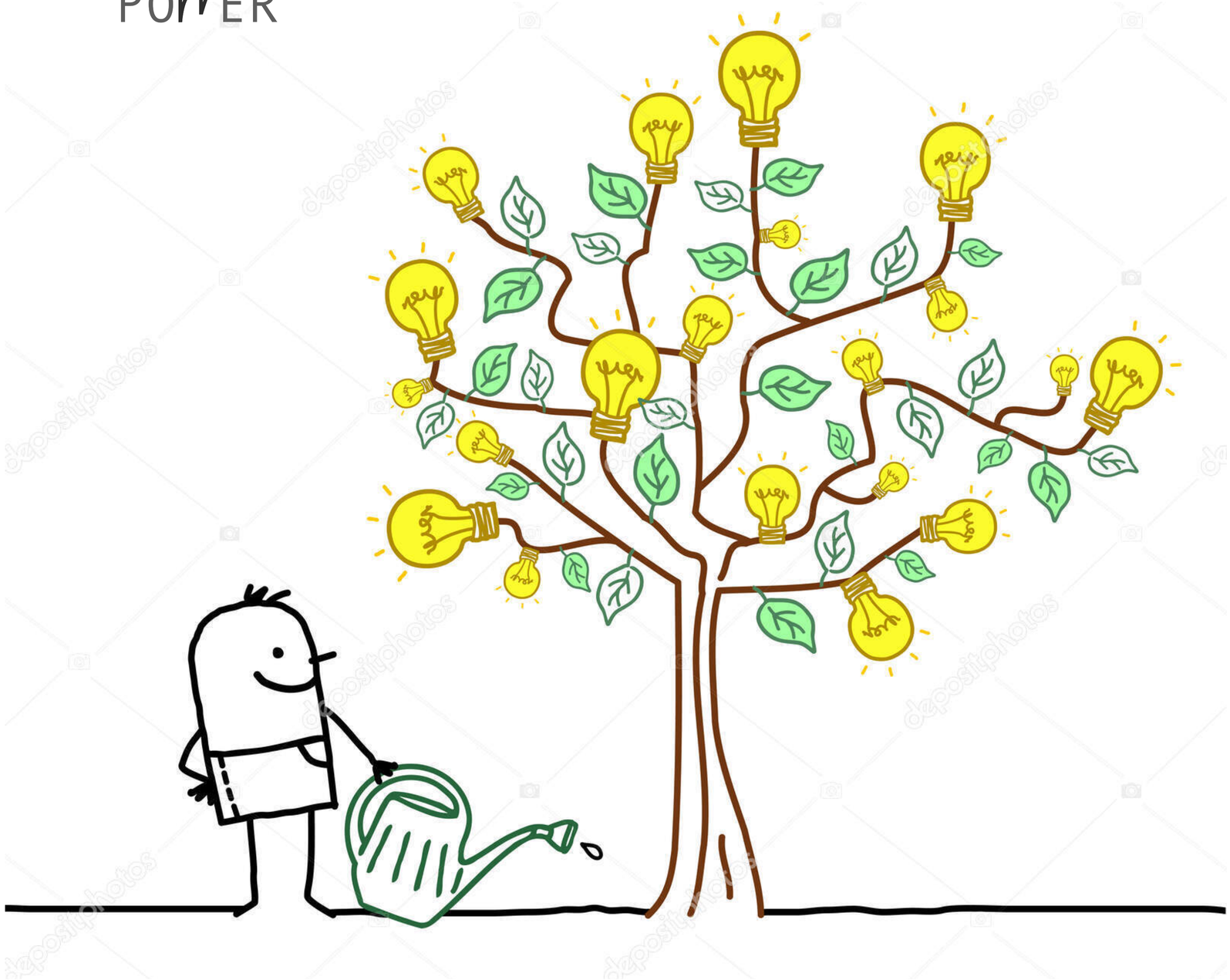


Growing Ideas

Excerpts from the
Knowledge and Technology **Exchange**
session
(and beyond)

TIPP 2023

Cape Town, ZA, 20230907

Massimo Caccia
Uni. Insubria & Random Power
massimo.caccia@uninsubria.it

- **THANKS**! to the **conference board** for supporting our proposal + **Paolo Giacomelli, Christophe De la Taille, Maxim Titov,** co-organisers of the KTT session + **all the speakers at the session!**

- **DISCLAIMER**: views and opinions in the following are my personal view, for sure debatable. Mistakes and misunderstandings are also mine, no need to debate!

- **APOLOGIES**: Things Take Time and I'm slow. I had to skip the conference banquet. Apologies to the organisers and all the attendees

the plan of our session, intended to present & discuss measures to support innovation and foster Knowledge & Technology Exchange:

At continental and trans-national level (Europe):

1. **European Innovation Council (EIC):** support of breakthrough technologies and disruptive innovation (**Maciej Lopatka, EIC**)
2. KTT with industry in **EU [framework program] projects** (**Paolo Giacomelli**, INFN-Bologna)
3. **ATTRACT: an EU funded project** to foster the transition from the lab to the market (**Pablo Garcia Tello,** PAO, CERN)
4. **KT at CERN:** opportunities and challenges (G. Anelli, CERN)

back to our session, enfin!, intended to present & discuss measures to support innovation and foster Knowledge & Technology Transfer:

At national level (Europe):

1. **Max Planck Innovation:** a comprehensive service for MP scientists (**Wolfgang Troeger, MPI**)
2. The **DESY innovation ecosystem**: from basic research to deep-tech business (**Denny Drossmann**, DESY)
3. **TT in Particle Physics** research institutes: the case of the [Italian] National Institute of Nuclear Physics (INFN) (**Mariangela Cestelli-Guidi,** INFN)

back to our session, enfin!, intended to present & discuss measures to support innovation and foster Knowledge & Technology Transfer:

At research team level (use cases):

1. Knowledge exchange through collaboration with industry partners: **a perspective from a University team** (Georg Steinbrueck, **Uni. Hamburg**)
2. **Random Power:** from single photon sensitive detectors o random bit generation. **An entrepreneurial endeavour**(**Massimo Caccia**, Uni. Insubria & Random Power)

The rationale:

What's holding back EUROPEAN INNOVATION?

PERFORMANCE

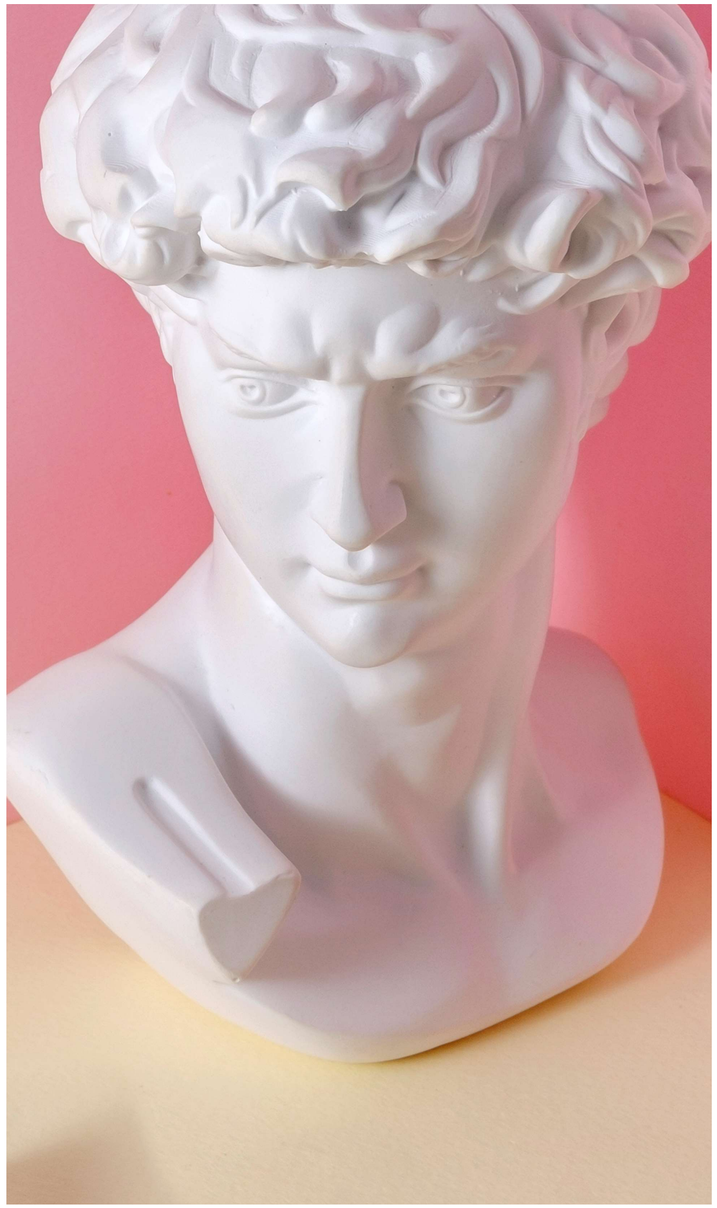
- Strong research performance *not translated into innovation*
- *Lack of breakthrough / disruptive innovations* that create new markets

FUNDING & INVESTMENT

- Financing gaps
- 2 "valleys of death"
  - In Transition from lab to enterprise
  - Scaling up for high-risk innovative start-ups

ECOSYSTEM

- Many national & local ecosystems, but fragmented at European level
- Need to include all regions and all talent (especially female)



HORIZON EUROPE

SPECIFIC PROGRAMME: EUROPEAN DEFENCE FUND

Exclusive focus on defence research & development

- Research actions
- Development actions

SPECIFIC PROGRAMME IMPLEMENTING HORIZON EUROPE & EIT*

Exclusive focus on civil applications

Pillar I EXCELLENT SCIENCE

- European Research Council
- Marie Skłodowska-Curie
- Research Infrastructures

Pillar II GLOBAL CHALLENGES & EUROPEAN INDUSTRIAL COMPETITIVENESS

Clusters

- Health
- Culture, Creativity & Inclusive Society
- Civil Security for Society
- Digital, Industry & Space
- Climate, Energy & Mobility
- Food, Bioeconomy, Natural Resources, Agriculture & Environment

Joint Research Centre

Pillar III INNOVATIVE EUROPE

- European Innovation Council
- European Innovation Ecosystems
- European Institute of Innovation & Technology*

WIDENING PARTICIPATION AND STRENGTHENING THE EUROPEAN RESEARCH AREA

- Widening participation & spreading excellence
- Reforming & Enhancing the European R&I system

EURATOM

- Fusion
- Fission
- Joint Research Center

* The European Institute of Innovation & Technology (EIT) is not part of the Specific Programme

7 years, about 95.5 Billion EUR

European Commission

The Innovation Pillar of HORIZON EUROPE

01. European Innovation Council

Support to innovations with breakthrough and market creating potential.

€10.1
BILLION

02. European Institute of Innovation & Technology

Bringing key actors (research, education and business) together around a common goal for nurturing innovation

€2.9
BILLION

03. European Innovation Ecosystems

Connecting with regional and national innovation actors

€520
MILLION

The EIC report:

EIC PRIZES

- Women innovators
- Capital of innovation
- Innovation procurement
- Social innovation
- Horizon
- Humanitarian Innovation

SEAL OF EXCELLENCE

Fast track to other funding

EIC ACCELERATOR SERVICES

- Mentors, coaches
- Global partners
- Innovation ecosystems
- EIC Community Platform

EIC ACCELERATOR

- For single companies
- Grants up to €2.5 million
- Equity up to €15 million or above
- To enter the market & scale-up (TRL 6-9)

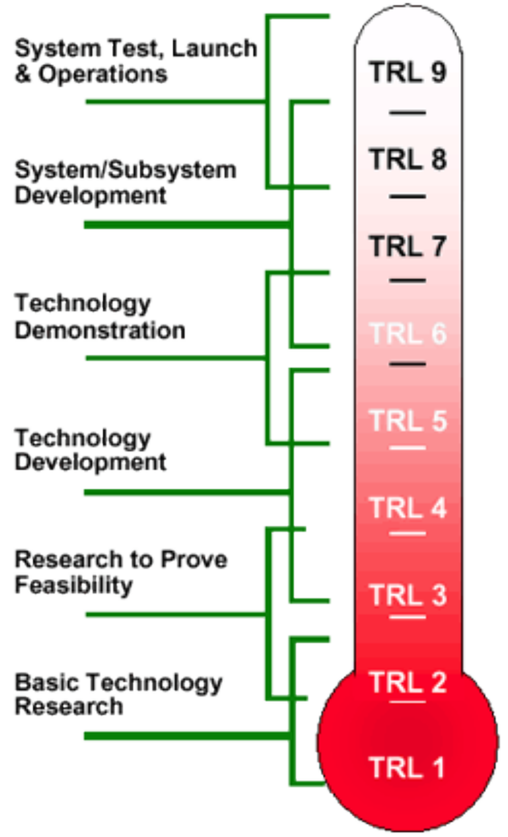
EIC TRANSITION

- For consortia & single companies
- Grants up to €2.5 million
- To develop business cases (TRL 4-6)

EIC PATHFINDER

- For consortia
- Grants up to €4 million
- To research technology breakthroughs (TRL 1-4)

European Innovation Council



The NASA Technology Readiness Level

EIC IMPACTS (From 2022)

CROWDING IN OTHER INVESTMENTS

- **€ 10 billion** follow up investments to EIC supported companies
- Leverage effect: 2.6 times private co-investment on EIC Fund investments
- **12 unicorns** - value € 1 billion+
- **112 centaurs** - value € 100 million+

GROWING SUPPORT TO STARTUPS & SMEs

- **1600** supported since 2014
- **410 selected for blended finance with € 2.18 billion equity proposed**
- Increase in startups with female CEOs

A PIPELINE OF BREAKTHROUGH TECHNOLOGIES

- **400** research projects
- **800** innovations tracked
- **Pilot of Transition funding** to follow up research results into applications

Collaboration with Industry within EC funded research infrastructure projects (O(4 years & 10 MEUR)):

AIDA innova

Advanced European Infrastructure for Detectors at Accelerators

iFAST

Innovation Fostering in Accelerator Science and Technology

LEAPS is the largest consortium of analytical facilities world-wide

EURO-LABS

EUROPEAN LABORATORIES FOR ACCELERATOR BASED SCIENCES

Offers **TA** to **44 Research Infrastructures** (RIs): https://web.infn.it/EURO-LABS/

Collaboration with Industry within EC funded research infrastructure projects:(O(4 years & 10 MEUR)):

all in all, more than 100 industrial partners involved, at different levels; exemplary illustrations:

AIDA innova

- Lithoz (A): ceramics (WP 10)
- Picotech (F): fast RPCs (WP 7)
- Weeroc (F): ASICs (WP 11)
- Workshop (F): composite materials (WP 10)
- CAEN (I): Electronics and power supplies for Nuclear and Particle Physics (WPs 4, 7, 8)
- ELTOS (I): PCBs (WP 7)
- FBK* (I): silicon detectors and SiPMs (WP 10)
- Conpart (N): Metalised polymers (WP 6)
- FYLA (E): ultrafast fibre lasers (WP 4)
- ITAINNOVA* (E): electrom. compatibility (WP 4)
- CSEM* (CH): Electronics and power supplies

✳ RTO (Research and Technology Organisation)

✱ **Essentially, co-development of advances in detectors, electronics, DAQ, processes and material science at the core of our field**

✱ **Mind exploitation agreements!**

Collaboration with Industry within EC funded research infrastructure projects (O(4 years & 10 MEUR)):

iFAST

15 industrial partners, 1/3 of the consortium (possibly “tier 1” providers to big players)

Opportunities:

- Strong demand for R&D: accelerators are crucial tools in the progress of modern science and technology (physics, biology, medicine, material science, etc.).
- Mature technology, with large industry involvement.
- Supported by a wide, motivated, and rapidly expanding scientific and technological community, spanning across continents.

