBEST Project. WP4. Action 4.1: Identification of the financial needs to propel  
36 innovation in Blue Economy in Atlantic Regions," Interreg Atlantic Area.  
]

[1 Redtransfer, "Recursos humanos en transferencia de conocimiento," 2019.  
37  
]

[1 Gobierno de España, *BOE*, no. 177, 25 July 2015.  
38  
]

[1 ONS, "Annual Business Survey," *UK non-financial business economy: 2016 provisional  
39 results*, 2016.  
]

[1 ONS, "Annual Business Survey," *UK non-financial business economy: 2016 provisional  
40 results*, 2017.  
]

[1 ONS, “Employee jobs, Self-employed, Employment multipliers,” 2017.

41

]

[1 GlobalData Healthcare, “Brexit deal secures UK access to EU’s €95.5B research and  
42 innovation programme, Horizon Europe,” 8 February 2020. [Online]. Available:  
] <https://www.pharmaceutical-technology.com/comment/brexit-deal-horizon-europe-uk/>.  
[Accessed 14 February 2020].