20 September 2018, Berlin

Sheraton Grand Hotel Esplanade

Societal Outcome of Academic-Industrial Collaboration

Organised by

AESIS
NETWORK FOR
ADVANCING & EVALUATING THE SOCIETAL IMPACT OF SCIENCE

ELSEVIER

In partnership with

Technologie Allianz

STIFTERVERBAND

Emporio I Room

Plenary Opening

Welcome by: Dr. Volker Meyer-Guckel

Dr. Matthias Graf von Kielmansegg

Dr. Matthias Gotttwald

Dr. Alison Campbell

Dipl.-Geogr. Carsten Schröder

Dr. Thomas Gurney

Emporio I Room

Plenary opening:
Word of Welcome

Dr. Volker Meyer-Guckel

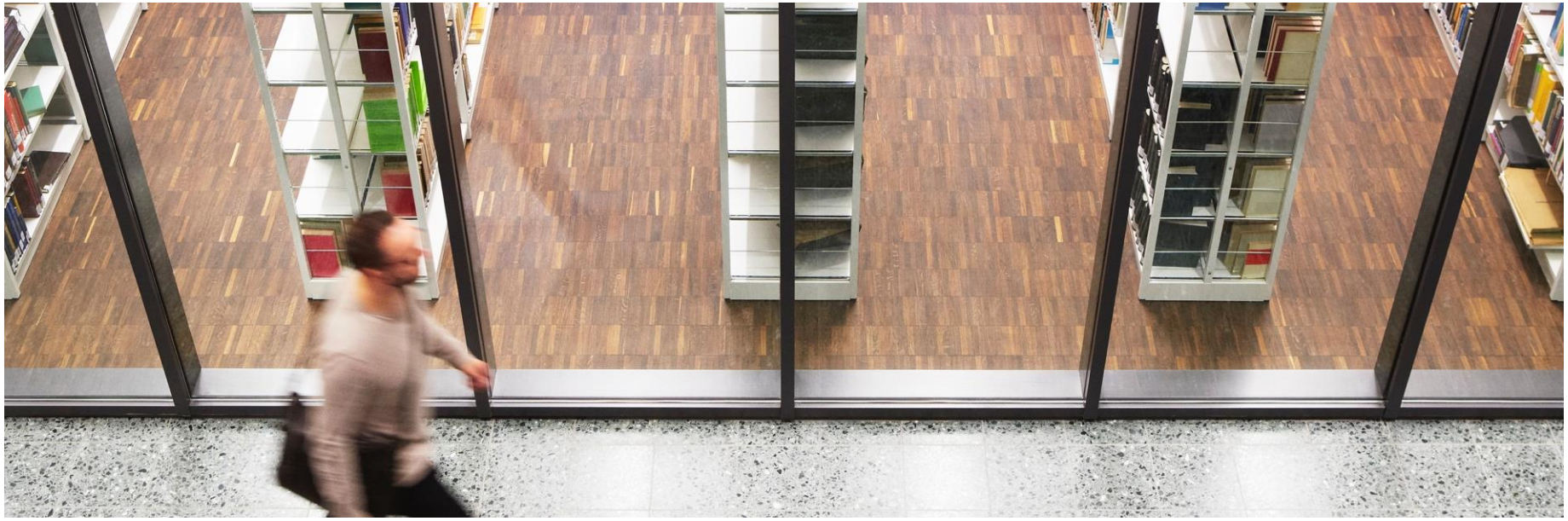
Deputy Secretary-General of the Stifterverband für die Deutsche Wissenschaft, Germany

STIFTERVERBAND
Bildung. Wissenschaft. Innovation.

Berlin, 20 September 2018

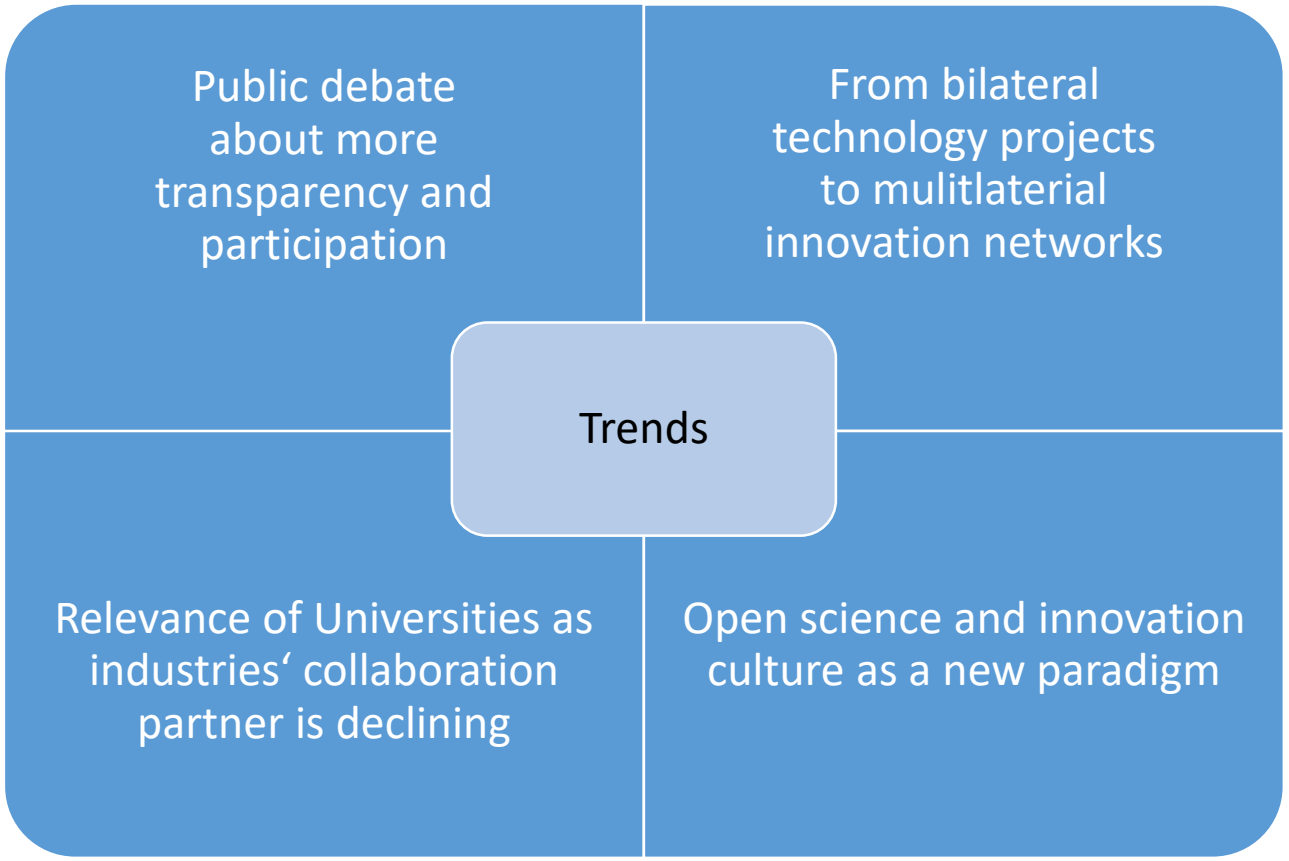
Societal Impact of Academic-Industrial Collaboration

Dr. Volker Meyer-Guckel



Academic-Industrial Collaboration

four Trends



Societal Outcome of Collaboration

Key questions to debate

- How can we strengthen the transfer potential of universities across all disciplines?
- How can we create value für industry and society?
- What is openeness in research and innovation, where does it end, and how does it contribute to value creation?
- How can universities benefit from as well as contribute to innovation ecosystems and networks?
- Do we need new rules and regulation für openess and multilateral cooperation?
- How can we measure collaboration outcome?

Emporio I Room

MinDir Matthias Graf von Kielmansegg

Head of the Department on Policy Issues, Strategy and Digital Transformation

Federal Ministry of Education and Research, Germany

AESIS

Bundesministerium
für Bildung
und Forschung

HIGHTECH STRATEGIE 2025
Köpfe. Kompetenzen. Innovationen.

Research and Innovation for the People.

The German ‚Hightech-Strategie 2025' and its Societal Impact

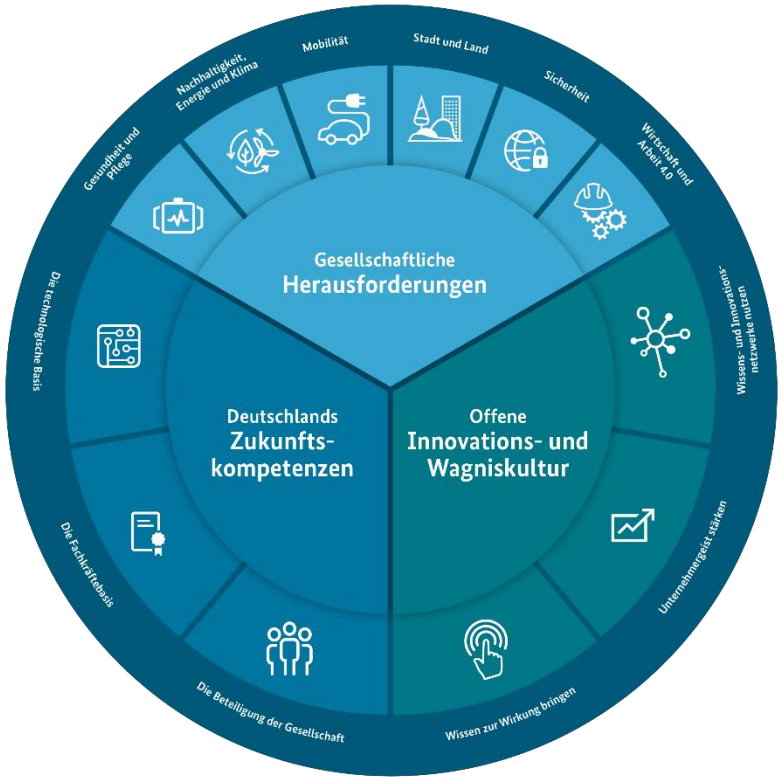
MinDir Matthias Graf von Kielmansegg
Director-General
Policy Issues, Strategy, Digital Transformation
Federal Ministry of Education and Research

AESIS seminar in Berlin, 20th January 2018

Research and Innovation Policy with a Future Perspective

3 fields of action

12 missions



Future needs: our three fields of action.

Societal challenges

- Health and Care
- Sustainability, climate protection and energy
- Mobility
- City and Land
- Security
- Economy and Labor 4.0

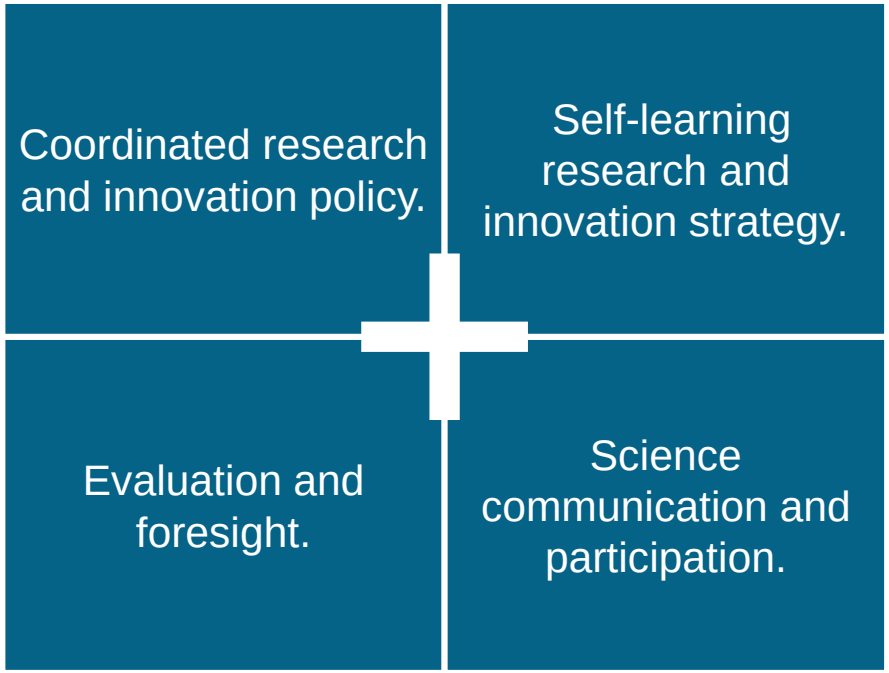
Germany's future competences

- Being at the forefront of technological progress
- Filled technology pipelines
- Modern teaching
- Strong vocational training
- International exchange
- Making use of the social sciences

Open innovation and venture culture

- Open innovation culture
- Social innovations
- Breakthrough innovations
- The state as a driver of innovation
- Innovative power of SMEs
- New entrepreneurial spirit
- Cooperation/networking
- European and international innovation partnerships

The implementation of HTS 2025: Coordinated. Learning. Looking ahead. Participative.