Challenges:

- Presence of many actors, many projects, many technologies, with different priorities and time-scales.
- Long time scale and high cost of accelerator R&D, well beyond the capabilities of single EU projects.
- Strong dependence on post-ww2 technologies increasingly faraway from modern industry’s focus.
- Needs coordination and sharing of resources.

My comment: there’s some “meat”

Linear Accelerator Market Size And Forecast

Linear Accelerator Market size was valued at USD 4.76 Billion in 2022 and is projected to reach **USD 8.76 Billion by 2030,** growing at a **CAGR of 7.91% from 2024 to 2030.**

A two-phase “cascade grant” program to lead breakthrough ideas from the lab towards the market, from low TRL up to TRL 7-8, getting projects ready to take off and gain access to private investment

Research Infrastructures

Business, Entrepreneurship & Innovation Experts

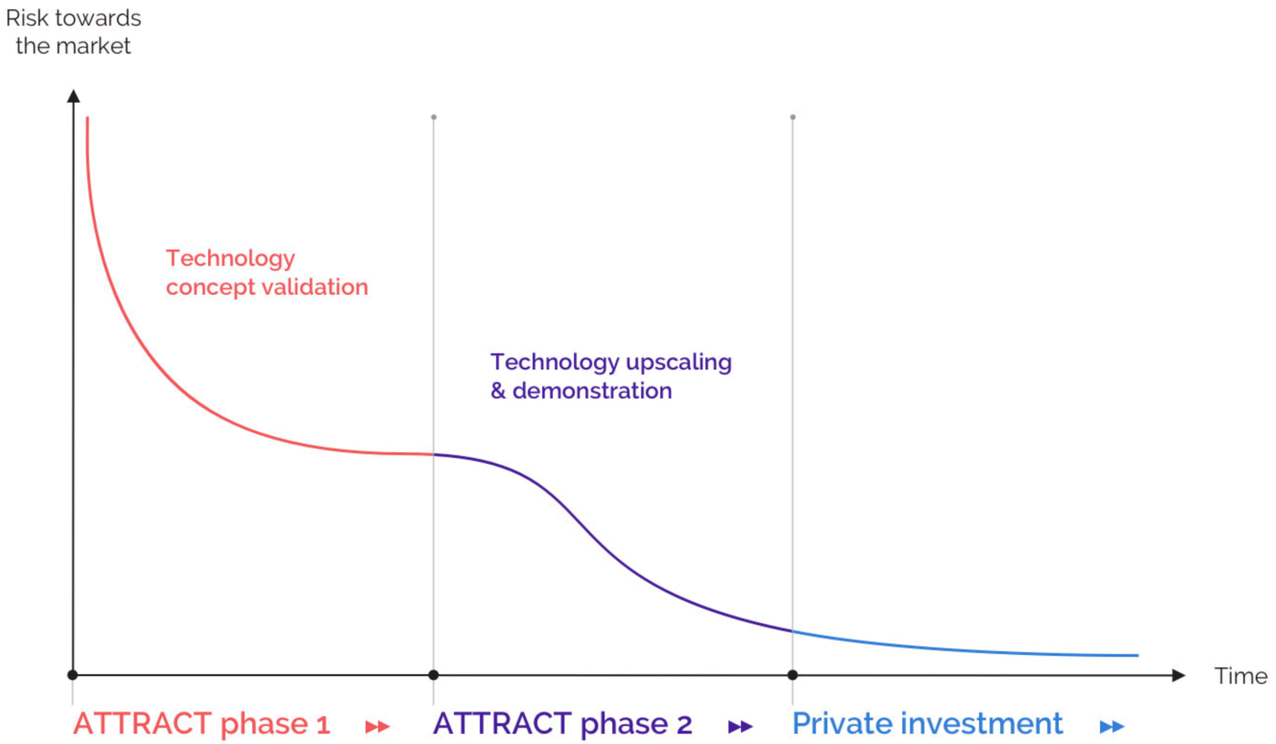
Public Investment

Industry

European Commission

focus of the first round on detection & imaging technologies

ATTRACT



✱ **A two-phase "cascade grant" program** to lead breakthrough ideas from the lab towards the market, from low TRL up to TRL 7-8, getting projects ready to take off and gain access to private investment

✱ focus of the first round on detection & imaging technologies

Phase I:

- submission October 31st, 2018
- Duration: May 2019 to October 2020
- funding: 100 kEUR
- **selection & competitiveness: 1211 proposals received, 170 approved**

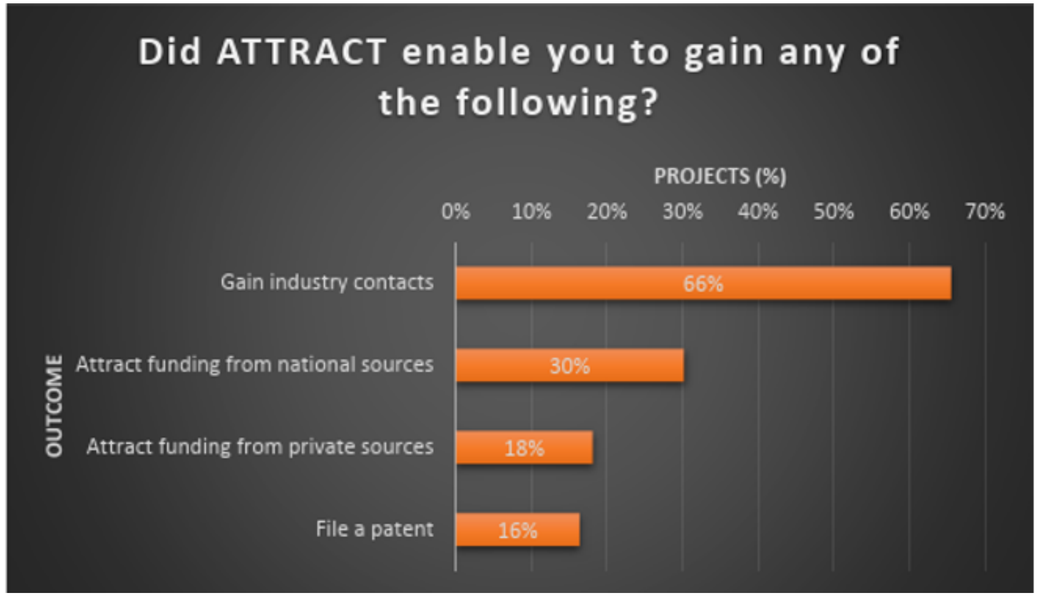
Phase II:

- submission Sept. 20th, 2021
- notification of approval Jan. 31st, 2022
- Duration: May 2022 to August 2024
- funding: up to 2 MEUR
- **selection & competitiveness: 68 R&D proposals received, 18 approved**

Combined success rate: 18/1211 = 1.5%

A few facts & figures (Phase II):

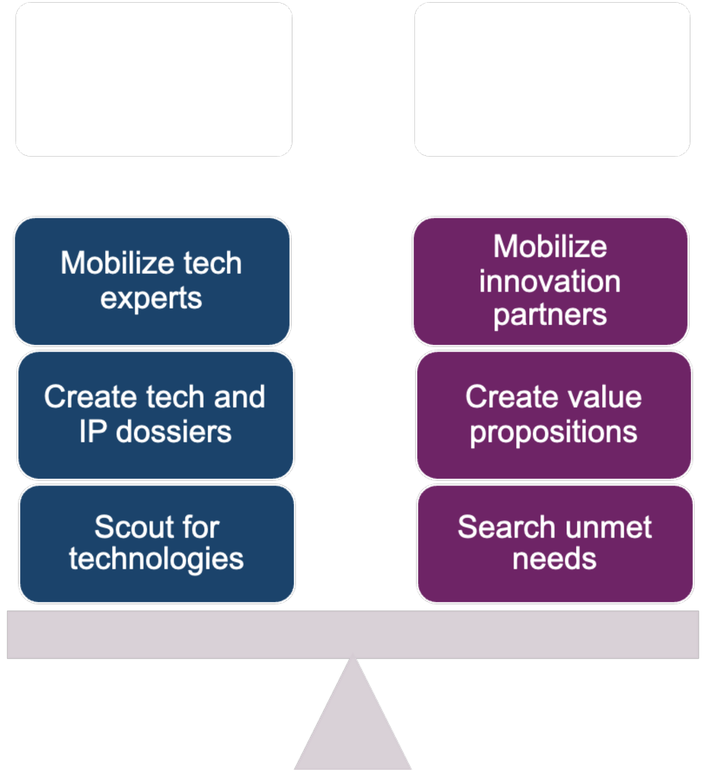
- R&D projects are complemented by Student's Academies and Socio-economical analysis of the Deep-tech revolution



- Even at low TRL, 18% of the funded projects got private investment.
- 30% of the project got additional National Funding
- 34% of the projects intend to proceed towards commercialisation

Knowledge Transfer at CERN a Science & Innovation hub:

The toolbox



Balance between technology push & pull

Knowledge Transfer at CERN by numbers:

EVENTS

25+

Events organised or attended by the CERN Knowledge Transfer group to innovate with industry

SPECXRAY WORKSHOP
CIPEA INNOVATION DAY
QT4HEP CONFERENCE
GENEVA HEALTH FORUM
TERA SYMPOSIUM
CERN UK QUANTUM TECHNOLOGY ROADSHOW

1k

People attended **7 Knowledge Transfer Seminars** in person or via webcast

#CERNIMPACT

2022 HIGHLIGHTS AT A GLANCE

OUR DOMAINS

HEALTHCARE
AEROSPACE
DIGITAL
QUANTUM
ENVIRONMENT

INTELLECTUAL PROPERTY AND LICENSING

11

New technologies disclosed internally

42

Knowledge Transfer **contracts signed**

Contracts by Type

3	Assignment of IP Rights
15	Collaborative R&D
1	Contract Research
15	Licence
5	Service & Consultancy
3	Others

Contracts by Partner

4	Hospital or biomedical research institution
20	Industry
13	Institute/Laboratory
6	University
4	Other

Knowledge Transfer at CERN by numbers:

CERN TECHNOLOGY IMPACT FUND

5

UN Sustainable Development Goals (SDGs) contributed to by **BioDynaMo**, a technology added to the fund in 2022

FUNDING OPPORTUNITIES FOR CERN PERSONNEL

12

Projects funded by the Knowledge Transfer fund and Medical Applications budget

CIPEA CERN Innovation Programme on Environmental Applications

Of which **7** projects have a strong environmental focus thanks to the **CERN Innovation Programme on Environmental Applications (CIPEA)**

1.47 MCHF

Total funding allocated to projects taking CERN tech into society

50kCHF - 224kCHF

Range of funding received per project

ENTREPRENEURSHIP

80+

Participants at the **NTNU Screening Week** and the **INSEAD deep-tech Key Management Challenge**

EUROPEAN UNION CO-FUNDED PROJECTS WITH A STRONG KT COMPONENT

AIDAINNOVA
released report on particle detector market trends

ATTRACT2
unveiled selected projects for innovation

I.FAST
achieved first 3D printing of RFQ and hosted innovation project addressing accelerators for the environment

#CERNKT

Max Planck Gesellschaft

"Knowledge must precede application.“

(Max Planck)

30 nobel laureates

23,969 total staff as of Dec 2020

21, 187 contractually employed
542 sholarship holders
2,240 guest scientists

Top 3 in the global list of highly cited researchers *and* in nature index

86 MPIs

32 in natural sciences
29 in life sciences
22 in humanities

ca. **€ 2.22B** total subsidy funding in 2020

ca. € 1.92B institutional funds, mainly from the federal government and the federal states

ca. € 300M project funds, governmental and federal, EU, DFG, other

Innovation at Max-Planck proceeds through a dedicated legal entity (Max Planck Innovation) with highly skilled internal professionals, providing support from scouting to licensing & start-up support:

MPG **MI** **Society**

Insights & ideas
by 86 Max Planck Institutes

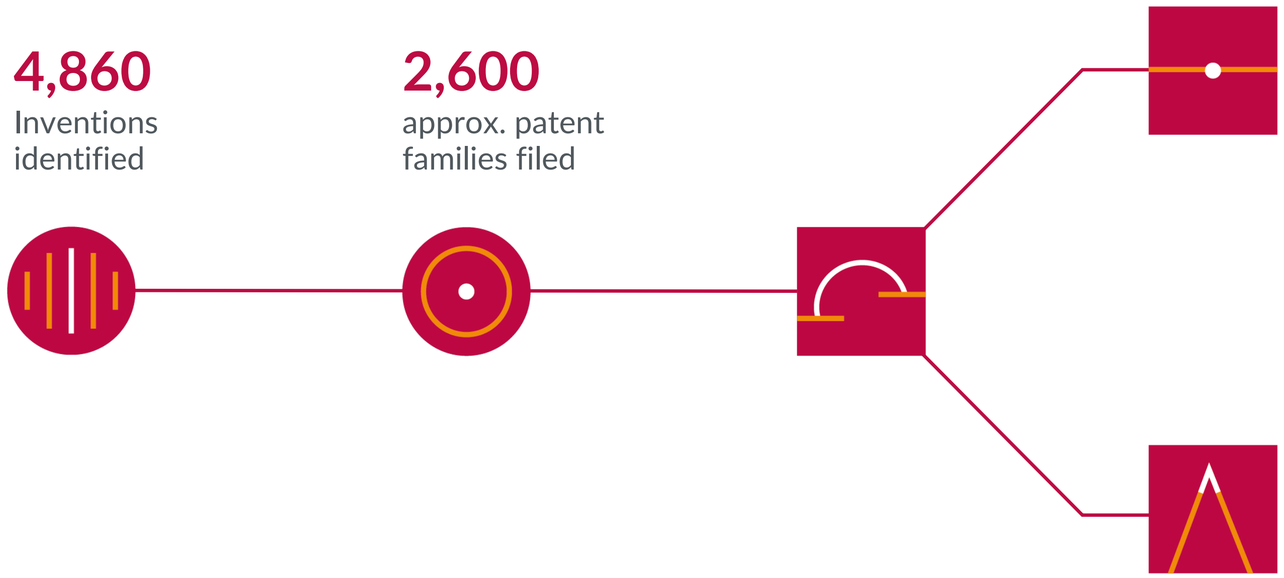
Valuable products & services
New companies & jobs

- 100% MPG subsidiary
- Central service unit for **patenting, licensing** and spin-off support
- Exclusive partner for MPG scientists
- Service free of charge for MPG scientists
- All revenues passed through to MPG (33.3%), MPI (36.7%) and inventors (30% inventor’s remuneration)

Proven approach: MI figures since 1970

4,860
Inventions identified

2,600
approx. patent families filed



2,935
License agreements concluded. including 2,650 License agreements

50% in Germany, 50% globally

€ 550M
Revenues from license agreements

thousands
of jobs created by licensing

184*
Start-ups, most of which were supported by MI

*since 1990

€ 31.4M
Revenues from M&As from 26 spin-offs

> 9,000
Jobs created by start-ups

75%

of the companies founded since 1990 still exist.*

About 25% of MPG technologies are commercialized

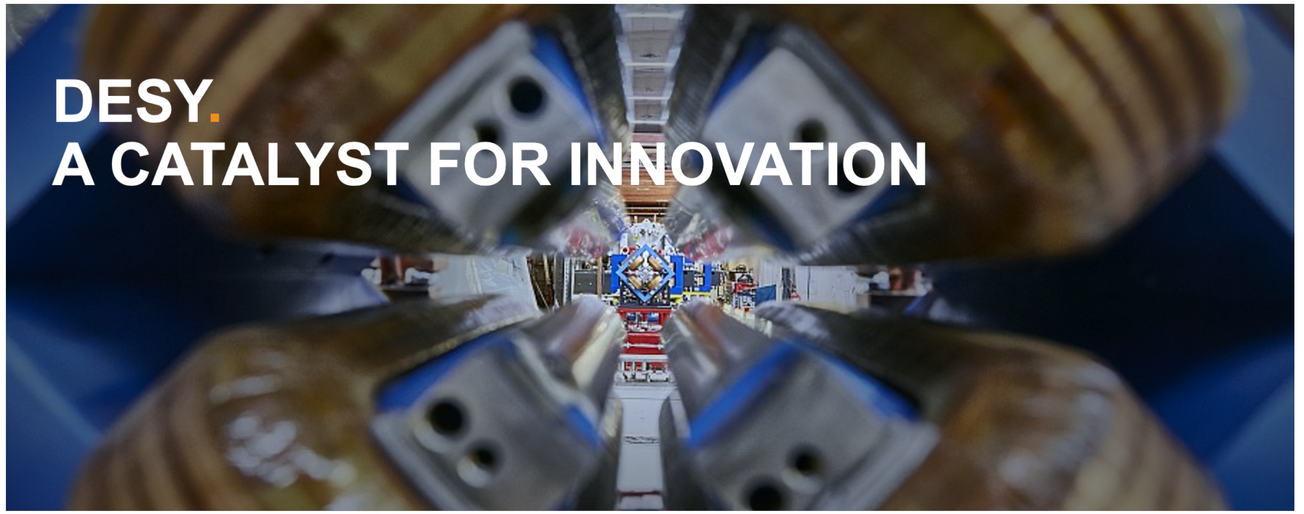
<1%	> € 1M*
3%	€ 0.5 – 1M
20%	€ 0.05 – 0.5M
72%	< € 0.05M

*numbers until 2019

Companies that were successfully sold or listed

SUGEN	morphosys	evotec
SOLD: **$ 650M**	MARKET CAP: **€ 1.47B**	MARKET CAP: **€ 526M**
U3 PHARMA	Alnylam PHARMACEUTICALS	SuppreMol
SOLD: **€ 150M**	MARKET CAP: **$ 7.18B**	SOLD: **$ 200M**
KINAXO Biotechnologies GmbH	MenloSystems	BODY LABS
SOLD: € **15M**	SOLD: **€ 20M**	SOLD (UNDISCLOSED)

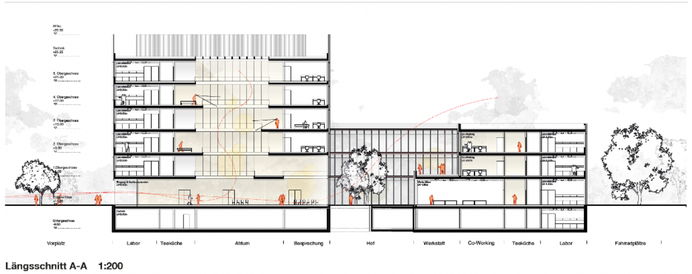
Innovation at DESY:



Fostering new Tech Products	Provider for Industry	Enabling new businesses	Creating an innovative ecosystem	Strengthening culture of innovation
#ideastomarket	#Services	#Startups	#sciencecity	#mindset
#techtrans			#dahmeinnovation	

Innovation at DESY: an amazing investment on infrastructures

Physics Labs and Workshops, not equip (2700 m²) (2026)



ca. 5.600 m² Rental Space, Offices, Labs, Workshops and Shared Spaces (2026)

ca. 2.200 m² Rental Space, 50/50 for Office and Labs/Workshops

ca. 3.500 m² rental space, not equiped (2023)

DESY Innovation Factory

Startup Labs Bahrenfeld

DESY Innovation Village

Innovation park Altona

INNOVATION & TECHNOLOGIE TRANSFER

DESY.

Flexible Access for industry

Optimization of instruments

Professional sample handling

Industrial beamlines in the future

Mail-in Services

Network of Service Companies

Key Account Industry Services

Industry Relation Management

Innovation at DESY: an amazing investment on infrastructures

	Basic Research		Idea Phase		Validation Phase		Founding Phase		Start-up Phase		Scale-Up Phase		Steady Phase	
Lab Types/ Infrastructures	Bio./Ch. Lab.	Phy. Lab.	Bio./Ch. Lab.	Phy. Lab.	Bio./Ch. Lab.	Phy. Lab.	Bio./Ch. Lab.	Phy. Lab.	Bio./Ch. Lab.	Phy. Lab.	Bio./Ch. Lab.	Phy. Lab.	Bio./Ch. Lab.	Phy. Lab.
DESY u. Campus Partners	x	x												
DESY Innovation Factory I			x	x	x	x	x	x	x					
Start-up Labs								x		x		x		
tecHHub									x		x		x	
DESY Innovation Factory II										x		x		x

Overall Goals:

- An offer for every innovative hightech-Idea
- Who ones enters the ecosystems stays within

Target Groups:

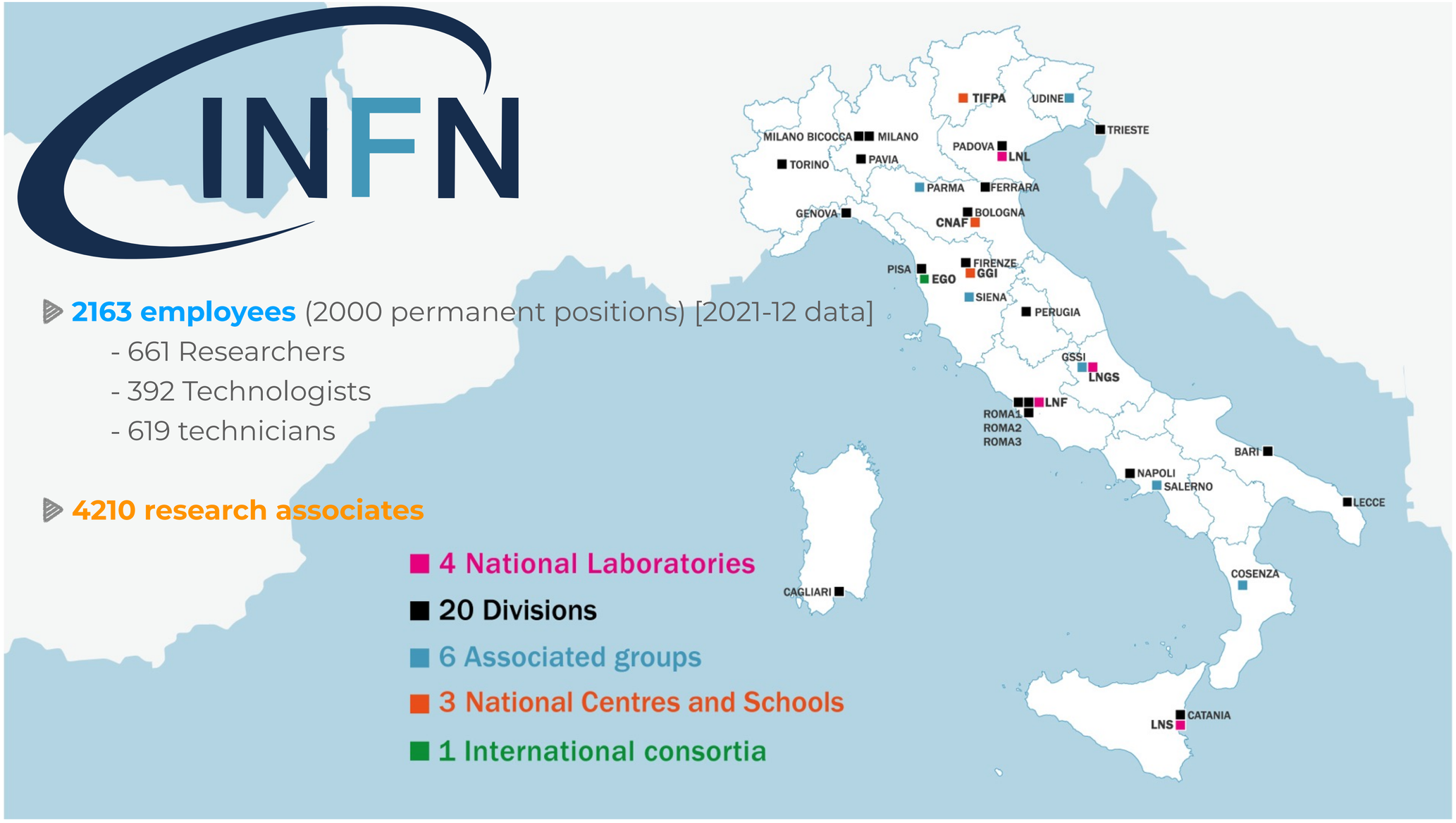
- all innovators from natural sciences
- hightech/deeptech companies in every development stage
- e.g.: Material Sciences, Electronics, Med-, Bio-, Laser- and Detector Technologies

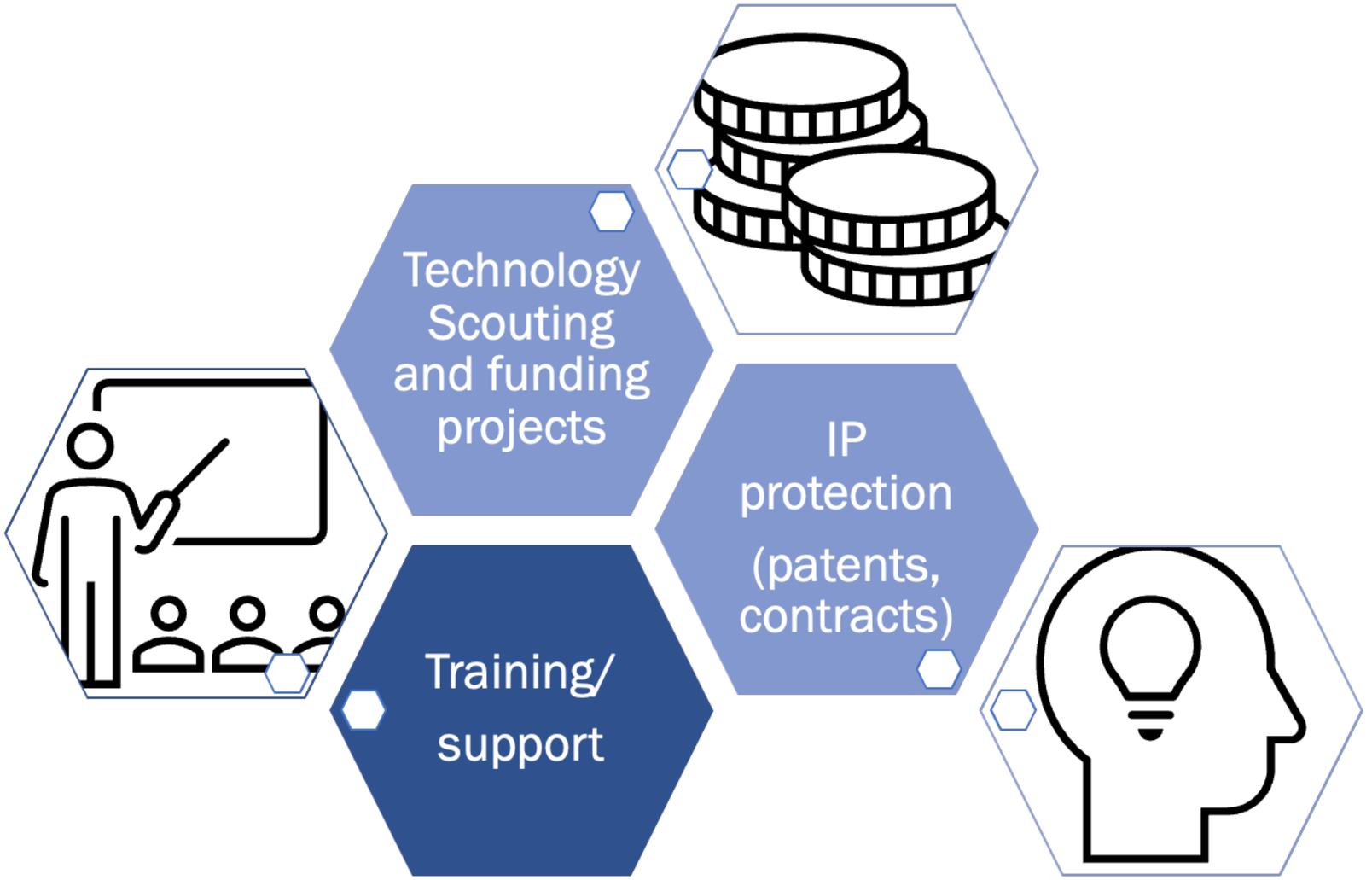
Approach:

- Characterizing the needs along the development steps and types of laboratories needed

KTT @INFN, the Italian National Institute of Nuclear Physics:

- **2163 employees** (2000 permanent positions) [2021-12 data]
  - 661 Researchers
  - 392 Technologists
  - 619 technicians
- **4210 research associates**





The three-fold way

Technology scouting and valorization: PoC strategic actions

R4I 2021 Research for Innovation

- ✓ 31 project founded since 2018, total budget 150K€/year
- ✓ 12 months → increase TRL (4-6)
- ✓ Internal peer review panel
- ✓ External advisory board
- ✓ Co-development with industry is strongly encouraged

- ✓ 19 Licences
- ✓ 3 Spin-off
- ✓ 11 Patent related

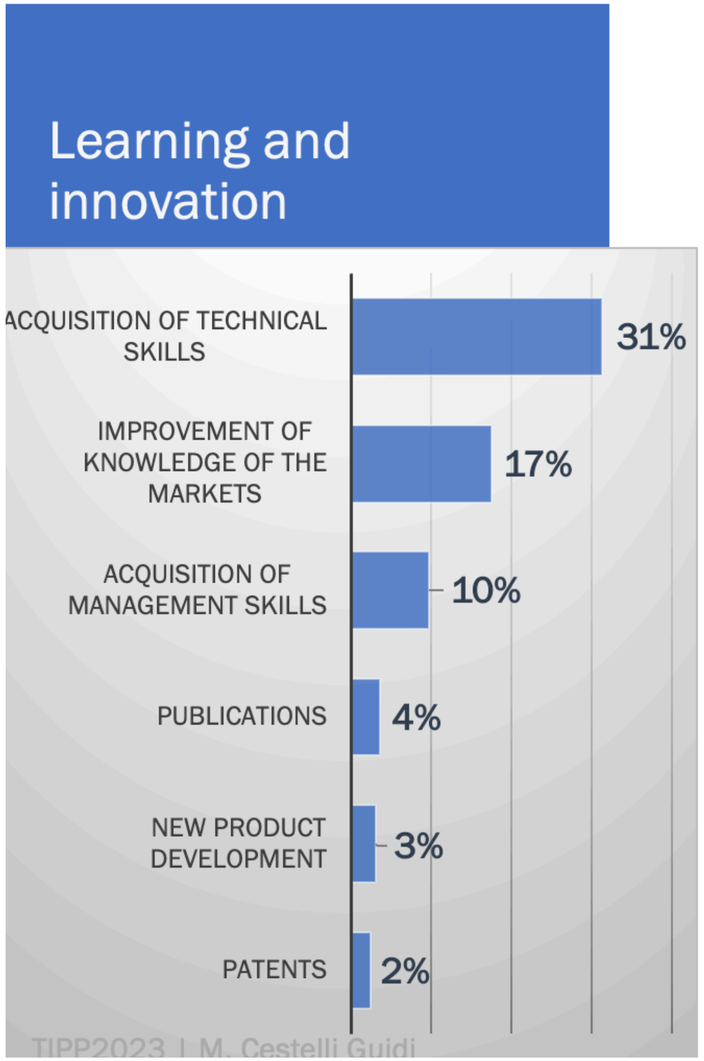
Ministero dello sviluppo economico

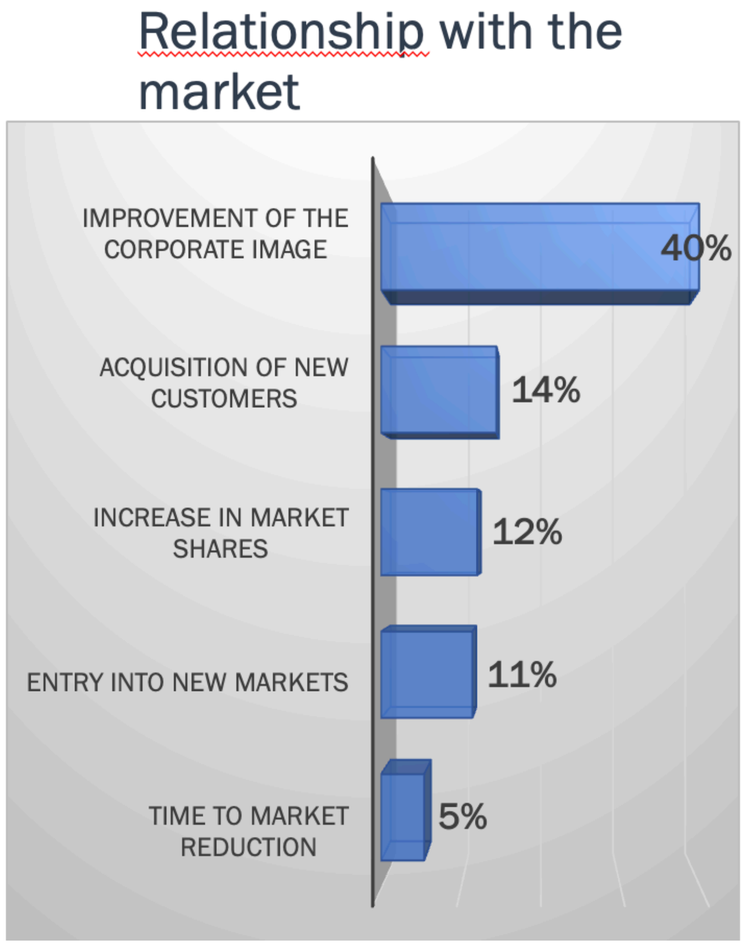
- ✓ 16 co-funded projetcs (2020-2024)
- ✓ Existing patents
- ✓ Budget 800 K€

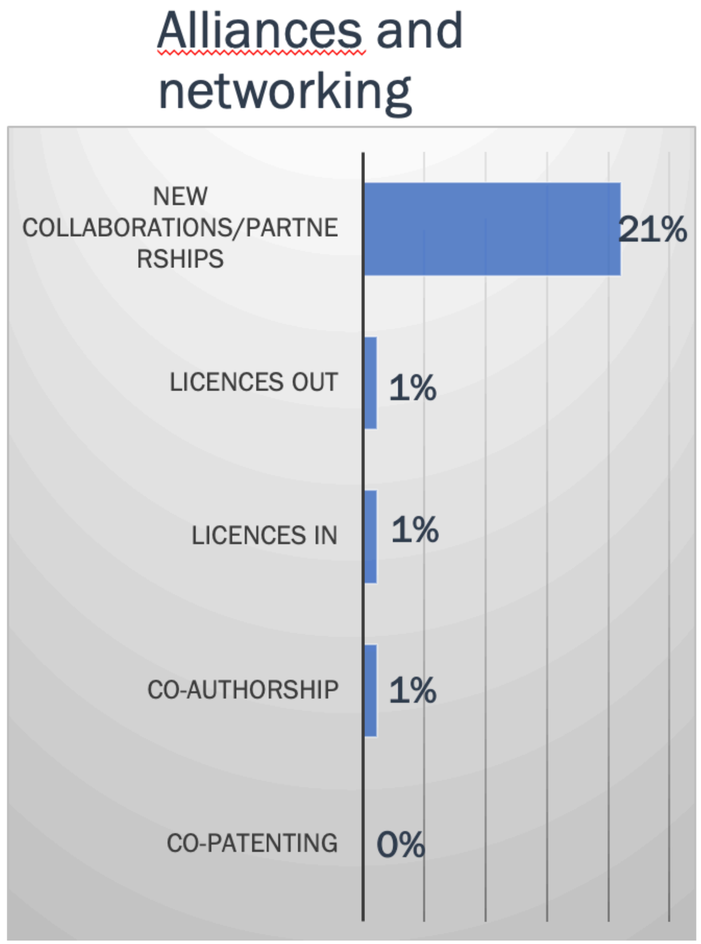
Challenges

- Cultural change: increase the engagement of our researchers ....
- Increase the industrial partnerships: it goes a long way to define a balance between push and pull-driven KTT strategies
- Co-development must be supported by proper instruments: Firs bench test of an innovation center on additive manufacturing @LNGS is ongoing...
- EU framework

Innovation through procurement: a survey on the INFN suppliers







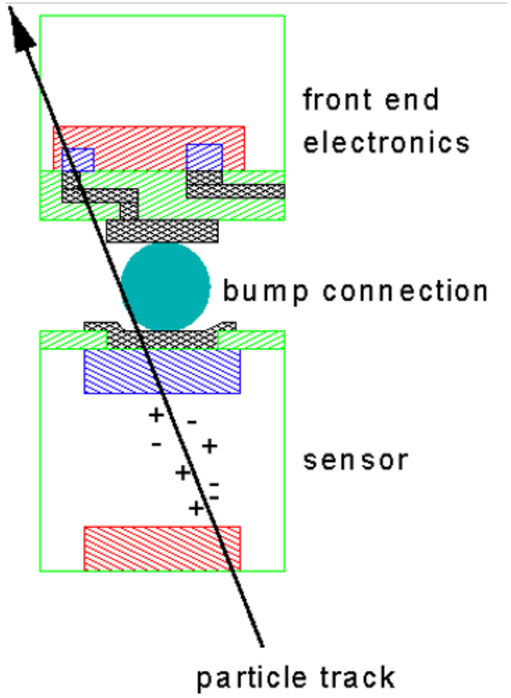
Knowledge exchange through collaboration and procurement: the point of view of a University group (Uni. Hamburg)

The rationale behind it:

- **Detectors in experimental physics are custom made devices**
- They are developed by the research groups who later use them for their experiments
- **The production of such detectors requires industrial processes**
- Mutual understanding of our experimental needs and the technologies offered by the companies is critical
- **Adaptations of the processes might be required**
- Open collaborations with industry partners are essential for the field of instrumentation for experimental physics

Knowledge exchange through collaboration and procurement: the point of view of a University group (Uni. Hamburg) - co-development

Fine pitch bump bonding

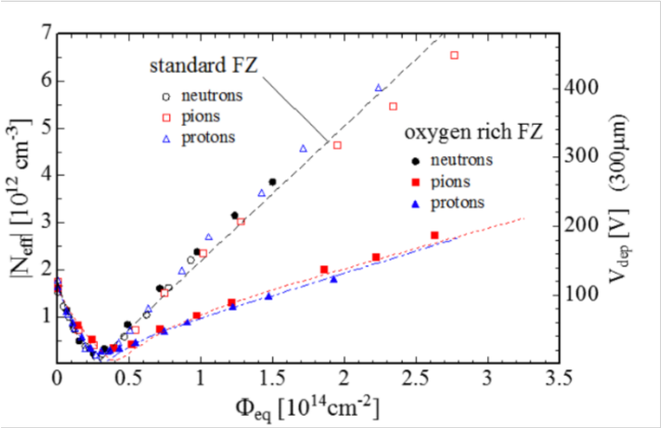


solution for a problem related to sensor warping

IZM Fraunhofer - Berlin

Rad-hard sensors

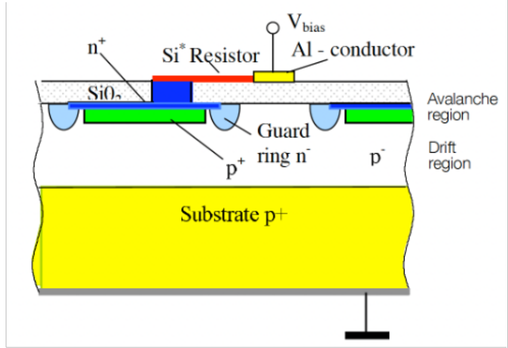
G. Lindström et al., Radiation hard silicon detectors - developments by the RD48 (ROSE) collaboration, NIM A 466 (2001) 308–326



Oxigen rich material is beneficial

CiS Research Institute for micro-sensors (D)

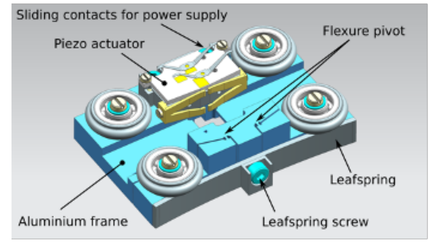
Rad-hard SiPM



- Dedicated R&D production of silicon structures with gain
- Novel implant designs
- Open exchange of layout parameters as input for device simulation

KETEK Gmbh - Munich

Piezo-actuators



Actuators that work
- in vacuum,
- magnetic field up to 10 T, at 4 K,
- long stroke (up to a meter),
- high precision (better than 10 μm)

Janssen Precission Engineering - Netherlands

Knowledge exchange through collaboration and procurement: the point of view of a University group (Uni. Hamburg) - lessons learned

Research Institutes	Companies	How to overcome
Long timescales from ideas to final product →15 years	Interested in faster turnaround	Work with R&D SME or break into well defined blocks
Open source policy	Patents, company specific processes	Sign NDAs, define clear boundaries for publication of information
Niche applications and smallish productions	Mass application/ productions	Become active in identifying spinoffs, import existing solutions where possible
Fundamental understanding of underlying science	Often application of existing knowledge	Knowledge exchange via secondments, industry-academia events
Education driven	Market driven	“

Last but not least, my experience (after 23 years of applied physics projects in collaboration with industry, through 6 EC funded proposals)

In-Silico generation of random bit streams

RANDOM POWER

the value of unpredictability

A spin-off company of:

- Università dell'Insubria (Como - Italy)
- AGH - University of Science and Technology (Krakow - Poland)

AGH

UNIVERSITAS STUDIORUM INSUBRIAE

Last but not least, my experience (after 23 years of applied physics projects in collaboration with industry, through 6 EC funded proposals)

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A "**quantum coin flipper**" to enhance the strength of

- cyber security procedures
- privacy preservation
- zero-knowledge proof mechanisms

Total expected addressable market: 7.2 B$ by 2026

INSIDE™ QUANTUM TECHNOLOGY

HOW DO WE DO IT?

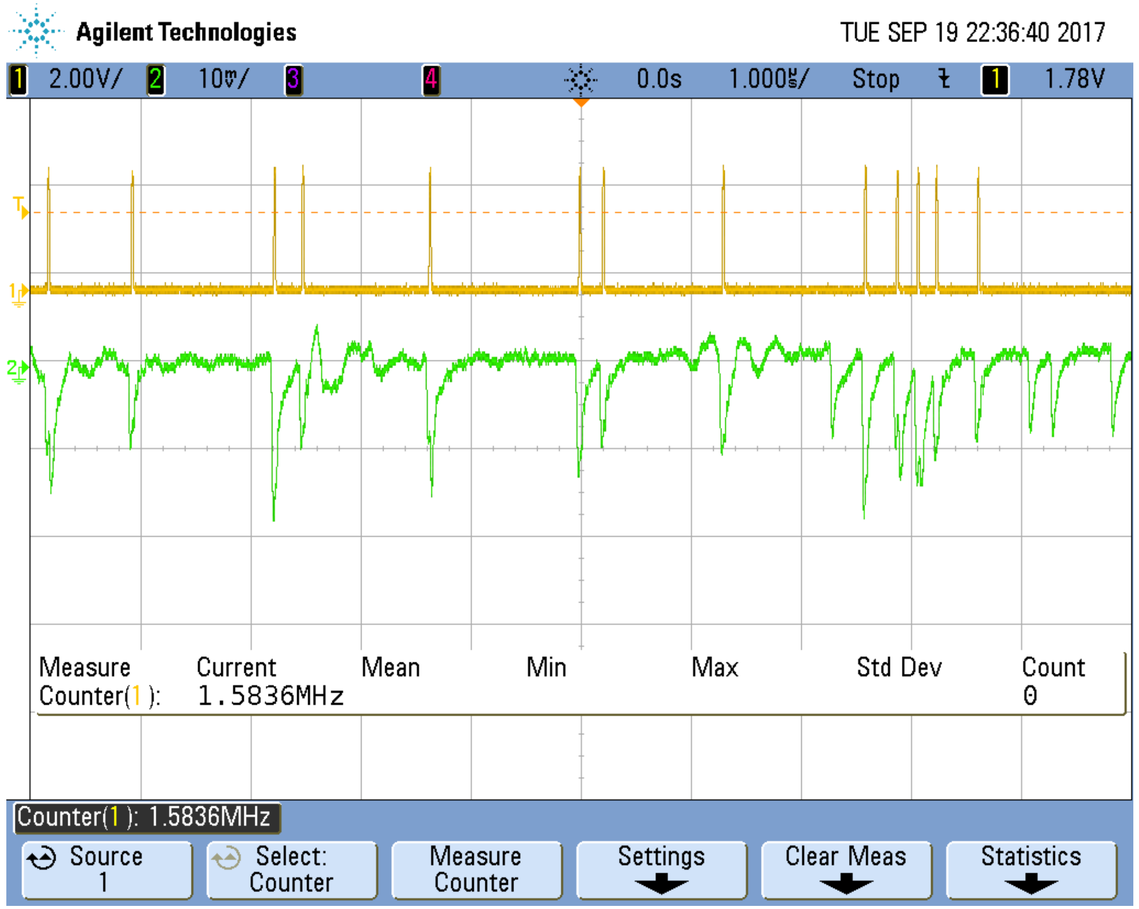
Inspired by Forrest Gump, we say:

RADIOACTIVE IS AS RADIOACTIVE DOES

- emission by a radioactive source is due to the quantum laws of Nature
- decays of unstable nuclei are unpredictable

⇒ the sequence of detected decays can be used to generate random bits with different recipes:

- check the parity of the number of pulses in a time window
- pre-define the time window in a way that is equally like to have or not to have a single pulse

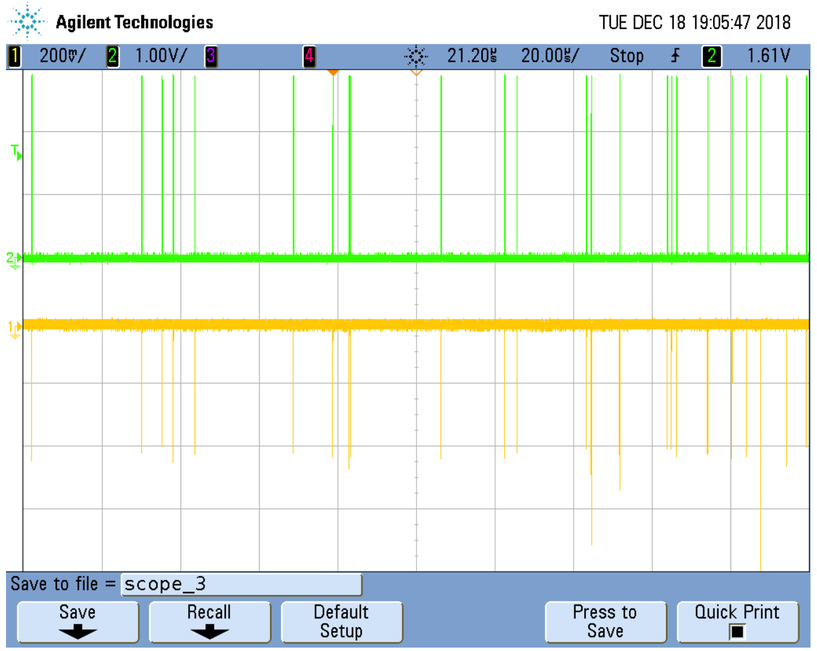


Sequence of pulses by the decay of a radioactive source in a nuclear physics detector

The idea behind RANDOM POWER is to replace a radioactive source with something safer, more handy, cost effective, simple, robust, providing sequences of pulses mimicking radioactive decays.

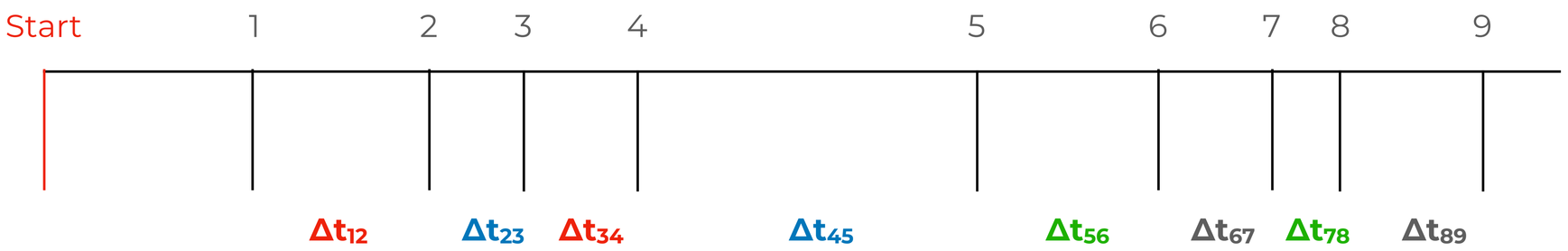
Essentially, we turn unpredictable “Dark Pulses” in Silicon Photomultipliers into bits:

1. tag & time stamp the occurrences of the random pulses



- Italian Patent granted in Sept. 2020
- EU & US patent granted in 2022
- in the examination phase in China, JP, Korea (since April 2021)

2. analyse the time series of the pulses:



- bit 1: Δt_{12} vs Δt_{34}
- bit 2: Δt_{23} vs Δt_{45}
- bit 3: Δt_{56} vs Δt_{78}
- bit 4: Δt_{67} vs Δt_{89}

RANDOM POWER

WHERE ARE WE NOW - completed developments

The MINIMUM VIABLE PRODUCT [MVP], the progenitor of a class of Quantum Random Bit Generators:

8 cm

3.5 cm

Qualified according to the NIST standards
(National Institute of Standard & Technology)

Developed thanks to the **seed capital [100 000 €]** granted by

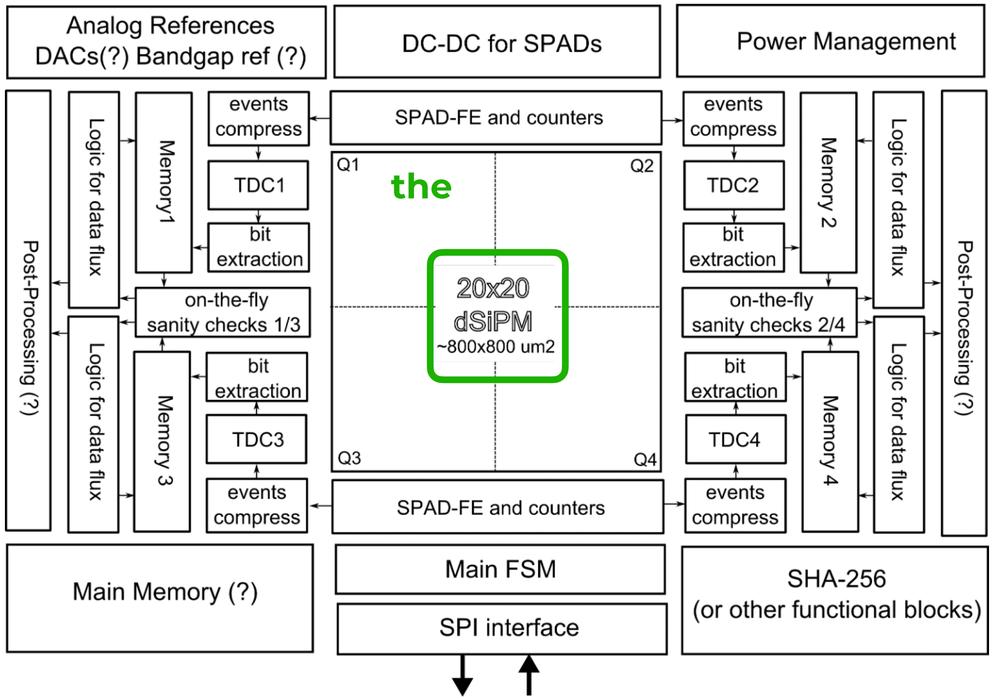
https://attract-eu.com

ATTRACT

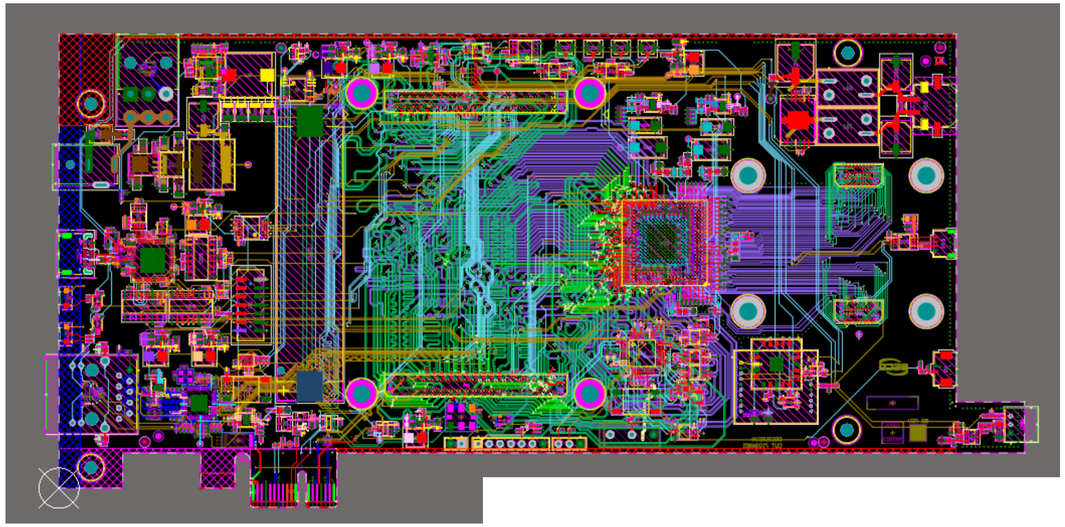
which selected Random Power as one of 170 “breakthrough projects” out of 1211 submissions **[May 2019- October 2020] (Phase 1)**

o n g o i n g d e v e l o p m e n t s :

- design a FIPS-compliant ASIC embedding a SPAD array in standard CMOS technology:



- design a scalable multi-generator system based on an array of SiPM and a LIROC front end ASIC by LIROC



- raw bit rate: 1 Mbps
- FIPS mode (NIST DRBG): 4096 Bytes in 1050 µs (31.2 Mbps) with prediction resistance
- bits delivered in an encrypted stream - expected power: 100 mW
- expected to be back from the foundry in Dec. 2023