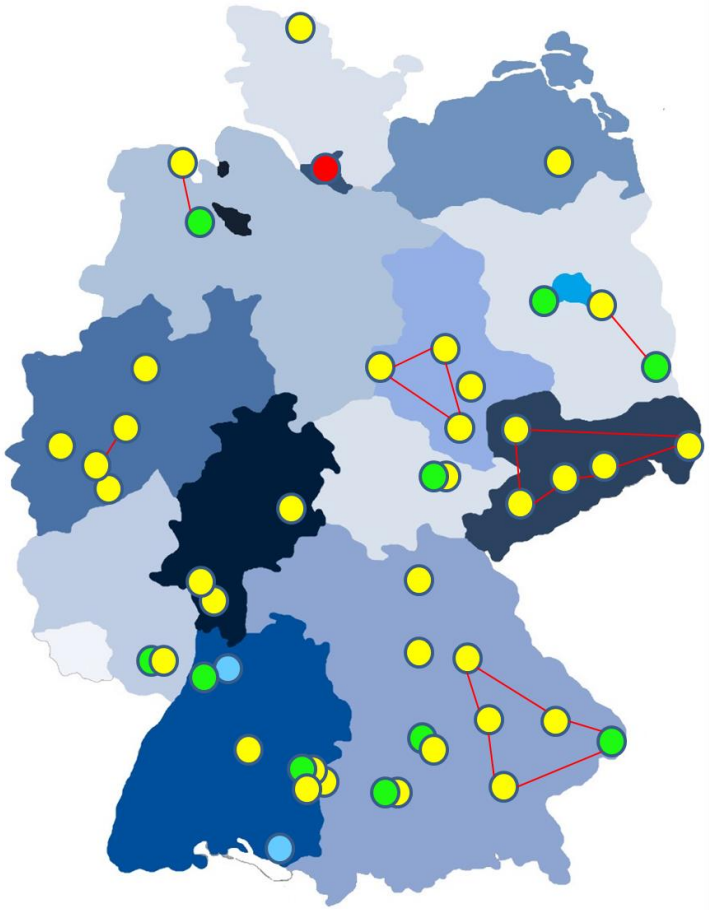


Towards an open innovation culture – mission „New Sources for New Knowledge“

Open Access
Open Science
Open Data
Open Innovation

- Measures in the High-Tech Strategy 2025 increasingly address the **interface between science, industry and society** aiming at better collaboration

Funding programme Innovative Hochschule



Picture: PtJ 2017

- Focused on “**third mission**” activities
- Strengthening the **strategic role of higher education institutes** in their regional innovation systems
- **550 million euros** for two funding periods up until 2027
- **Co-funding** from the Federal level (90%) and Länder Governments (10%)
- 29 applications with **48 higher education institutes** selected for the first funding period

Measuring the impact of science …

on the society and

on people`s live!

- Demand for new approaches in monitoring (indicators) and evaluation
- BMBF already started to cope with this need

Societal outcome of academic-industrial collaboration

20 September 2018, Berlin

Emporio I Room

Dr. Matthias Gottwald

Head of R&D Policy & Networking at Bayer AG, Germany

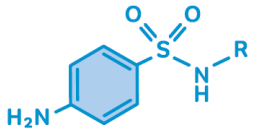
AESIS

Value of academic-industrial collaboration

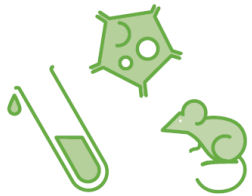
- **Matthias Gottwald**
  Bayer AG
  Pharmaceuticals R&D Policy and Networking

From molecules to medicine to integrated solutions: The long process of drug development

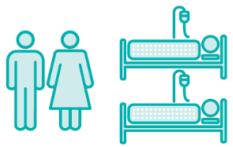
1 *Drug research*



2 *Preclinical tests*

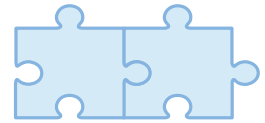


3 *Clinical trials*



4 *Approval*

Integrated Healthcare Solutions



From approx.

4million

compounds,
up to **10,000** are further tested and optimized

< 250
Test compounds

< 5 Test compounds

1 Drug approved by Health Authorities

0 years | 3 | 6 | 9 | 12 | 15

Devices

Drugs

Diagnostics

Digital Health/ Apps

External Innovation –
Role in global Research & Development

One company only represents a small portion of the global biomedical knowledge

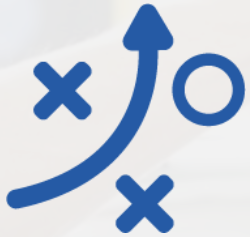
Partnerships deliver essential input

COLLABORATIONS

Are key to achieve Breakthrough Innovation

Strengthen networks and exchange of expertise in core areas

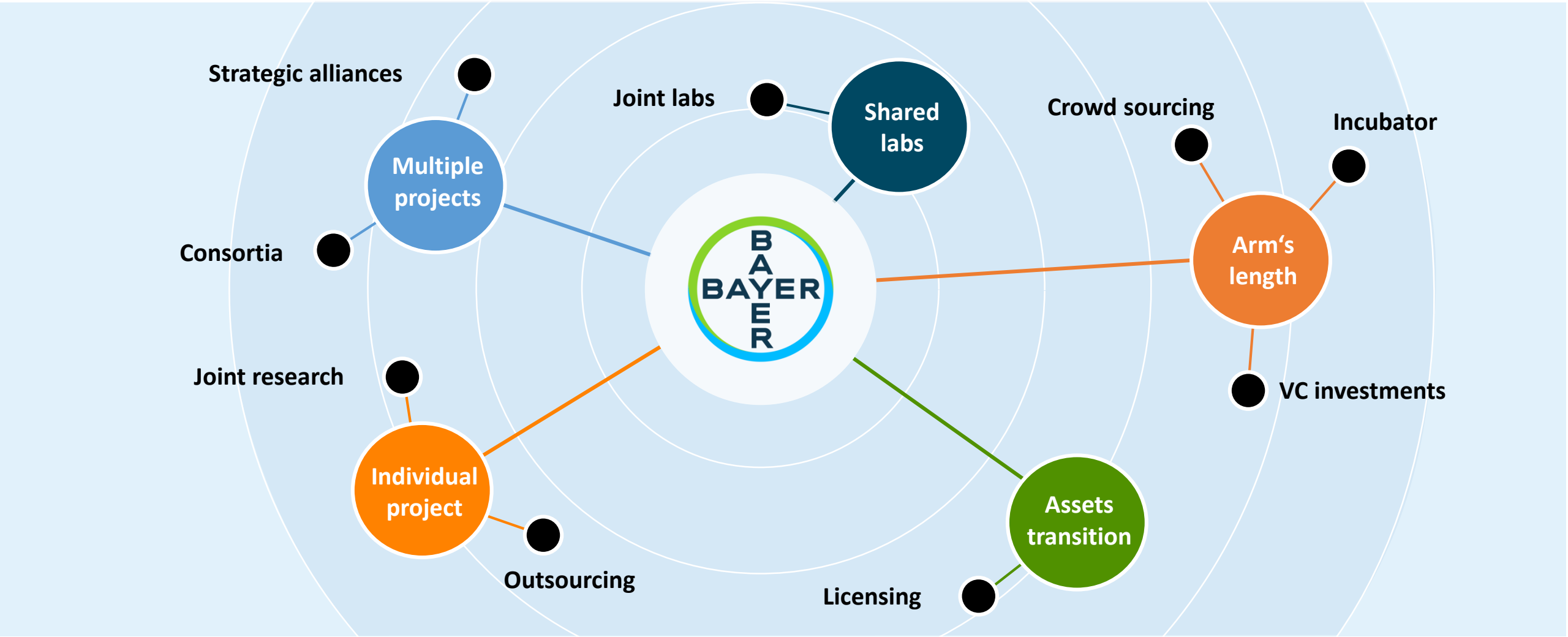
Access to assets complementing internal research and development



Allow to pursue highly complex and innovative projects that the single partners might not have moved forward

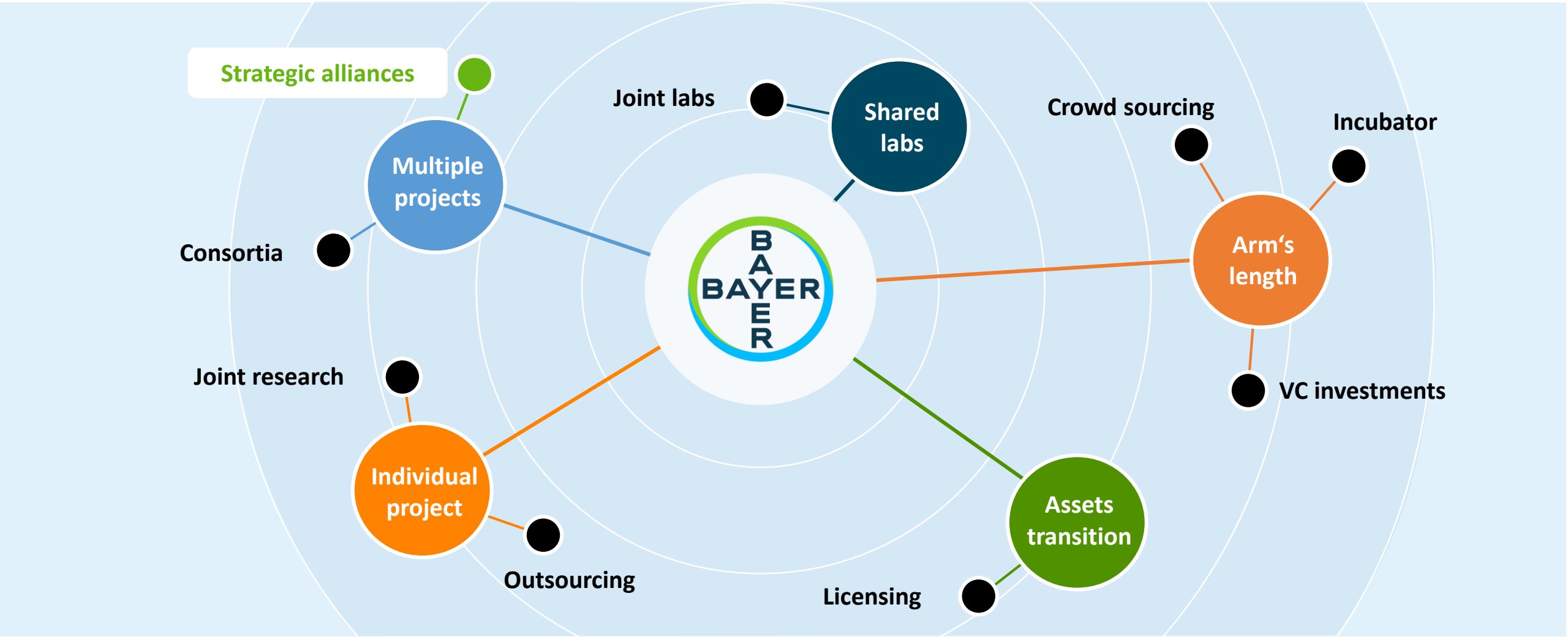
Flexible Partnering Models

Match the needs of partners



Flexible Partnering Models

Strategic Alliances



Strategic Alliances
Example Cooperation Bayer – DKFZ

Bayer and the DKFZ formed a long-term Strategic Alliance in Oncology in 2009

Combining deep knowledge on molecular mechanisms of cancer at the DKFZ with Bayers pharma R&D expertise