- v1.0 delivered in July 2023, currently under test

RANDOM POWER

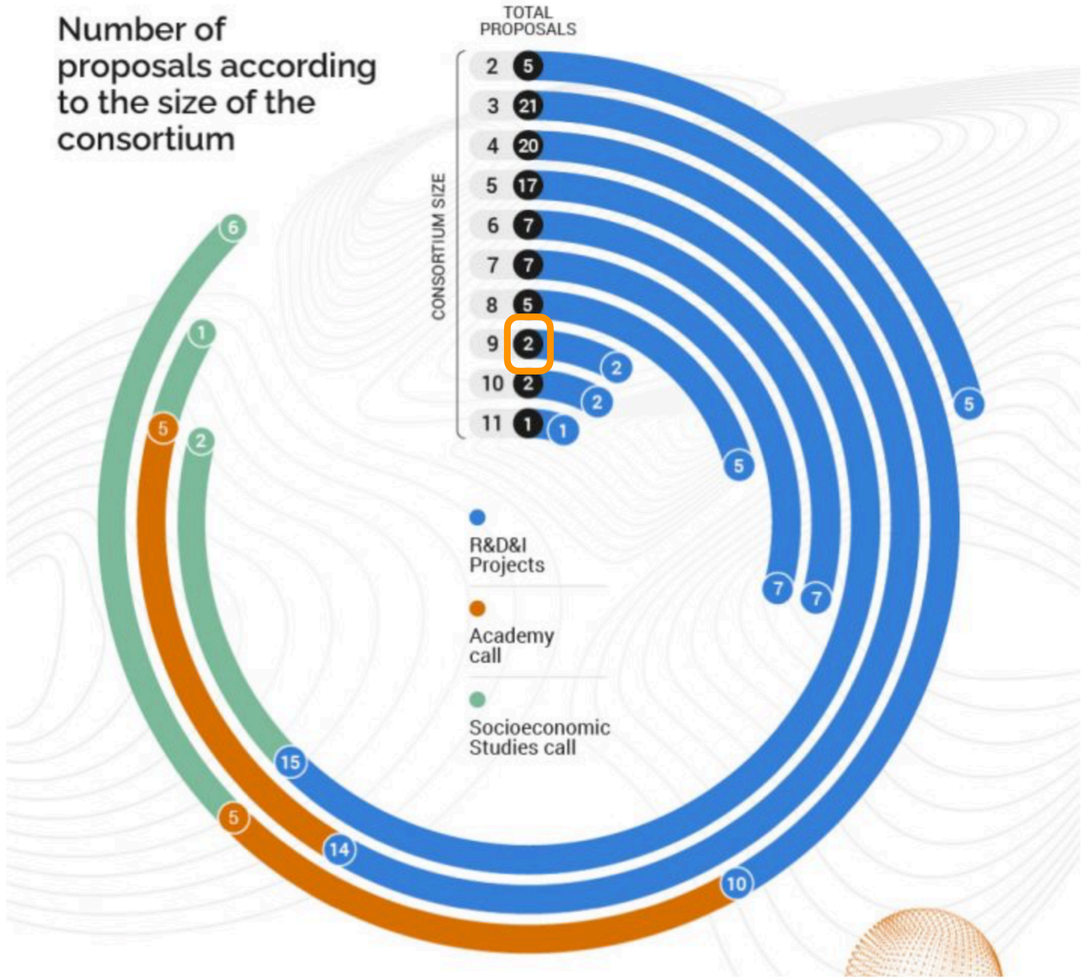
how do we do it?:

our VC: 0.2 Million in equity)

(Phase 2: 2 Million grant)

Our consortium:

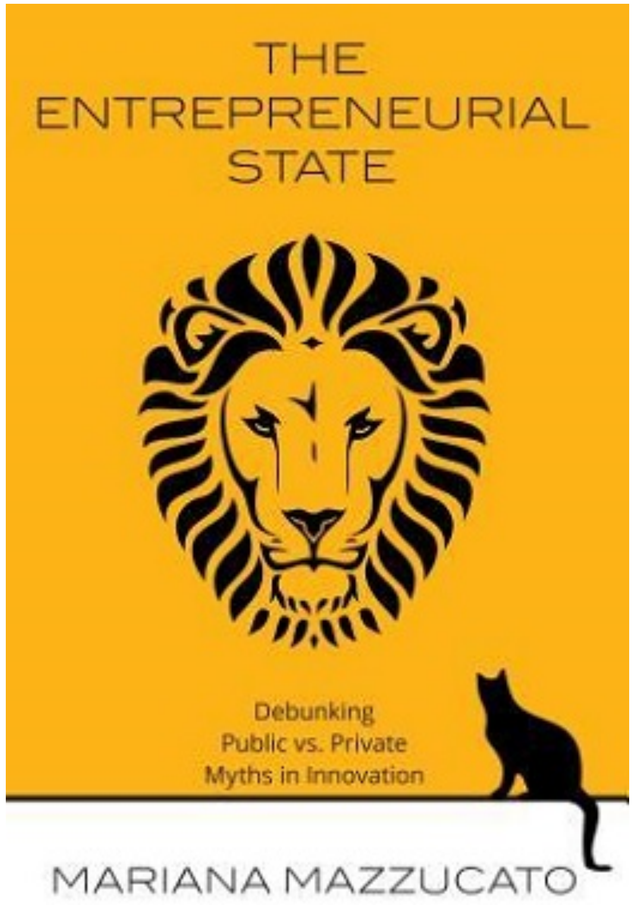
leading party



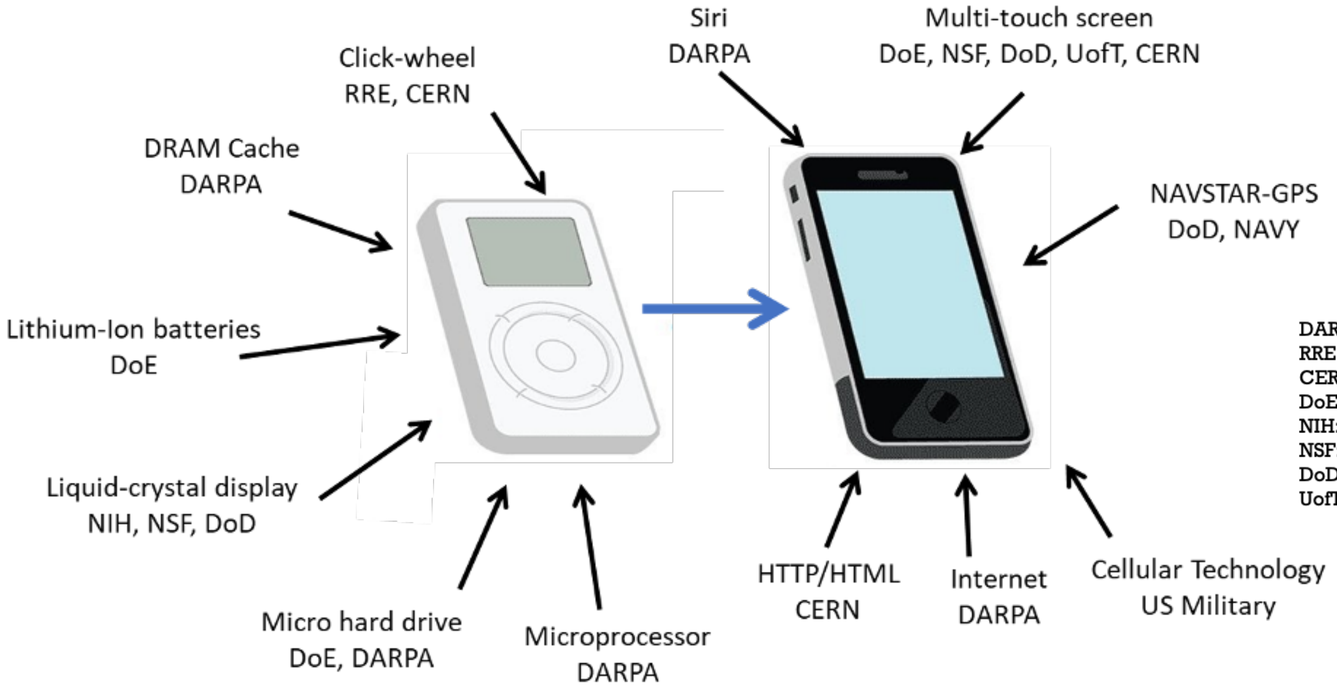
18 man-years dedicated to the project

food for thought

Food for thought: what is the role of Research performed with public funding in the Innovation mechanism? which is the most risk-prone investor?



published in 2013

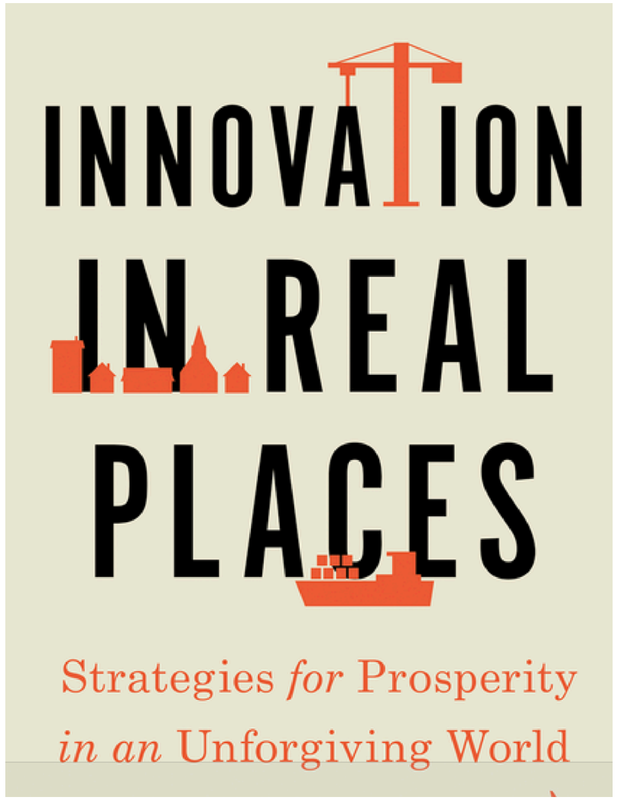


courtesy of P.G.Tello

- **M.M. says:** any way to avoid “socialising risks” and “privatising returns”?
- **Others say:** shall the State drive or act as a “facilitator”?

- **I’m saying**: **Most of the analysts and innovation economists focus on INVENTIONS (which possibly changed the world). Is it really what matters most?**

Food for thought: four shades of Innovation



Dan Breznitz

published in 2021

- **stage 1:** novelty (→ start-up entrepreneurship)

- **stage 2**: design, prototype, development & production engineering

Footwear of Riviera del Brenta

- **stage 3:** second-generation product and component innovation

SHIMANO

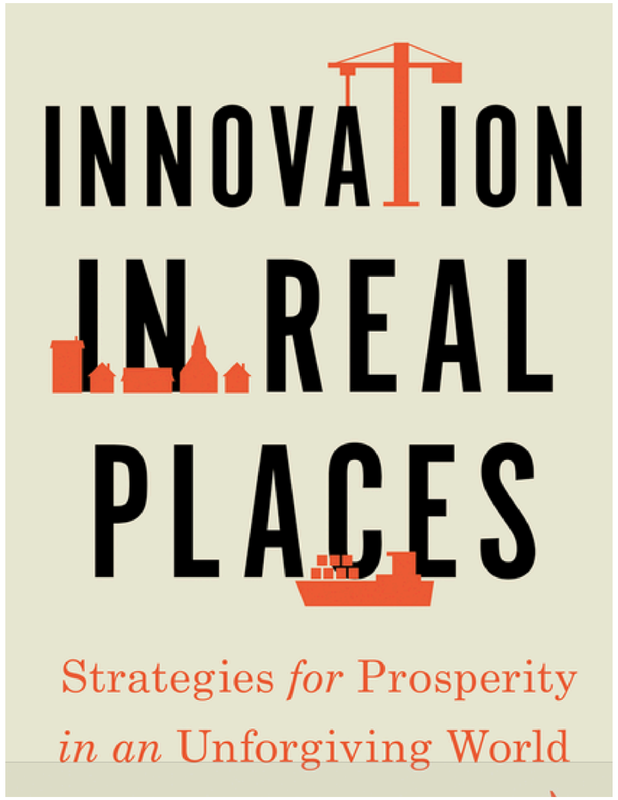
- **stage 4:** production and assembly

FOXCONN

Ford T - 1908-1927

- **Invention:** the process of coming up with truly novel idea
- **Innovation:** process of using ideas to offer new products & services (possibly at reduced factor cost)

Food for thought: four shades of Innovation



Dan Breznitz

published in 2021

Inventions (at the base of stage 1 innovation) are shining bright and are an easy way to tell the world (and the Minister of Science) that we are doing well.

Is there possibly a hype on this mechanism (and the financial framework that goes with it)?

How do we measure innovation?

Chief Scientist: Hugo Hollanders
Maastricht University - ONU MERIT

FRAMEWORK CONDITIONS

- Human resources
  - 1.1.1 New doctorate graduates (in STEM)
  - 1.1.2 Population aged 25-34 with tertiary education
  - 1.1.3 Lifelong learning
- Attractive research systems
  - 1.2.1 International scientific co-publications
  - 1.2.2 Top 10% most cited publications
  - 1.2.3 Foreign doctorate students
- Digitalisation
  - 1.3.1 Broadband penetration
  - 1.3.2 Individuals who have above basic overall digital skills

INVESTMENTS

- Finance and support
  - 2.1.1 R&D expenditure in the public sector
  - 2.1.2 Venture capital expenditures
  - 2.1.3 Direct government funding and government tax support for business R&D
- Firm investments
  - 2.2.1 R&D expenditure in the business sector
  - 2.2.2 Non-R&D innovation expenditures
  - 2.2.3 Innovation expenditures per person employed in innovation-active enterprises
- Use of information technologies
  - 2.3.1 Enterprises providing training to develop or upgrade ICT skills of their personnel
  - 2.3.2 Employed ICT specialists

INNOVATION ACTIVITIES

- Innovators
  - 3.1.1 SMEs with product innovations
  - 3.1.2 SMEs with business process innovations
- Linkages
  - 3.2.1 Innovative SMEs collaborating with others
  - 3.2.2 Public-private co-publications
  - 3.2.3 Job-to-job mobility of Human Resources in Science & Technology
- Intellectual assets
  - 3.3.1 PCT patent applications
  - 3.3.2 Trademark applications
  - 3.3.3 Design applications