Develop innovative anticancer therapeutics

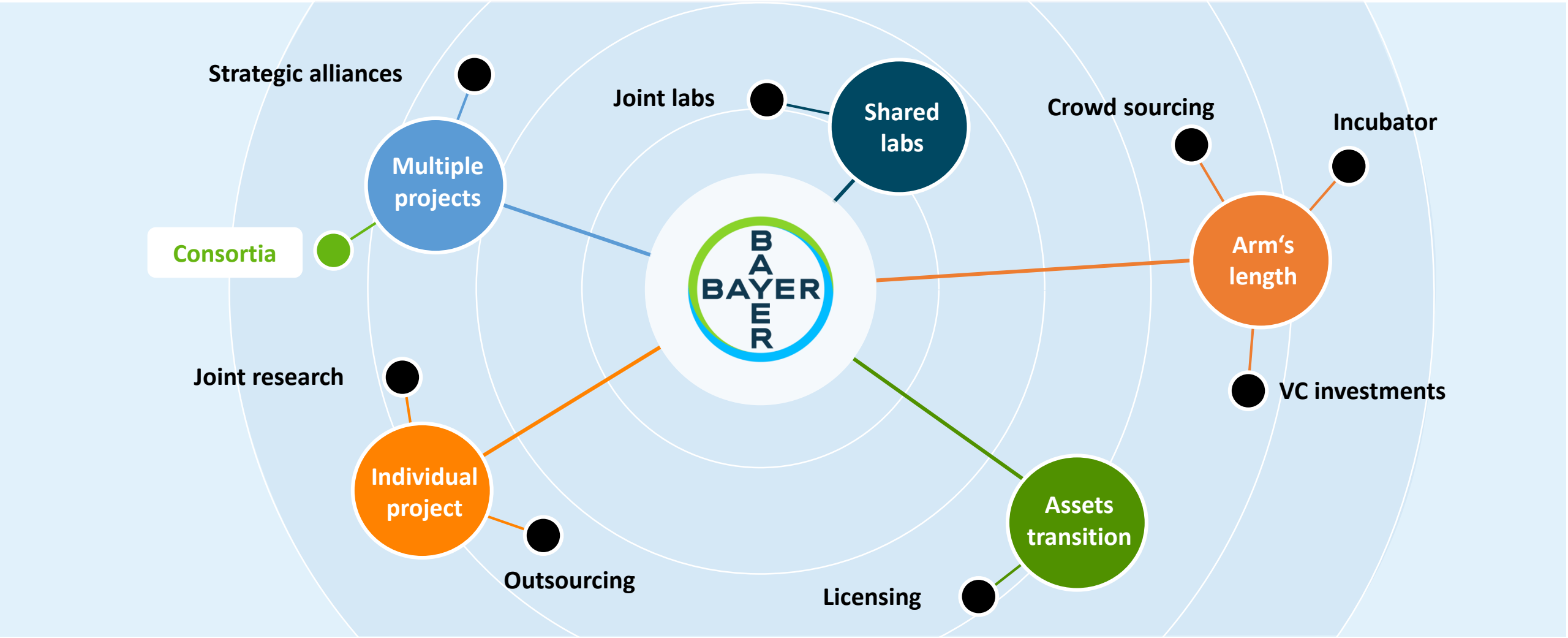
>40 joint projects initiated

2 compounds reached Clinical Phase I

Joint Immunotherapeutics Lab started 2013

Flexible Partnering Models

Consortia

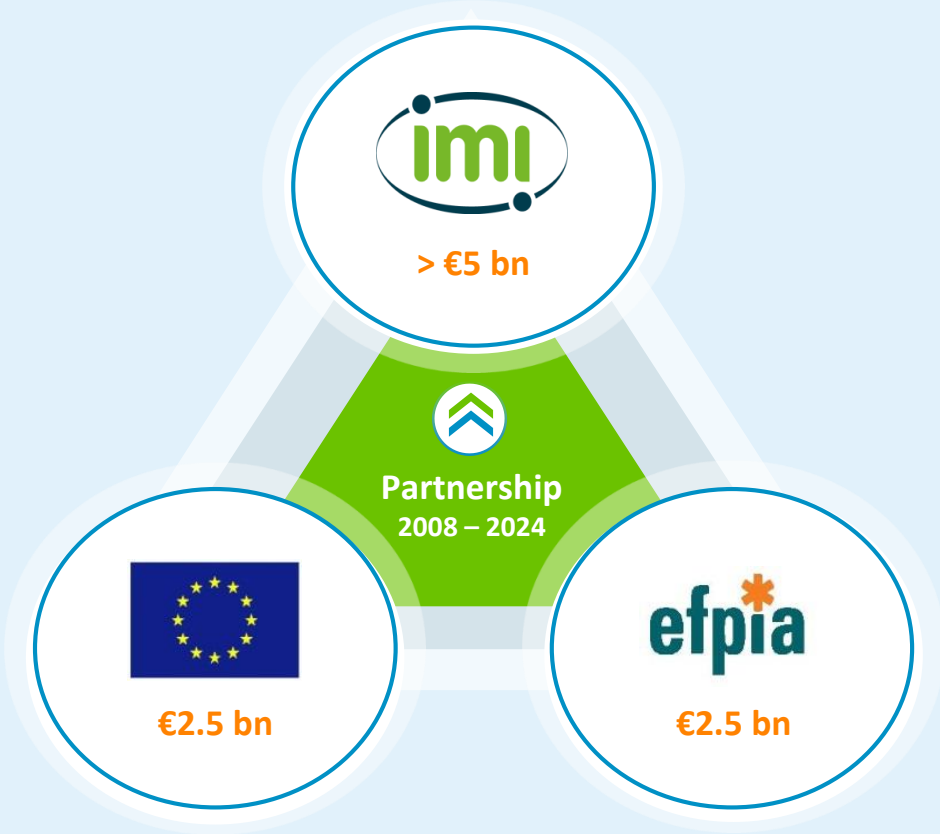


Consortia
Example Innovative Medicines Initiative (IMI)

Worldwide largest public-private partnership in healthcare R&D between the EU Commission and the European Pharmaceutical Industry

Establishing critical mass consortia to make **drug R&D processes** in Europe more innovative and efficient and to address key societal challenges

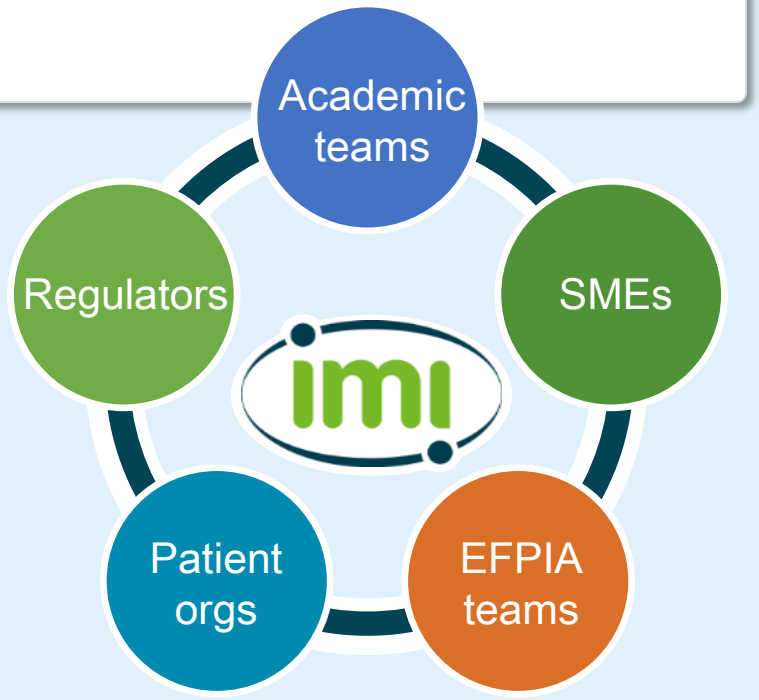
- Addressing topics **no single partner** would address alone, e.g. big data in healthcare, patient engagement in R&D
- Projects across value chain from discovery to healthcare delivery and access models
- Interaction with **various stakeholders** (incl. patient groups, authorities)



IMI establishes multi-stakeholder consortia offering critical mass & diversity

IT IS ALL ABOUT NETWORKS…

* open collaboration on shared challenges; joint decisions
* increased efficiency, shared risked
* international cross-sector community; integrating latest science into drug development



~100 consortia *>12.500 researchers*

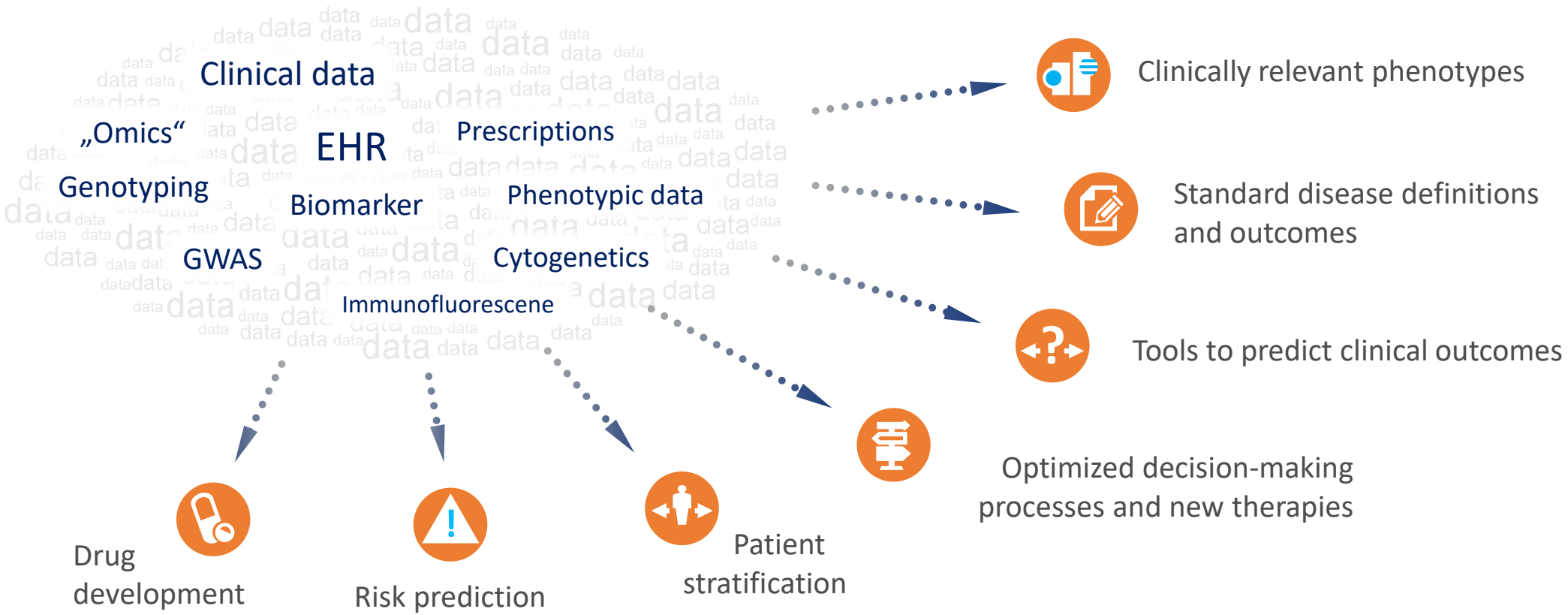
Addressing topics no single partner would address alone

Big Data for Better Outcomes (BD4BO)

- Cardiovascular diseases
- Leukemia & Lymphoma
- Prostate Cancer
- Alzheimer

Big Disease Data cohorts…

… to transform Patient Care



BD4BO projects in oncology and cardiovascular research

BigData@Heart

- Heart failure
- Atrial fibrillation
- Acute coronary syndrome

20 project partners

3 EFPIA
14 public partners
2 SMEs
1 ‚third party'

PIONEER

- Prostate Cancer

32 project partners

6 EFPIA
26 public partners

HARMONY

- Seven fields of Hemato-Oncology
  (e.g. several types of leukemia)

52 project partners

7 EFPIA
40 public partners
4 SMEs
1 ‚third party'

Improve medicinal Research and Development by

- Classification of disease subphenotypes
- Better design of clinical studies
- Personalized medicine
- Identification of the most promising treatments

Summary and Conclusion

- Partnering – complementing internal excellence – is a key to success for addressing the challenges in healthcare
- There is no one-size-fits-all solution; for each goal the right partnering model has to be found
- Governance structure of alliances should include professional alliance management from the beginning.

Requirements for a successful academic-industrial collaboration

Quality

- Ensure reproducibility of scientific results (quality of targets, animal models,…)
- Ensure adequate IP protection before publication

Understanding requirements for development of an asset

- E.g. data / tests needed for a validated target, hit, lead or preclinical development compound

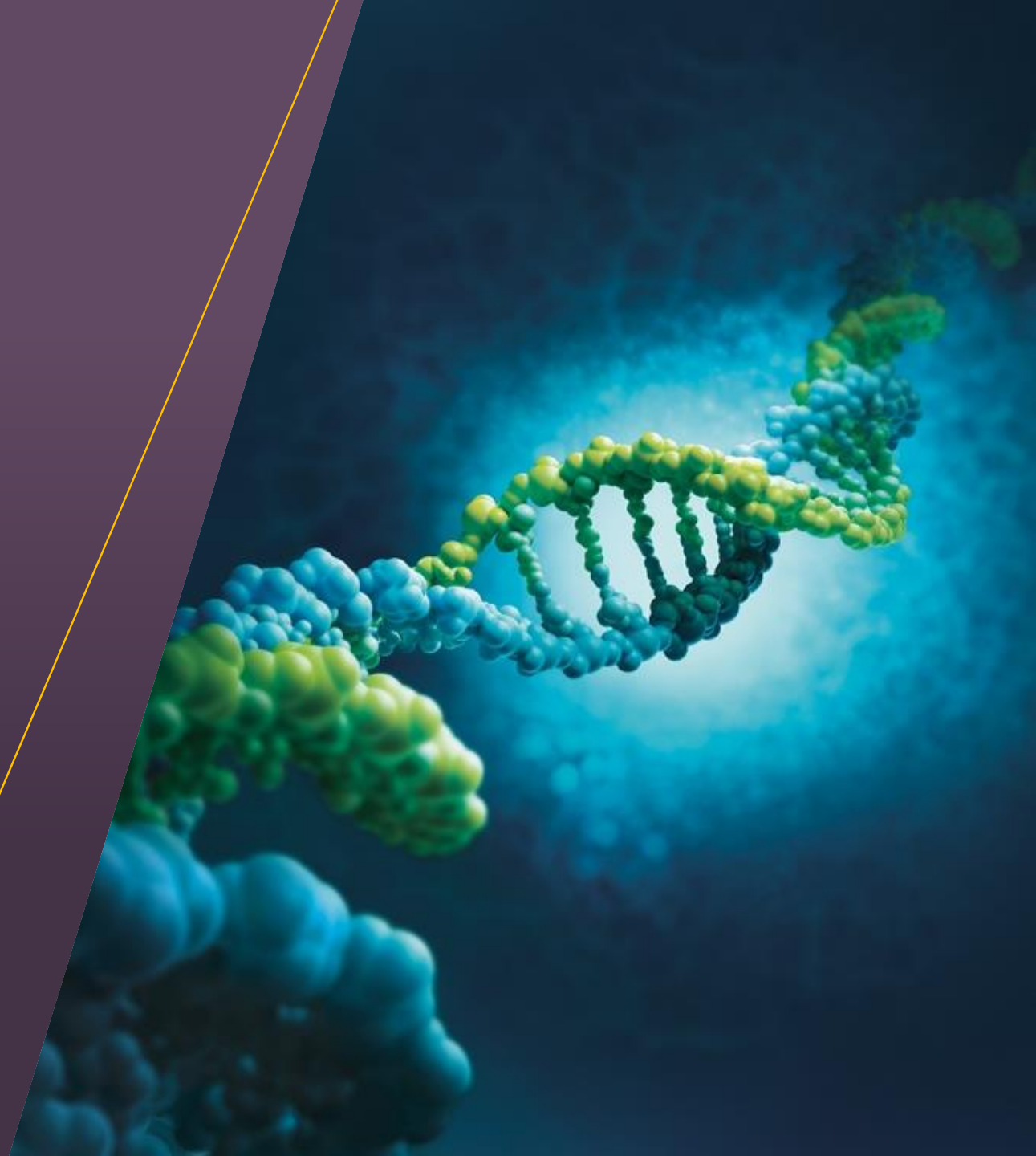
Pragmatic administrative processes for negotiation

- Reasonable understanding of realistic financial and IP terms
- Allowing access and collaboration with an institutional network across several institutes

Professional alliance management

- Joint, transparent governance structure & communication processes

Thank You!



Emporio I Room

Dr. Alison Campbell

Chair of AUTM & Director of Knowledge Transfer Ireland

Stimulating & Measuring Outcomes of Academic-Industrial Collaboration

Dr Alison Campbell OBE RTTP

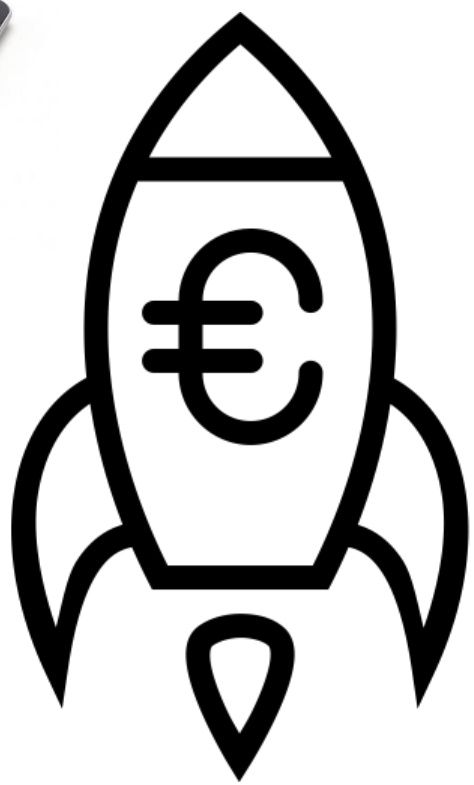
Director KTI, Chair AUTM

AESIS Conference

Berlin, 20 September 2018

Do outcomes matter?

Key components



National policy

Ireland's policy for research commercialisation includes:

- Maximise the economic and societal benefits and returns to Ireland from its public investment in research.
- The opportunity shall be taken to commercialise such IP in all possible fields, applications and territories where it is consistent with achieving Ireland's objectives.
- All enterprises, from start-ups and small and medium enterprises ('SMEs') to multi-national corporations, should be able to access and exploit IP quickly, on terms that provide fair value to all parties, and in ways that are predictable and consistent from one negotiation to the next.
- Commercialisation shall also benefit the Higher Education Institutes and State Funded Research Organisations ("Research Performing Organisations", RPOs) and provide incentives to the researchers involved in creating the IP.

Full policy objectives in Chapter 1 of national IP Protocol

National Strategy

R&D Strategy

Higher Education Strategy

Key system objectives for the higher education system 2018 – 2020

3. *Excellent research, development and innovation that has relevance, growing engagement with external partners and impact for the economy and society and strengthens our standing to become an Innovation Leader in Europe*

Benefits of knowledge/technology transfer

For HEIs

Dissemination of research results

Further development of research & expertise

Access to real world problems

Leveraged research funding

For industry & HEIs

Skills and talent development

Access to new knowledge

Access to facilities and resources

Creation of new knowledge and publications

Ability to recruit and retain good people

Reputation

Revenue

For industry

New products and services

New processes or process improvements

More competitive

Company growth

Sustainability

Jobs

Benefits of knowledge/technology transfer

For HEIs

Dissemination of research results

Further development of research & expertise

Access to real world problems

Leveraged research funding

For industry & HEIs

Skills and talent development

Access to new knowledge

Access to facilities and resources

Creation of new knowledge and publications

Ability to recruit and retain good people

Reputation

Revenue

For industry

New products and services

New processes or process improvements

More competitive

Company growth

Sustainability

Jobs

Impacts on society and the economy

A happier, healthier and richer public & environment


In 2017
164
LOAs to RPO intellectual property signed
1,324
live research collaboration agreements with industry
670
new consultancy services agreements signed
111
spin-outs thriving at least three years post-incorporation at the end of 2017
82%
of companies that signed collaboration agreements with RPOs were based in Ireland
21
new spin-out companies were formed
94%
collaboration agreements with the SME sector were with Irish SMEs
€563m
RPO research expenditure
24
new products and services were launched on the market in 2017 as the result of a licence from an RPO
116
new patent applications were filed by RPOs
455
new invention disclosures
915
jobs in Active Spin-out Companies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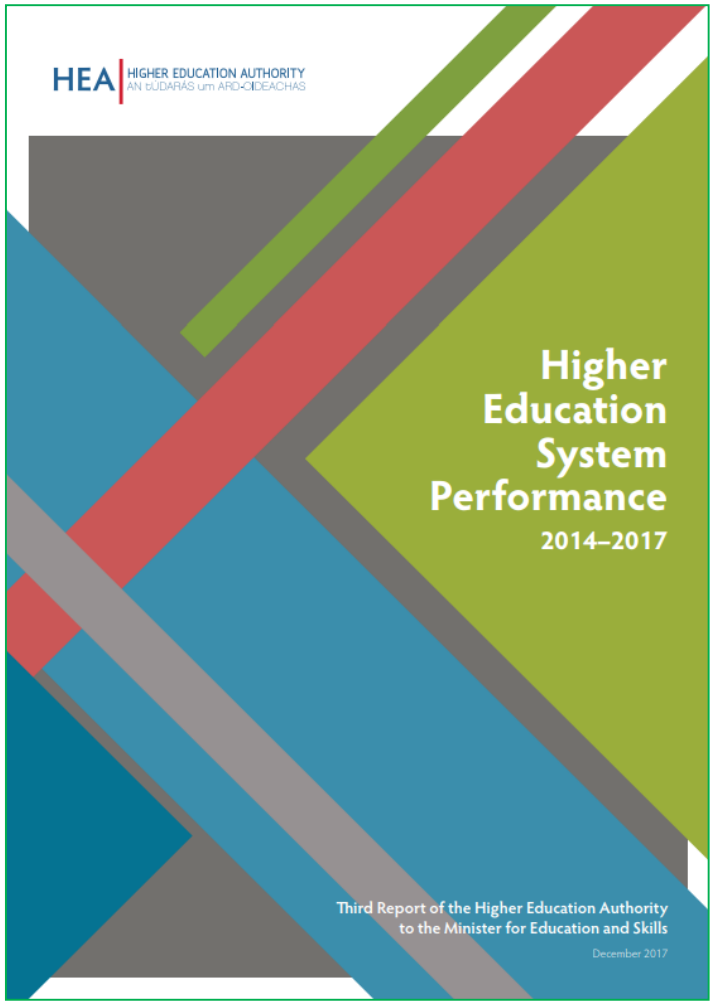
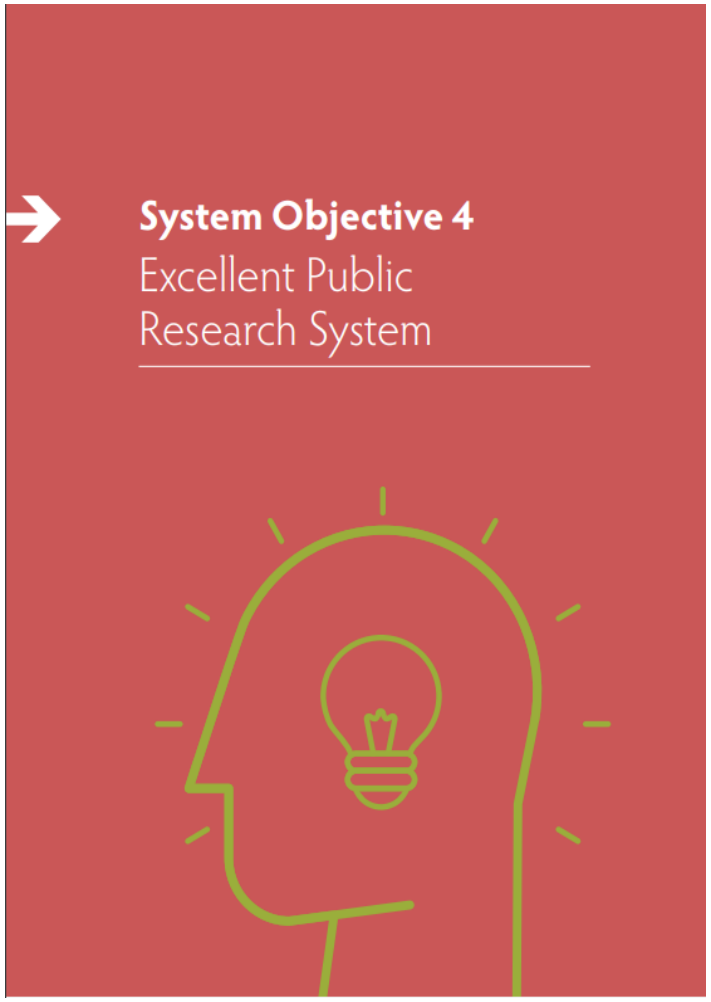
Knowledge Transfer Ireland
Where Research & Business Connect
KTI REVIEW AND ANNUAL KNOWLEDGE TRANSFER SURVEY 2017
Supported by
ENTERPRISE IRELAND
IRISH UNIVERSITIES ASSOCIATION


HEA
HIGHER EDUCATION AUTHORITY
AN tÚDARÁS um ARD-OIDEACHAS
Higher Education System Performance
2014–2017
Third Report of the Higher Education Authority to the Minister for Education and Skills
December 2017


System Objective 4
Excellent Public Research System

KTI
Knowledge Transfer Ireland
Where Research & Business Connect

KTI REVIEW AND ANNUAL KNOWLEDGE TRANSFER SURVEY **2017**

Supported by

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IRISH UNIVERSITIES ASSOCIATION

Powervation – University of Limerick spin-out operating as a subsidiary of a multinational company headquartered in Cork accessing global markets

Commercialisation timeline

- First patent application filed 2003
- Company formed 2006
- First investment 2006
- Acquisition 2015

ROHM

Summary

Powervation is a leading innovator in digital power controllers serving high performance computing, cloud and communications infrastructure markets. It employs over 40 people at its headquarters in Cork. A University of Limerick spin-out company, it was established in 2006 and ten years later, after raising over €32M private investment, the company was acquired by a Japanese multinational and operates as a fully-owned subsidiary, and the company's principal digital power design centre, in Cork. The company was based on novel technology from the University. The University licensed several patent applications to Powervation, the first of which was filed in 2003.

Establishment of the company

The science was developed over a number of years from research in University of Limerick's Circuits and Systems Research Centre, within the Department of Electronic and Computer Engineering, leading to a protectable invention in 2003. A second patent application was filed in 2006 and a third the following year. The underpinning research was funded from national and European sources. The company founding team comprised four staff from the CSRC: Dr. Karl Rinne, Dr. Eamonn O'Malley, Antoine Russell and Alan Dunne.

Company progress

The technology is based on digital power management system-on-chip (SoC) solutions. The company developed its proprietary control platform and secured industry leading customers. Through acquisition by ROHM, the combination of Powervation's platform with ROHM's leading analog power technology and global market access has enabled the company to address a broad range of fast growing market opportunities.