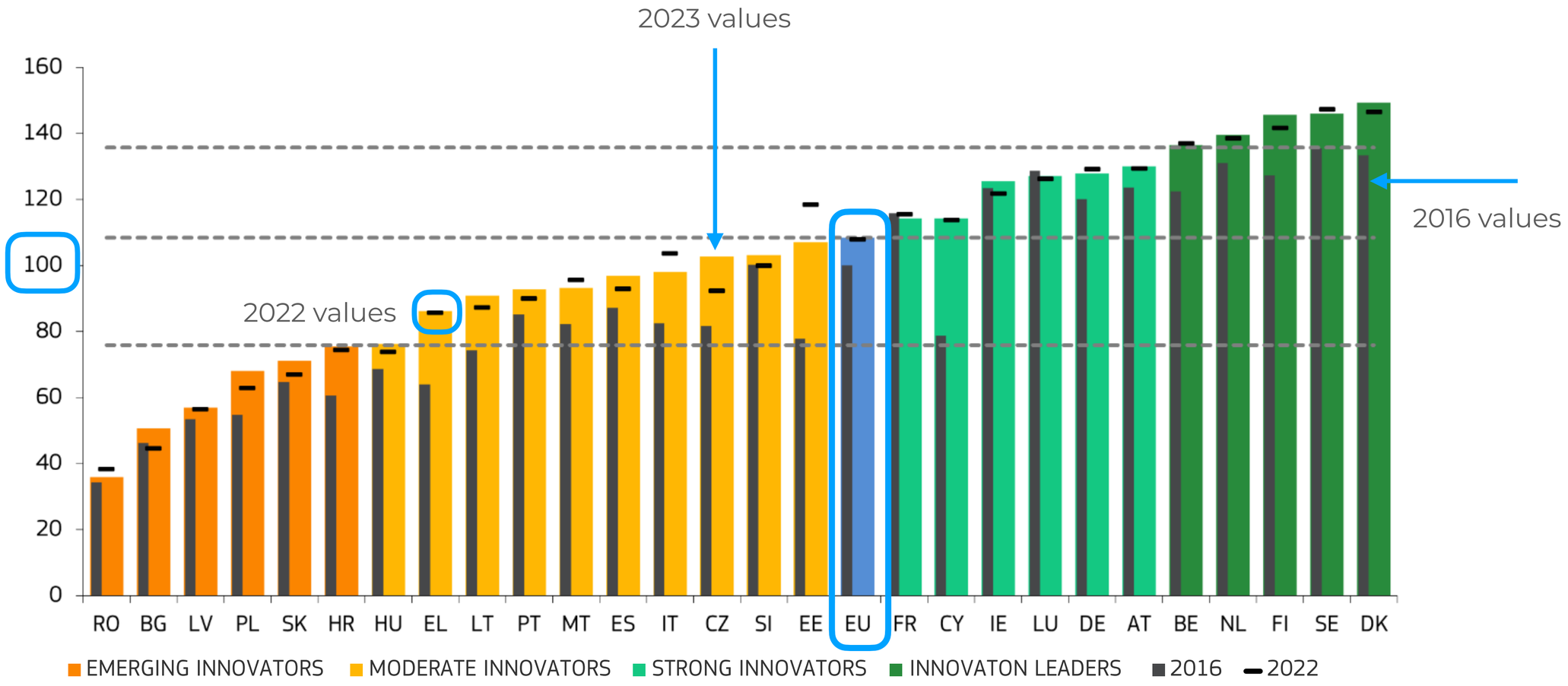
IMPACTS

- Employment impacts
  - 4.1.1 Employment in knowledge-intensive activities
  - 4.1.2 Employment in innovative enterprises
- Sales impacts
  - 4.2.1 Medium and high-tech product exports
  - 4.2.2 Knowledge-intensive services exports
  - 4.2.3 Sales of product innovations
- Environmental sustainability
  - 4.3.1 Resource productivity
  - 4.3.2 Air emissions by fine particulates PM2.5 in Industry
  - 4.3.3 Development of environment-related technologies

- **32 indicators, all normalised**
- **summed up with equal weight to define a Summary Innovation Index (SII)**

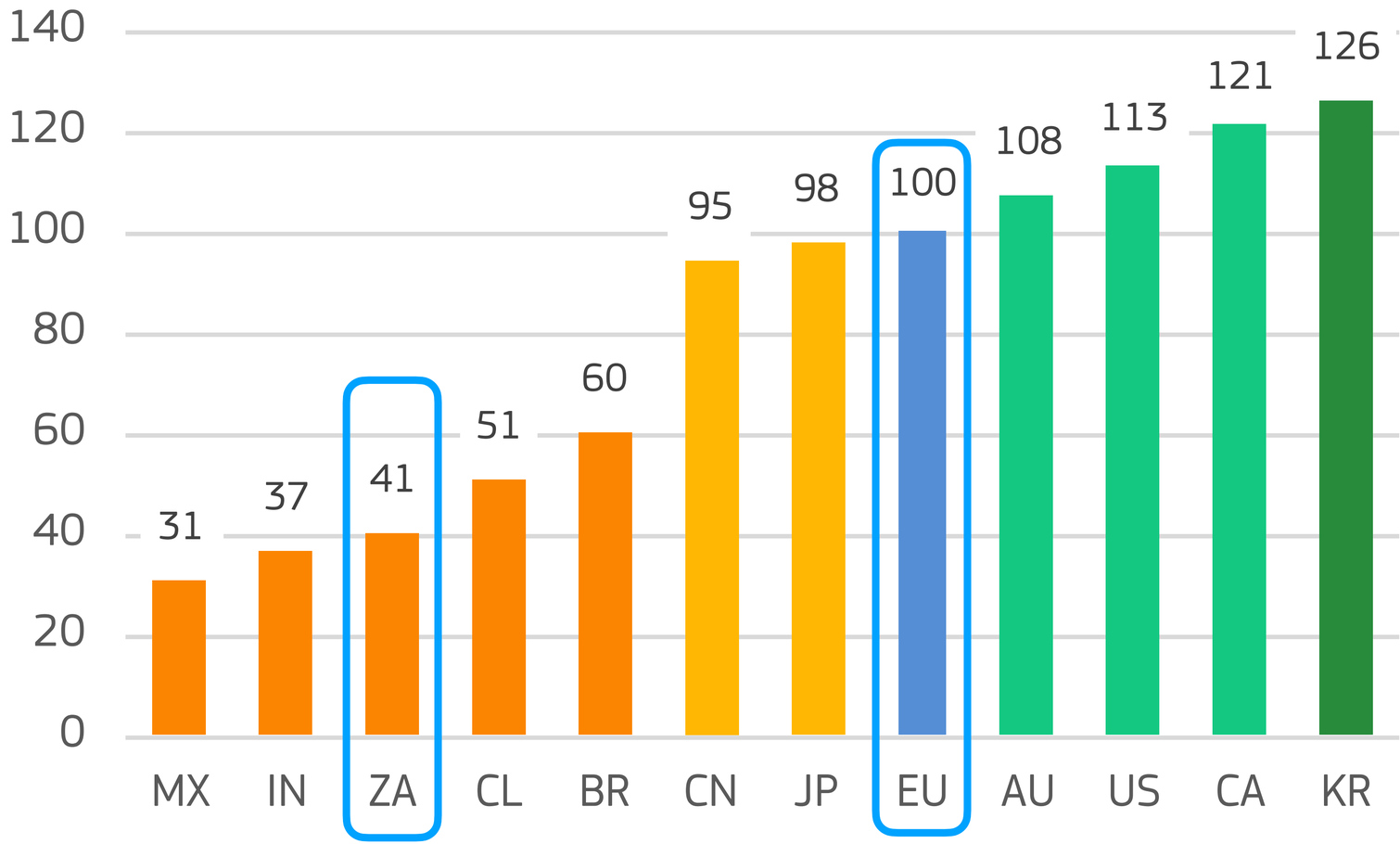
How innovative is Europe?

EU as a single country in 2016

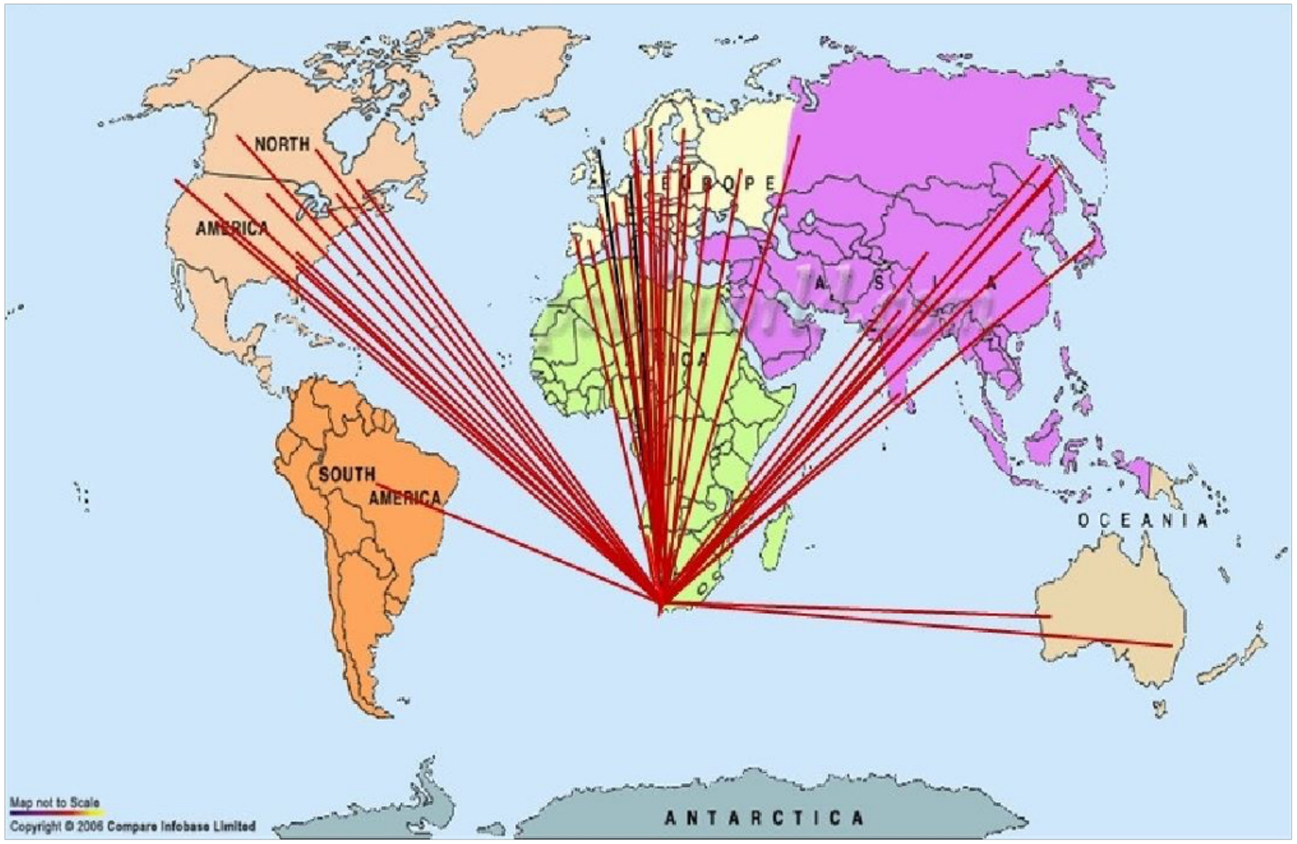


Mind the fact that SWITZERLAND is at 140, with an Attractive Research System at 224.
The UK is at 5, with indicators connected to collaboration among SME's and private/public links at 207

Where Europe stands with respect to others?



A note of general value from South Africa:



75

local nuclear medicine depts. & academic institutions

100

international clients and collaborators

165 000

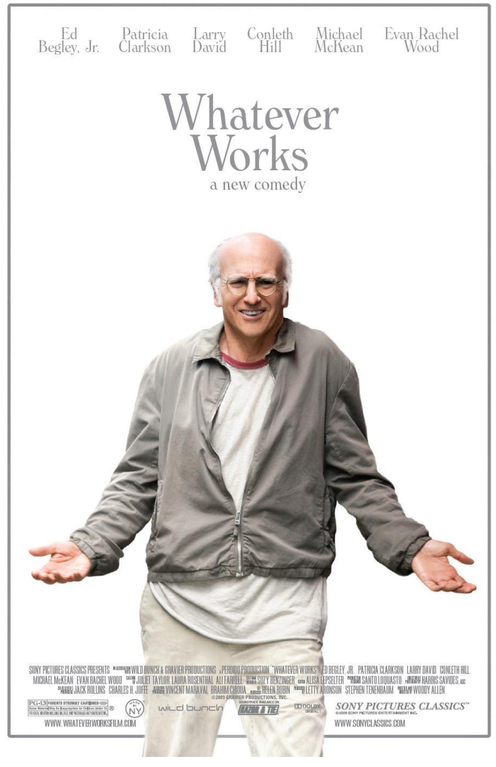
Patients in the last Financial Year

Radioisotope production, distribution & marketing at

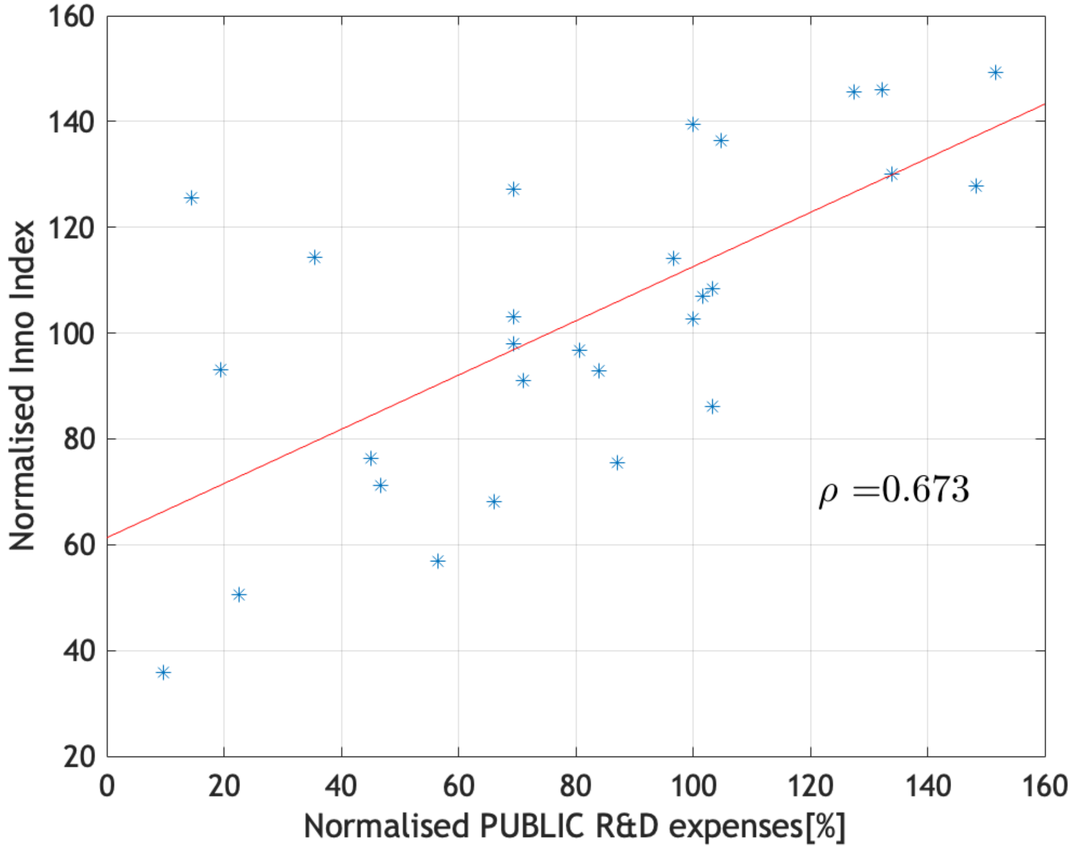
National Research Foundation | iThemba LABS | Laboratory for Accelerator Based Sciences