Investment

The degree of R&D and testing to reach the market requires considerable investment. In 2006 Powervation raised seed funding of €250K from Shannon Development and this was followed by a Series A round of investment of €7M from a venture capital syndicate the following year. Over the next eight years the company secured a further €25M in capital. In 2015 Powervation was acquired by Rohm Semiconductor (Japan). Rohm C expanded Powervation's Cork office to >40 people in 2017. As the company developed and as the external investment ramped up, the fixed percentage equity that University of Limerick held at the outset was diluted.

KTI
Knowledge Transfer Ireland
Where Research & Business Connect

Review of the outcomes reported in the KTI AKTS 2016

2

Products and services launched on the market based on licences from RPOs

The AKTS 2016 reported 26 new products and services launched on the market in that year as the result of a licence from an RPO. This is likely to be an underestimate of the actual number launched, due to the challenges of obtaining data in all situations as information may be viewed as commercially sensitive by the licensee. In some cases, the RPO may only be informed about the new product if and when royalties become due, rather than at the time of launch. The survey period of January-December 2016 relates to the product or service launch date, rather than the date of the licence, which may have been signed earlier.

After validation by the study team, two of the products reported in the AKTS2016 were excluded. The 24 validated new products and services flowed from licences executed by 11 RPOs. Ten of these new products and services were generated in Universities, nine from Institutes of Technology (IoT) and five from specialist institutes or state research bodies. The majority of these were products. Ten were services or included a service element.

The TTOs were actively involved, often from the initial research stages, supporting identification of industry partners and application to suitable funding schemes. They then worked with the Principal Investigators (PIs) at the RPO to identify tangible and intangible intellectual property arising from the research and to put appropriate protection mechanisms in place. The TTO routinely led the negotiation of the licence agreements.

2.1 Pathways to licensing

The study team examined the relationships that led to the licences that underpinned product and services launches. They found that half (12) of licences were issued to an RPO spin-out. Many of the other licences arose from collaborative research projects with industry, either funded exclusively by the partner company, or through grant-funding, most often from Enterprise Ireland and in one case from SFI and in two cases from the European Union. One product/service launch was the result of a licence of a student-led start-up.

2.2 Types of intellectual property underpinning products and services launched in 2016

Products and services brought to market may build on multiple types of IP. Not all of which may emanate from an RPO. Of RPO-derived IP, in 2016, a total of 29 different types of IP were transferred to generate the 24 products and services. As in previous years, about a third of the licences are based on patents originally filed by the RPO. A slightly smaller number of the licences are based on software code and algorithms.

Figure 1: Source of products and services brought to the market in 2016 by type of institution (n=24)

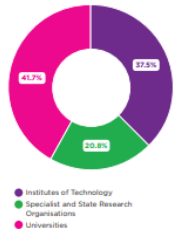
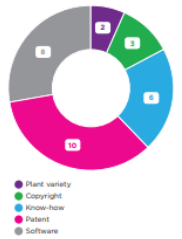


Figure 2: Types of IP rights licensed from RPOs that led to products and services launched in 2016 (n=29)

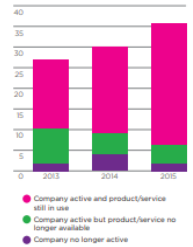


3.4 Products and services that are still in use

This year's study investigated all the products and services that had been launched onto the market between 2013 and 2015 based on IP licensed from the Irish RPOs to establish whether these products and service are still in use and, if not, whether this is because the licensee company is no longer active or because the technology is no longer being used. The study team used a combination of public data and information reported by the licensee to the TTO. A total of 67 products and services were found to be still on the market. This is likely to be an underestimate, as the team was unable to establish the definitive status for some of the products and services through the available information.

From the available data, as might be expected, fewer of the earlier launches remain in use today. In part this reflects the progress of innovation, with older products superseded as new technology is introduced. There seems to be no particular attrition trends in terms of type of IP transferred, research themes and priority areas, or ownership of the licensee company. There is, however, a slight difference in terms of the type of licensee. Proportionally more of the products and services which are still available on the market were licensed to RPO spin-out companies (62%).

Figure 10: Current status of products and services by year of original launch (n=93)



CASE STUDY

Sales and company growth at Ceramix based on a product licence from TCD

A licence to technology from Trinity College Dublin (TCD) to Ceramicx, an Irish manufacturer of infrared radiation (IR) heating elements, enabled company sales growth of 23% in 2016 compared to 2015.

The Herschel is a robot arm IR sensor technology that was developed in a research collaboration between Professor Tony Robinson's group from the School of Engineering at TCD and Ceramicx. The project was funded by Enterprise Ireland's Innovation Partnership scheme and the Herschel was subsequently licensed to Ceramicx in 2014.

Ceramicx is well established in Ireland with manufacturing facilities in Co. Cork. Ceramicx serves the aerospace, automotive and packaging industries, supplying industrial IR heating technologies to support their manufacturing processes for drying, bonding and annealing of component parts. The Herschel instrument supports the company's growing product portfolio, increasing product efficiency and facilitating bespoke client work and enabling the company's expansion of IR heating solutions to US and Asia industry. Its unique capability has raised Ceramicx profile in infrared R&D, industrial process heating and exotic materials processing in a wide variety of market sectors.

The growth of the company has facilitated an increase in the number of employees from 42 to 63 since it started working with TCD in 2012. The relationship with TCD is enduring and the company is working on two further collaborative research projects with other teams in the university.

The TTO team at TCD has supported many aspects of the commercialisation journey including project scoping, IP management and license negotiation.

Added value from the RPO: Collaborative research partnership; intellectual property; licence negotiation

Research Prioritisation Area: Processing Technologies and Novel Materials

Twitter Welcome! LinkedIn

KTI IMPACT AWARDS 2017

Licence2Market Award

Teagasc
Cheese-Making Technology Licence to Ornua Cooperative Ltd

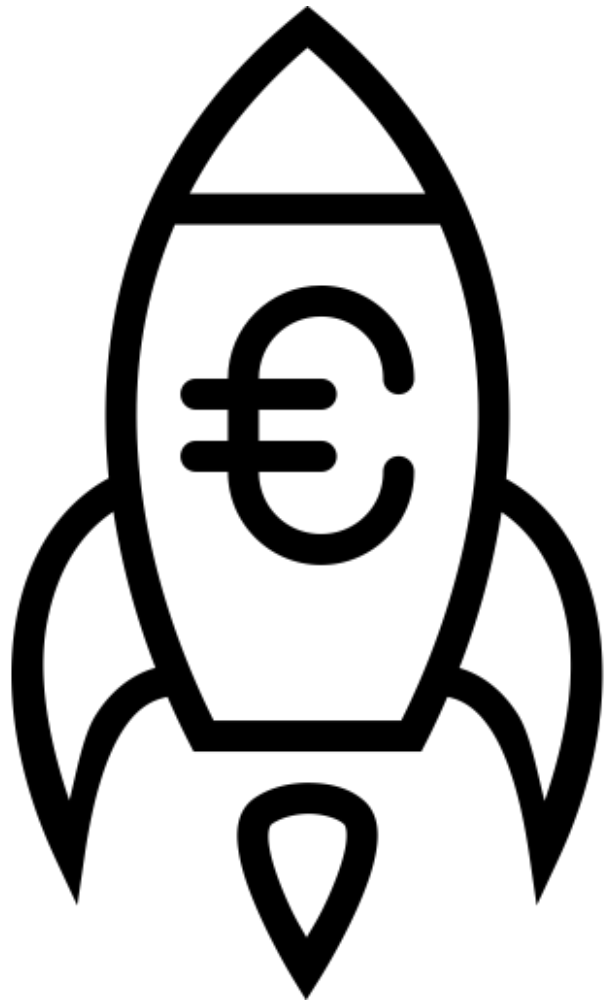
Teagasc has developed a platform technology that marks a new approach to cheese manufacturing by allowing cheese to be produced from reassembled milk without whey expulsion.

This opens the door to manufacturing cheeses in territories with shortage of fresh milk supply. The technology has been filed for patent and was licensed by Teagasc to Ornua Cooperative Ltd in 2012. Ornua Cooperative is an agri-food commercial cooperative that markets and sells dairy products on behalf of Irish dairy processors and dairy farmers. It is Ireland's largest exporter of dairy products. In engaging with the technology transfer office and researchers at Teagasc, the company foresaw potential to increase exports and routes to market for Irish dairy ingredients by exploiting the technology to make cheeses in the Middle East. The licence from Teagasc gave patent and know-how rights to Ornua for the manufacture of a range of white cheeses for the Middle Eastern markets. In March 2016, following a series of trials, prototype development and product validations and as a result of the technology licensed from Teagasc, Ornua opened a cheese manufacturing plant in Saudi Arabia launching its first product range shortly thereafter. Following positive customer feedback and with plans to extend its product range in 2017, Ornua have strong growth plans to fill the capacity of the €multi-million plant over the coming 5 years. The licence of this technology has provided valuable learnings to the relatively young TTO at Teagasc who is due to receive its first royalties on sales in 2017. The office continues its relationship with Ornua by managing the reporting and financial obligations of the licence and new collaborative projects resulting from this successful project.

Trinity College Dublin
Digital Student ID Software Licence to iDly

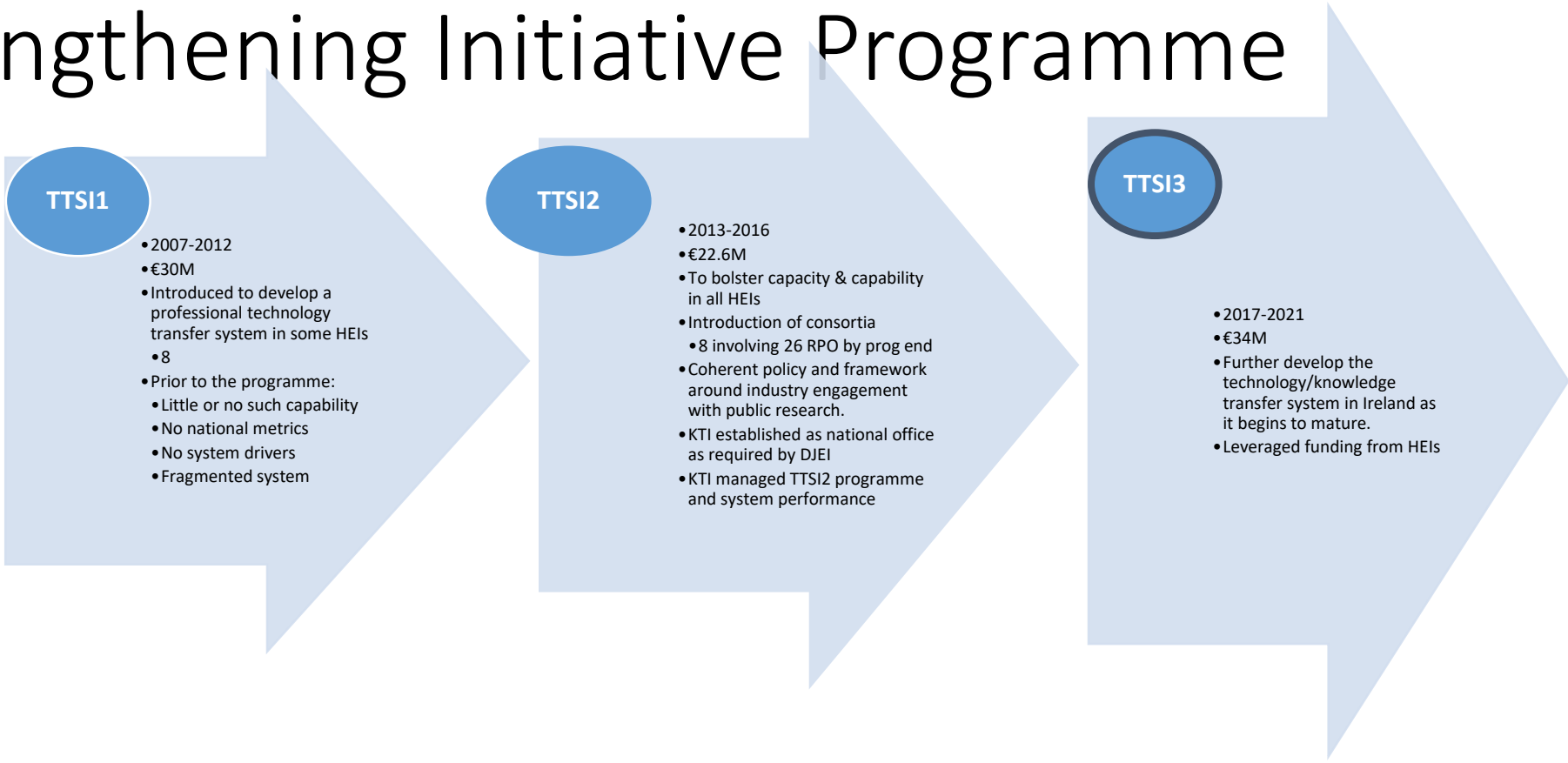
iDly is a Software as a Service company offering digital identification services.

The project that gave rise to the 'Trinity Digital Student ID' software was funded using internal Trinity resources and delivered by Trinity IT Services in conjunction with the iDly team, a Trinity College Dublin student team. The exclusive licence to the software from Trinity was instrumental in allowing the company to form and to secure funding for further technology development in the field of identification. The software was developed as a promising solution to the problem of identity confirmation when a student mislaid their physical ID but it became apparent that the solution was useful in a wide range of identity-requiring situations. The company made its first sale in 2016 to University College Cork where the product will be deployed in 2017 and has a strong pipeline of other universities in Ireland and the UK as well as clients in other sectors such as healthcare, politics and entertainment. The company plans to grow its team from 3 to 7 in 2017 and is in the process of further fund-raising to deploy its products to new customers in new sectors. Media coverage on iDly has assisted in profiling Trinity's ability to source, develop and commercialise new ideas from entrepreneurs and to raise the profile of the TTO and of commercialisation within the student population.



Ireland's Research, Development & innovation
Funders – working together to deliver impact

Funding KT: the Technology Transfer Strengthening Initiative Programme



Funding system oversight & support

KTI is Ireland's national office for business-research partnership and commercialisation with and from the research base

Our mission is to make it simple for industry & entrepreneurs to benefit from Irish research and expertise

Supported by

ENTERPRISE IRELAND
where innovation means business

IRISH UNIVERSITIES ASSOCIATION

How far have we got?

Goodhart’s law

“once a measure becomes a target it ceases to be a good measure”

- **KTI** Knowledge Transfer Ireland
- Enterprise Ireland, The Plaza,
- East Point Business Park, Dublin 3.
- T 0879714611
- E alison.campbell@knowledgetransferireland.com
- W knowledgetransferireland.com
- @kticonnect

Emporio I Room

Dipl.-Geogr. Carsten Schröder

Vice President for Research Management and Knowledge Transfer

University of Applied Science Münster, Germany

AESIS

20 September 2018, Berlin

Emporio I Room

Dr. Thomas Gurney

Analytical Services, Elsevier, The Netherlands

New German University figures on the outcome of Alliances with Industry

Dr. Thomas Gurney

Elsevier

AESIS, Berlin, September 2018

German and EU research priorities

Germany

Hightech strategie 2025

- Prioritising future challenges relative to prosperity and quality of life
- Consolidating resources and promoting transfer
- Strengthening the dynamism of innovation in industry
- Creating favourable conditions for innovation.
- Strengthening dialogue and participation

6 major themes:

- Digital economy and society
- **Sustainable economy and energy**
- Innovative workplace
- Healthy living
- Intelligent mobility
- Civil security

EU

Key Enabling Technologies

- Increased focus on innovation for key enabling technologies
- Increased focus on technology transfer and EU-wide supply chains
- Increased focus on joint strategic programming and demonstration projects

Technologies:

- **Advanced materials**
- **Chemical technologies**
- Digital technologies
- Engineering and fabrication
- Life sciences
- Nanotechnologies
- Photonics and light technologies
- Quantum technologies

Germany: https://www.hightech-strategie.de/de/leitfaden-fuer-die-zukunft-1781.html

EU: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52009DC0512

Overlap

Germany Hightech strategie 2025

Current social upheavals and rapid technological developments require new answers on how we can shape our coexistence in Germany and strengthen the cohesion in our society. The HTS 2025 shows perspectives on how Germany can successfully shape its future through research and innovation. At the same time, it should provide guidance to all actors in innovation. […] It should help to put Germany at the forefront of the next technological revolutions in order to keep jobs in Germany and to secure our prosperity. ***The promotion of new technologies goes hand in hand with investment in education and training and the involvement of society to prepare people for impending change***. […] Just as important as the commitment of the Federal Government is the commitment of business, science and society. Working hand in hand on common goals is the key to success. With the "High-Tech Strategy 2025", we want to increase spending on research and development in Germany to 3.5 percent of GDP by 2025.

EU KET

The potential of these technologies is largely untapped. ***Increasingly systemic solutions will need to evolve in order to address major societal challenges***, such as ensuring high-speed communication, ensuring food supply, the environment, finding appropriate transport solutions, ensuring high levels of health care for an ageing population, unlocking the potential of services, ensuring internal and external security and addressing the energy question. Low carbon technologies and applications will play a vital role in reaching European energy and climate change targets. For instance, CCS and CO2-related transport grids will be needed to reduce CO2 emission in countries that will continue to rely heavily on fossil energy sources. ***KETs, such as new materials for energy production, transportation and storage play an essential role.*** They could lead to better resource and energy efficiency and their environmental impact needs to be assessed in a life-cycle perspective, taking advantage of the related initiatives promoted at EU level in this context.

Overall theme: Address and improve societal challenges. One avenue is via increased collaboration between Academic, Corporate and Government research entities in key science and technology areas.

EU: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52009DC0512
DEU (translated): https://www.hightech-strategie.de/de/hightech-strategie-2025-1726.html

Sustainable economy and energy

Focus on three technologies with high importance in EU and Germany

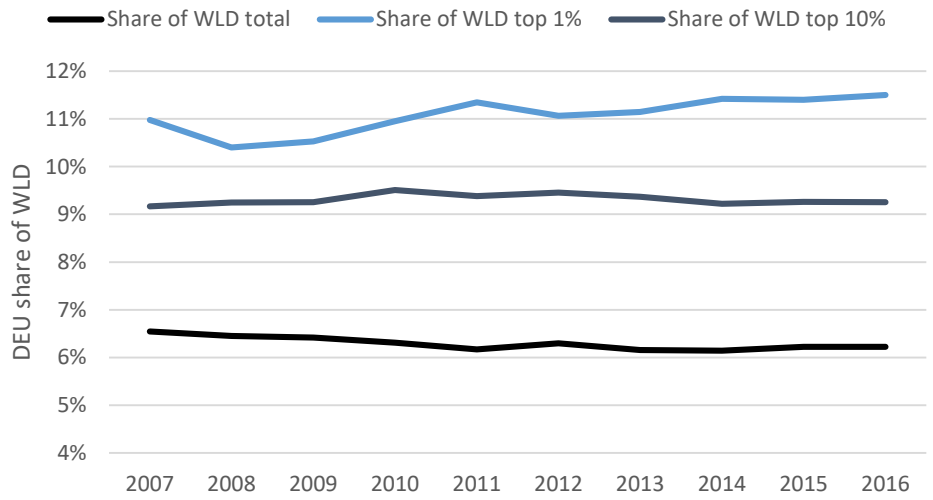
1. Energy conversion (Advanced materials)
2. Electrification / Hydrogen technology / power to gas (Chemical technologies)
3. Energy storage materials (Advanced materials)

Note: Publication output, impact, growth and excellence

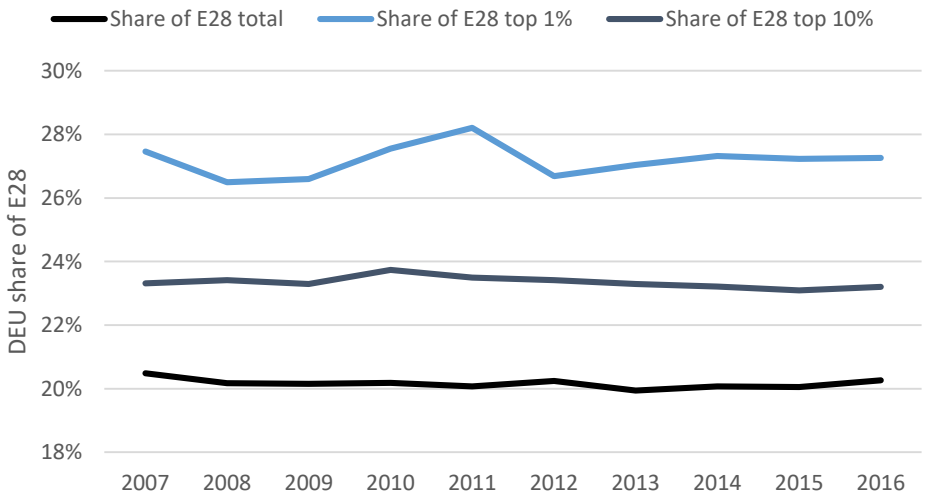
- Data provided by Scopus and ScienceDirect
- Technologies defined by field experts using keywords and journals

Overall context of German research

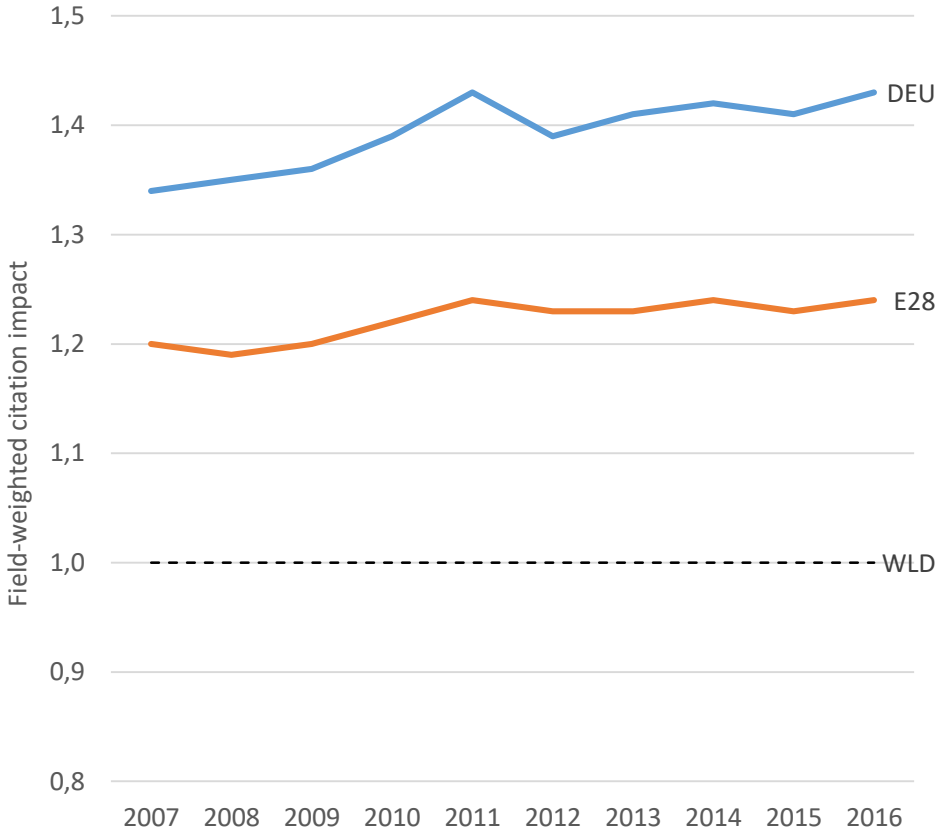
DEU/WLD



DEU/EU28

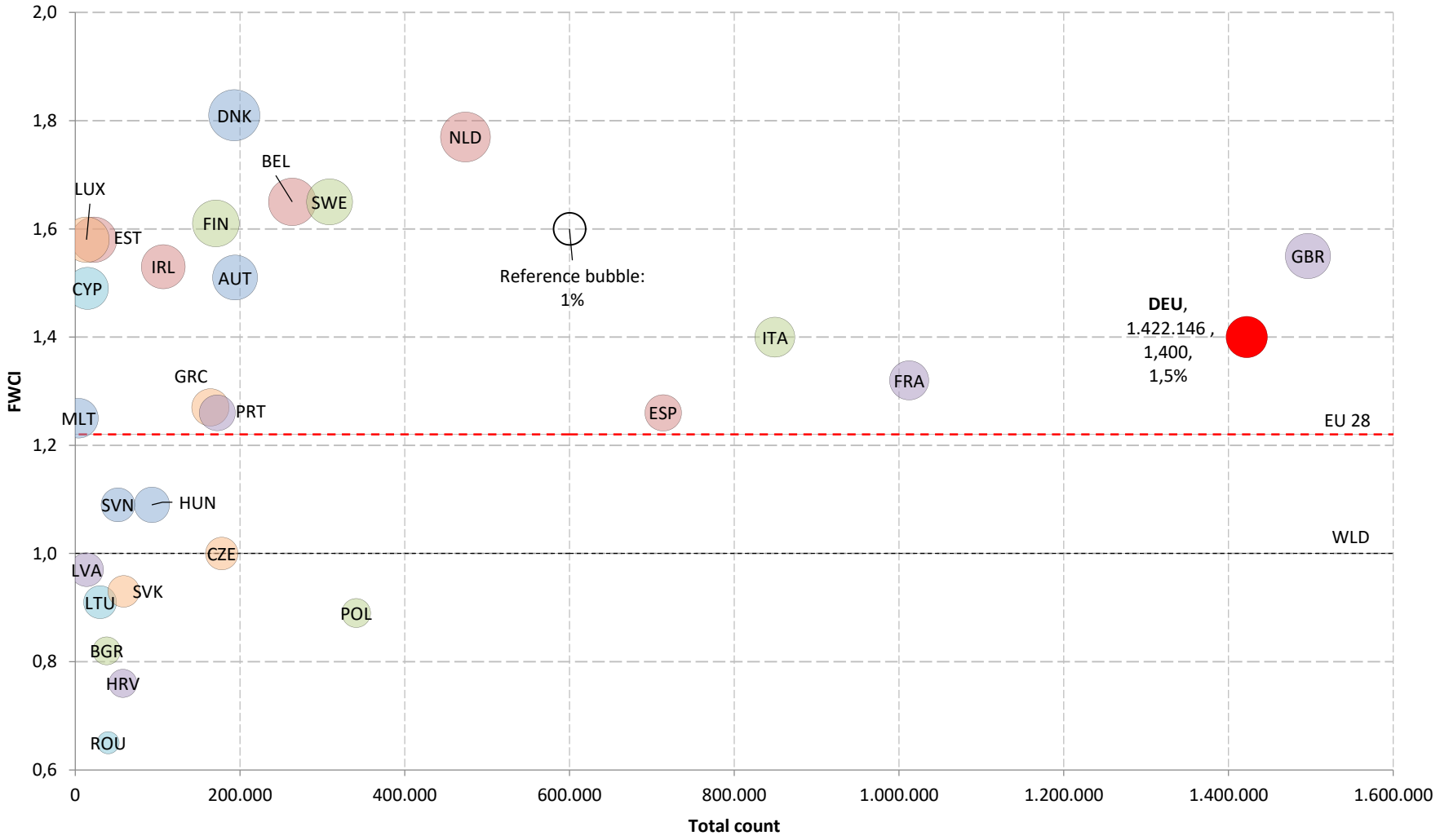


FWCI



Germany in an EU context

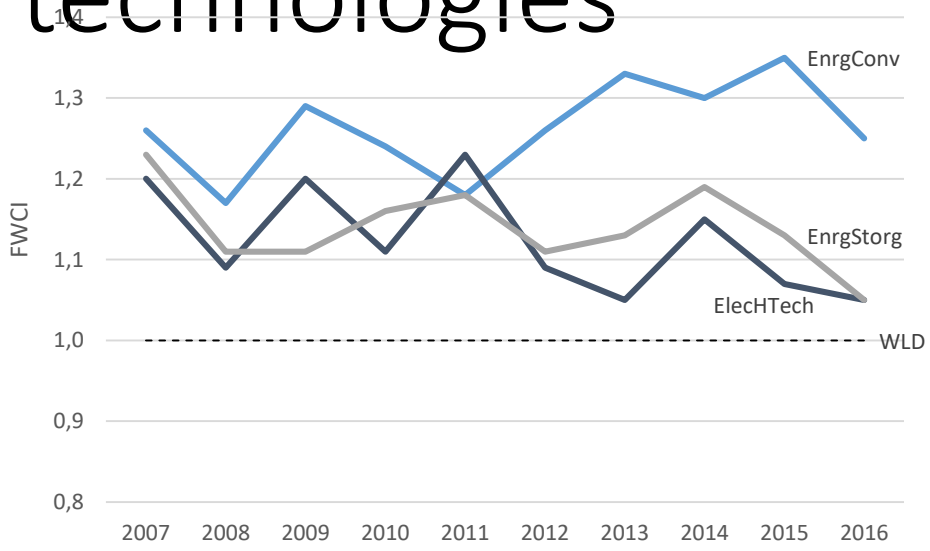
Overview of EU 28 countries' outputs, FWCI and share of publication in Top 1%, 2007-2016. Source: Scopus.

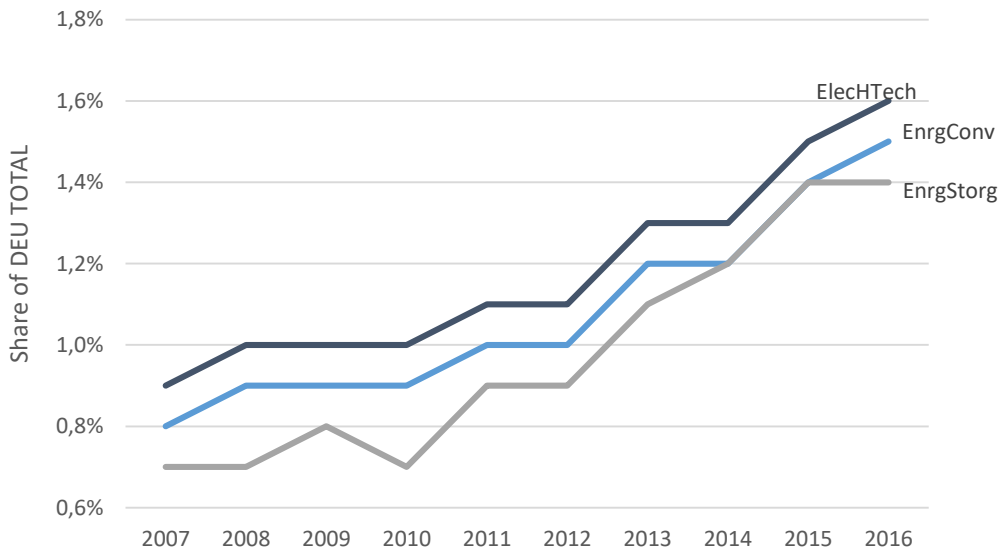


General trend

DEU (& GBR, FRA, ITA, ESP) largest producers of publications, middling FWCI, middling share of total output in Top1% cited publications

Impact and share of German output in technologies





General trend for:

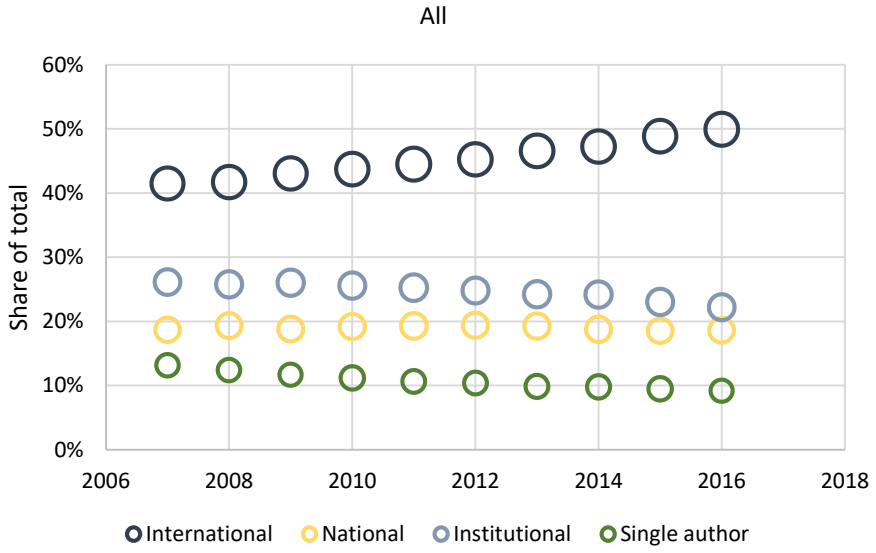
1. Energy conversion (Advanced materials)
2. Electrification / Hydrogen technology / power to gas (Chemical technologies)
3. Energy storage materials (advanced materials)

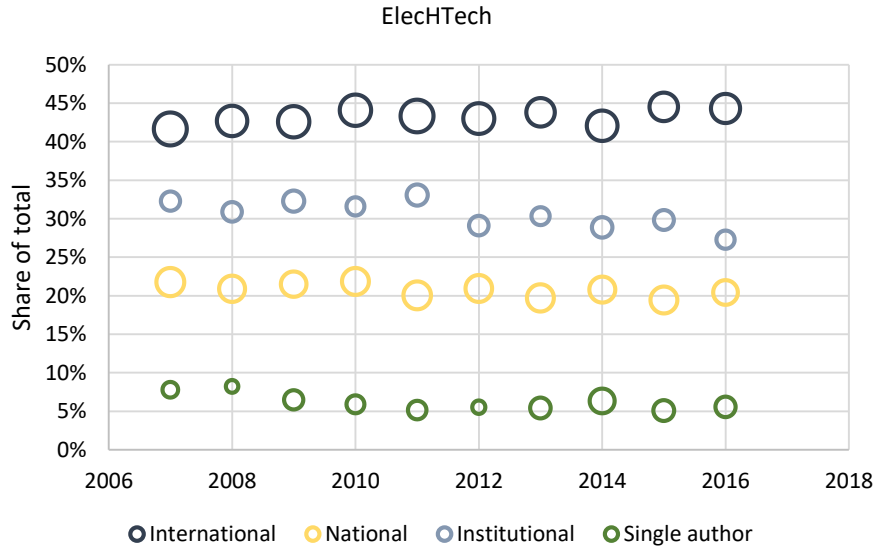
Increased share of German total output, decreasing impact

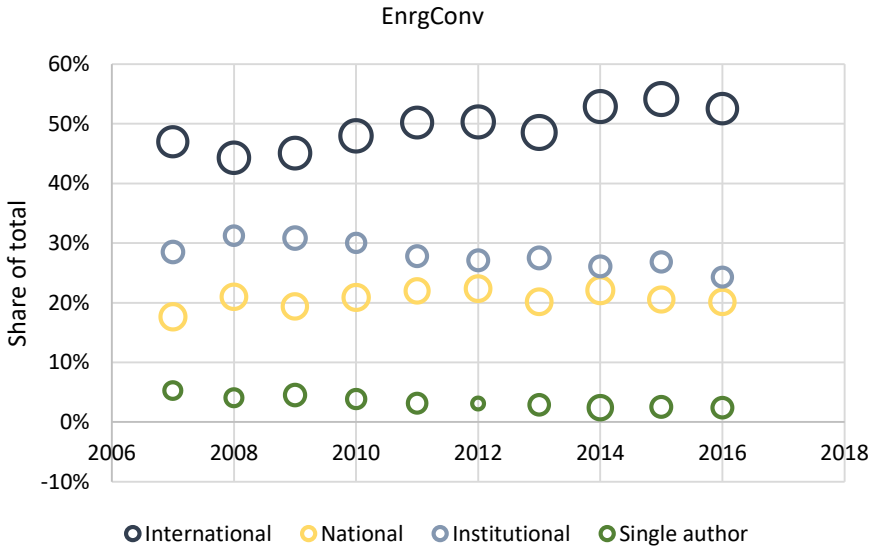
Germany compared to other EU 28 countries

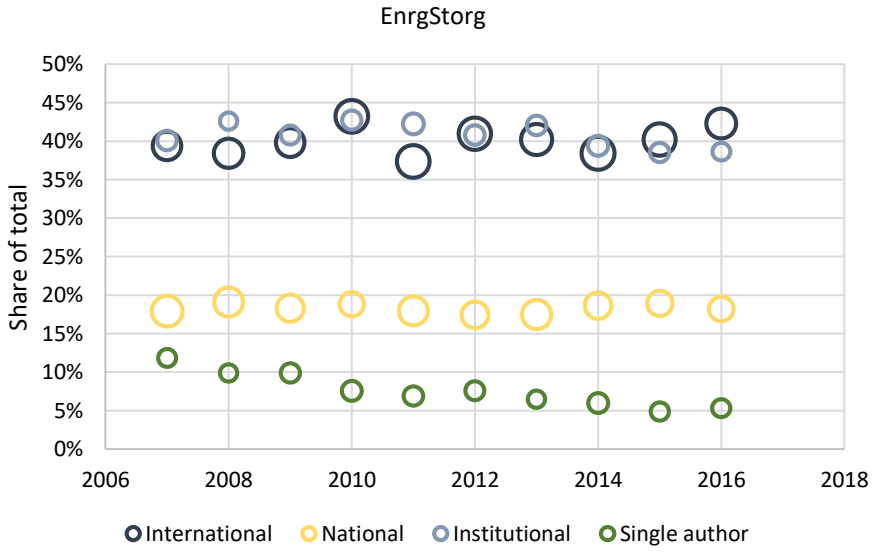
		Total		Top 1%			Top 10%		
Tech name	**Rank**	**Publications**	**FWCI**	**Publications**	**FWCI**	**% of tot**	**Publications**	**FWCI**	**% of tot**
All	1	GBR	DNK	GBR	BGR	DNK	GBR	EST	NLD
	2	DEU	NLD	DEU	EST	NLD	DEU	BGR	DNK
	3	FRA	SWE	FRA	CYP	BEL	FRA	MLT	BEL
	4	ITA	BEL	ITA	LVA	FIN	ITA	LTU	SWE
	5	ESP	FIN	NLD	SVK	SWE	NLD	CYP	GBR
EnrgConv	1	DEU	NLD	DEU	GBR	DNK	DEU	AUT	DNK
	2	GBR	DNK	GBR	ITA	LVA	GBR	NLD	EST
	3	FRA	GBR	FRA	NLD	SWE	FRA	GBR	SWE
	4	ESP	AUT	ITA	DEU	AUT	ITA	IRL	FIN
	5	ITA	IRL	NLD	FRA	EST	ESP	DEU	PRT
EnrgStorg	1	DEU	DNK	DEU	GBR	DNK	DEU	IRL	DNK
	2	GBR	IRL	GBR	ESP	EST	GBR	AUT	EST
	3	FRA	BEL	ITA	FRA	IRL	ITA	BEL	ITA
	4	ITA	CYP	FRA	ITA	DEU	FRA	GBR	SWE
	5	ESP	GBR	ESP	DNK	SWE	ESP	DNK	DEU
ElecHTech	1	DEU	DNK	DEU	GBR	DNK	DEU	DNK	DNK
	2	GBR	NLD	GBR	ESP	EST	GBR	GBR	EST
	3	FRA	BEL	ITA	NLD	DEU	ITA	DEU	PRT
	4	ITA	GBR	FRA	FRA	ITA	FRA	BEL	GRC
	5	ESP	SWE	ESP	DNK	IRL	ESP	-	ITA

International collaboration in Germany





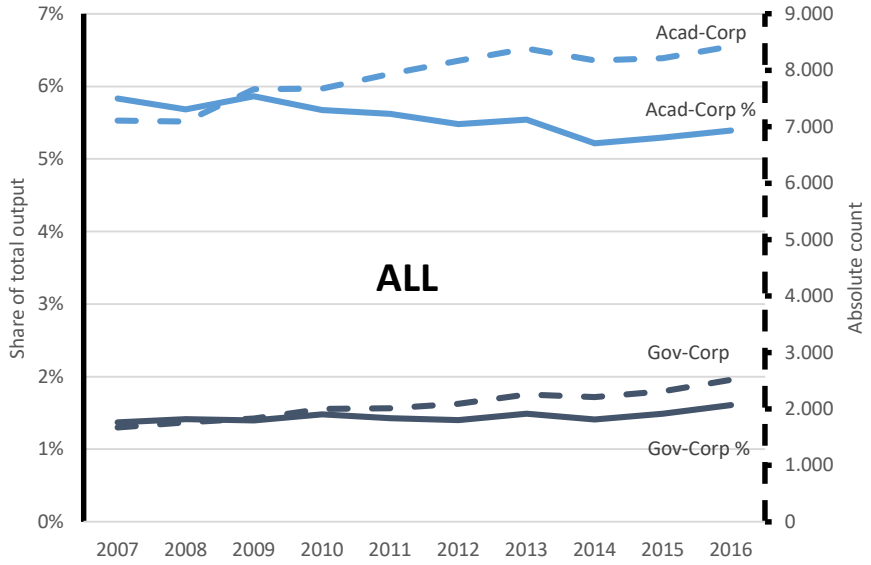


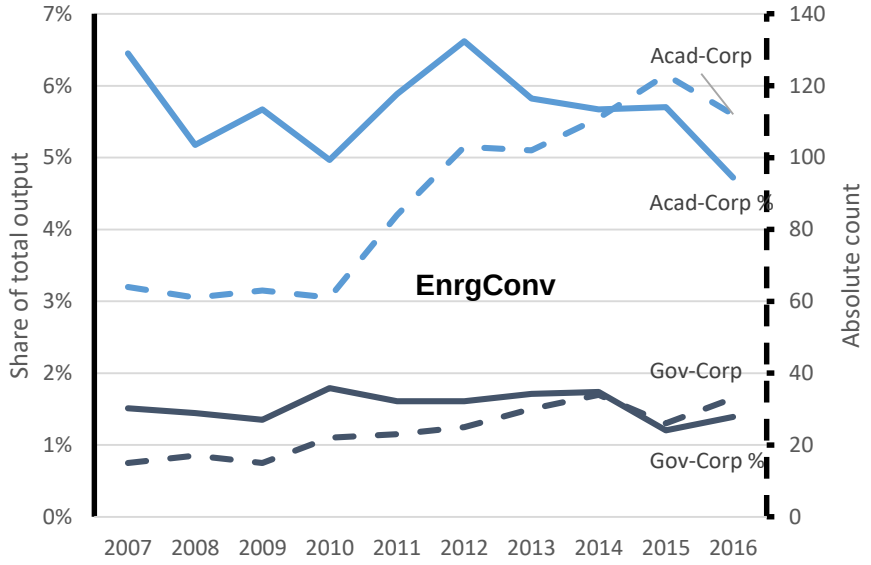


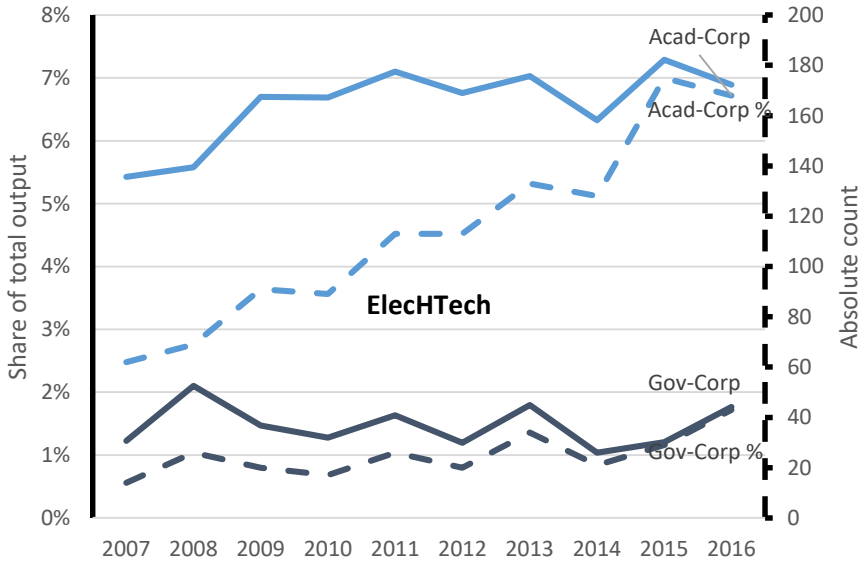
General trends overall and per technology

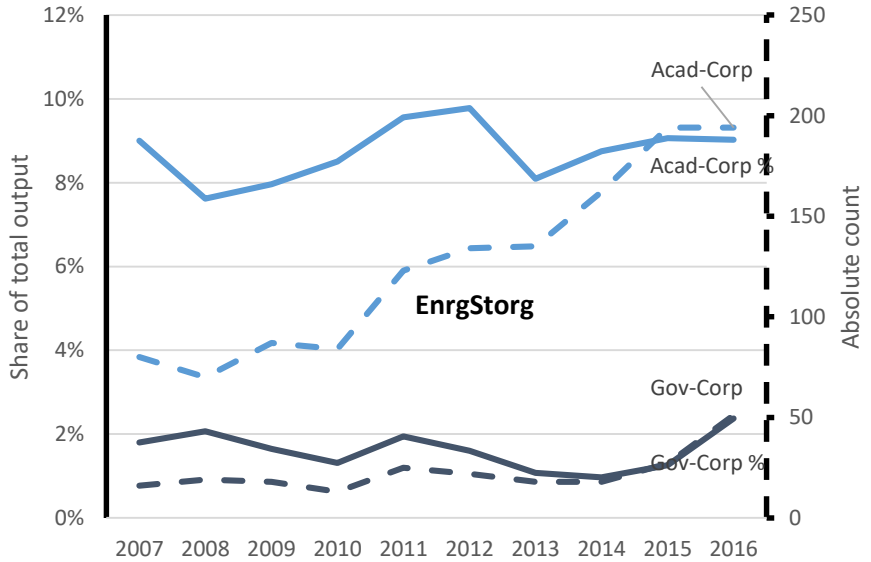
Increased international collaboration

Output of Academic-Corporate collaboration in Germany







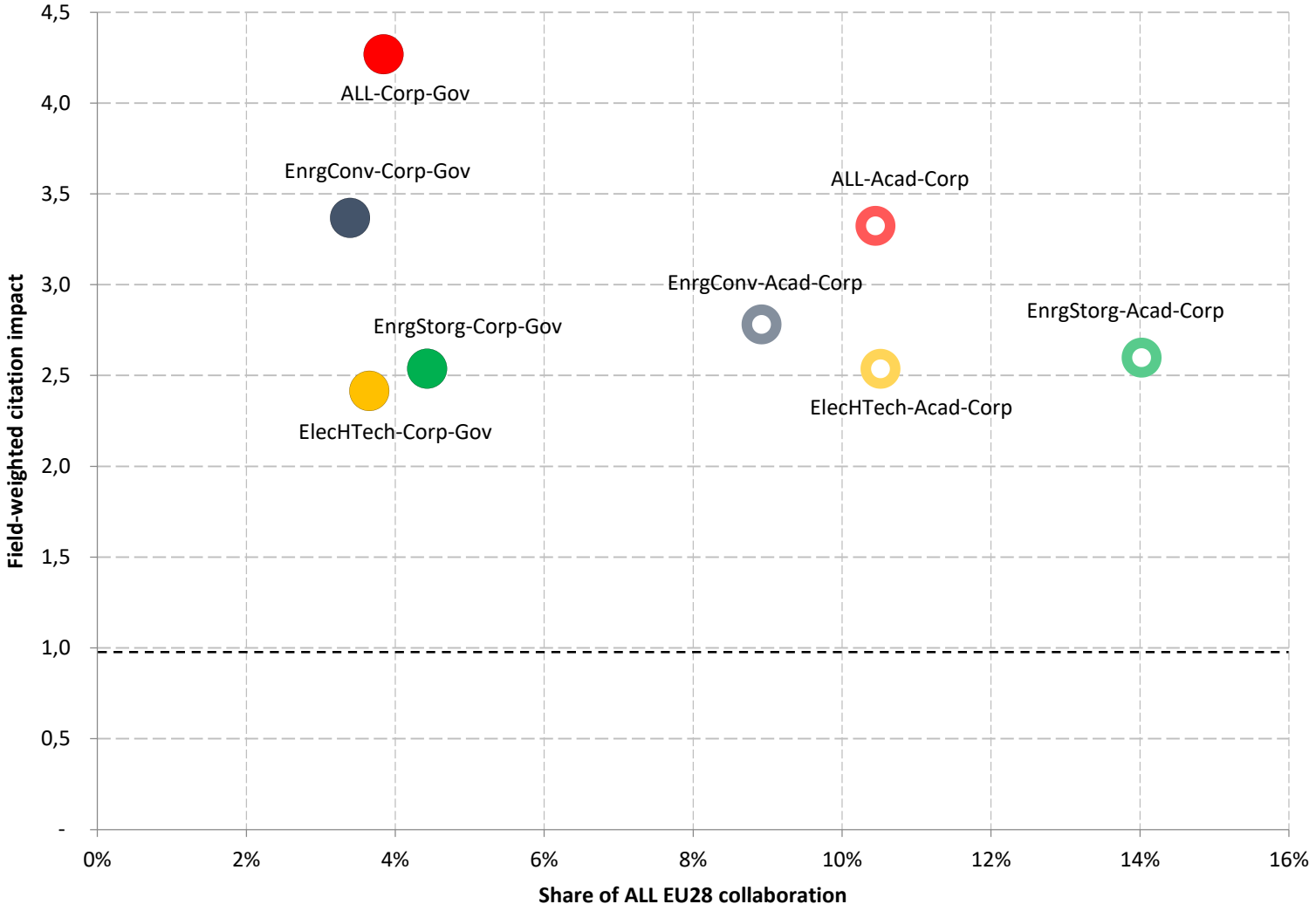


General trends overall and per technology

Acad-Corp collaboration counts increasing <u>but</u> share of total decreasing/stable

Gov-Corp collaboration counts increasing <u>and</u> share of total increasing/stable

Share and impact of German research in cross-sector EU 28 collaboration



General trends

Acad-Corp collaboration occupies greater share of DEU collaboration with EU 28

FWCI overall higher for Corp-Gov collaborations

German and EU research priorities - conclusion

Given goals of Hightech strategie 2025 and EU Key Enabling Technologies, within Sustainable economy and energy, and sampling only a few of the technologies, **can we identify opportunities to stimulate progress**?

Hightech strategie 2025 and KET

- Prioritising future challenges relative to prosperity and quality of life – identify technologies that are highly impactful
- Consolidating resources and promoting transfer – encourage international and cross-sector collaboration
- Strengthening the dynamism of innovation in industry – diversity of participating research entities
- Creating favourable conditions for innovation – incentives and policy environments
- Strengthening dialogue and participation – engagement on social needs and technological expertise


ELSEVIER

20 September 2018, Berlin

Emporio I Room

Panel discussion

Dr. Volker Meyer-Guckel (chair)
Dr. Matthias Graf von Kielmansegg
Dr. Matthias Gotttwald
Dr. Alison Campbell
Dipl.-Geogr. Carsten Schröder
Dr. Thomas Gurney

Next up:

11.00-11.30	Group picture and coffee break	Wintergarten B
11.30-12.45	Openness and transparency in academic-industrial collaboration	Emporio I Room
	IPR Policies	Embassy Room