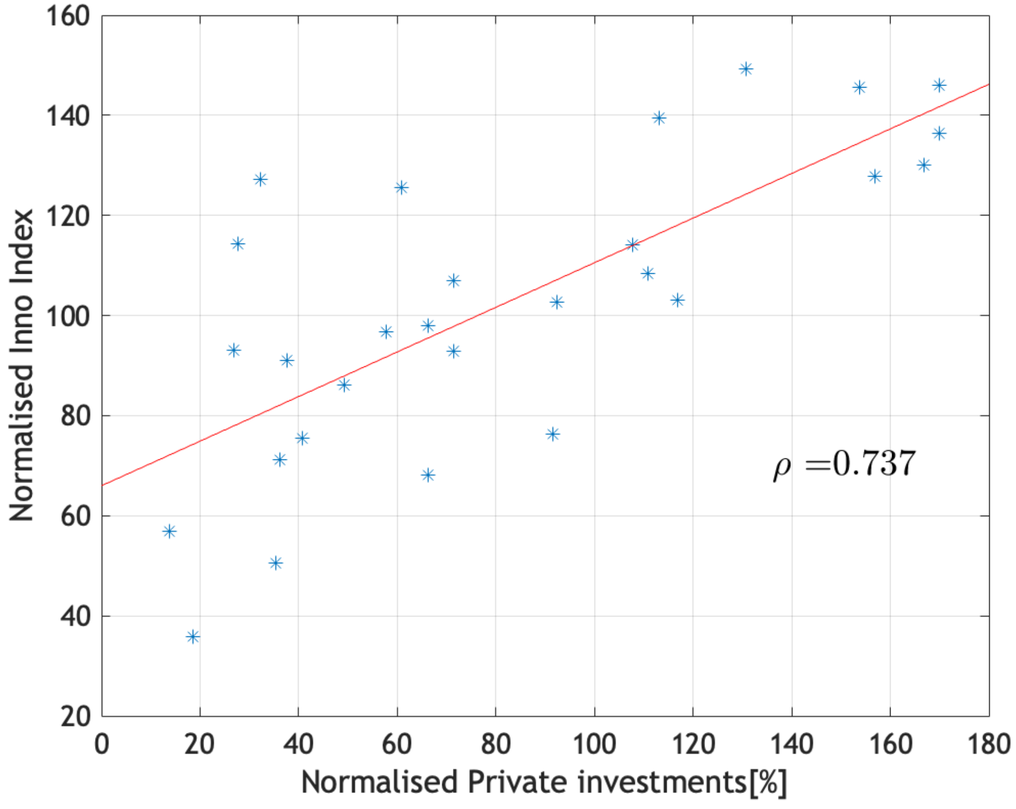
Q (M. Caccia):
what is your business model?

A (Makondele Victor Tshivhase):
essentially,



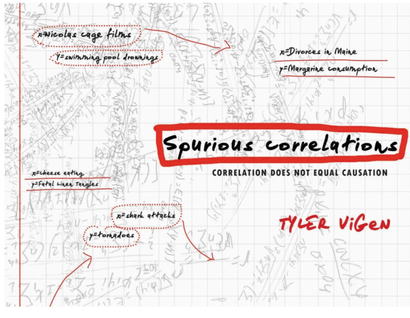
a few remarks (limited, since correlation does not imply causation!):





is it all about money?

https://ec.europa.eu/research-and-innovation/en/statistics/performance-indicators/european-innovation-scoreboard/eis



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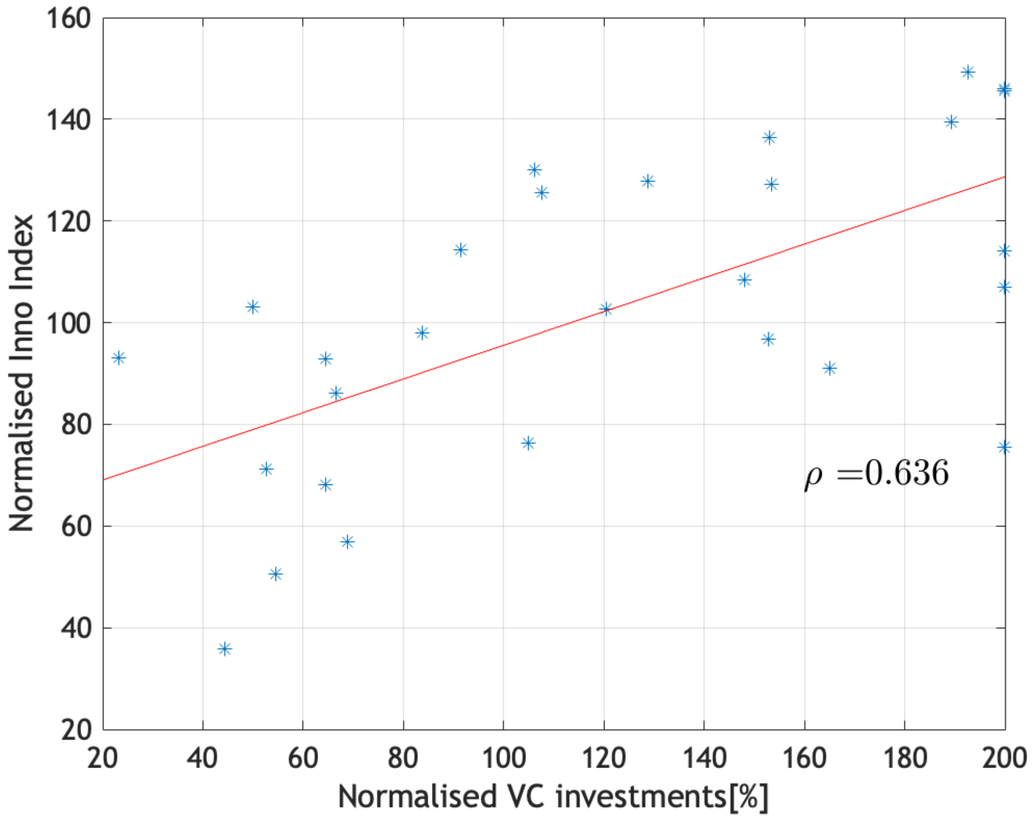
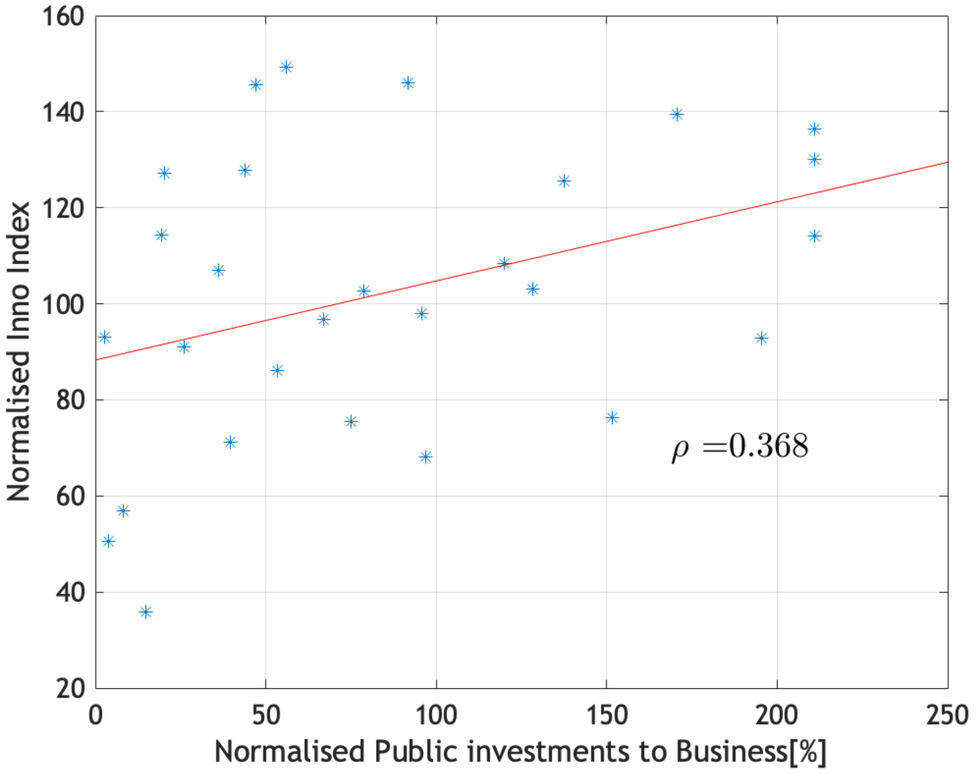
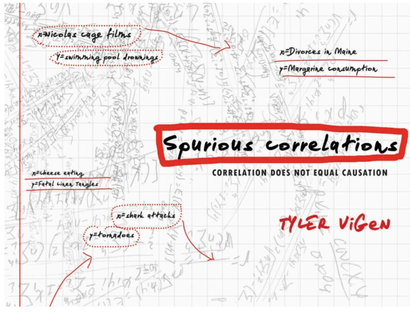
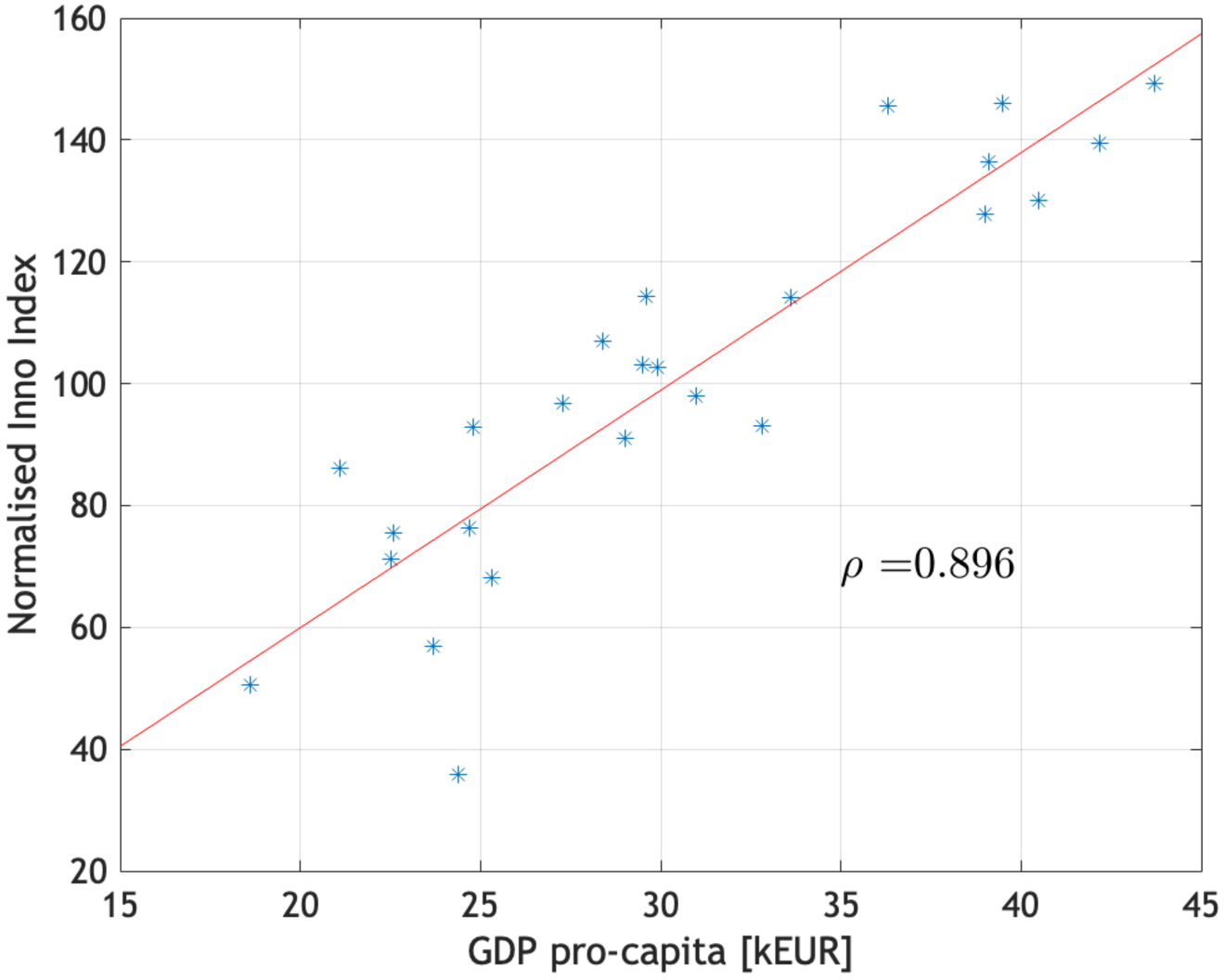




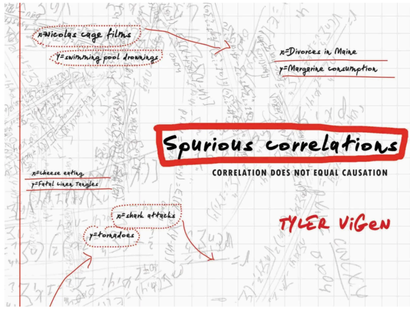


a few remarks (limited, since correlation does not imply causation!):

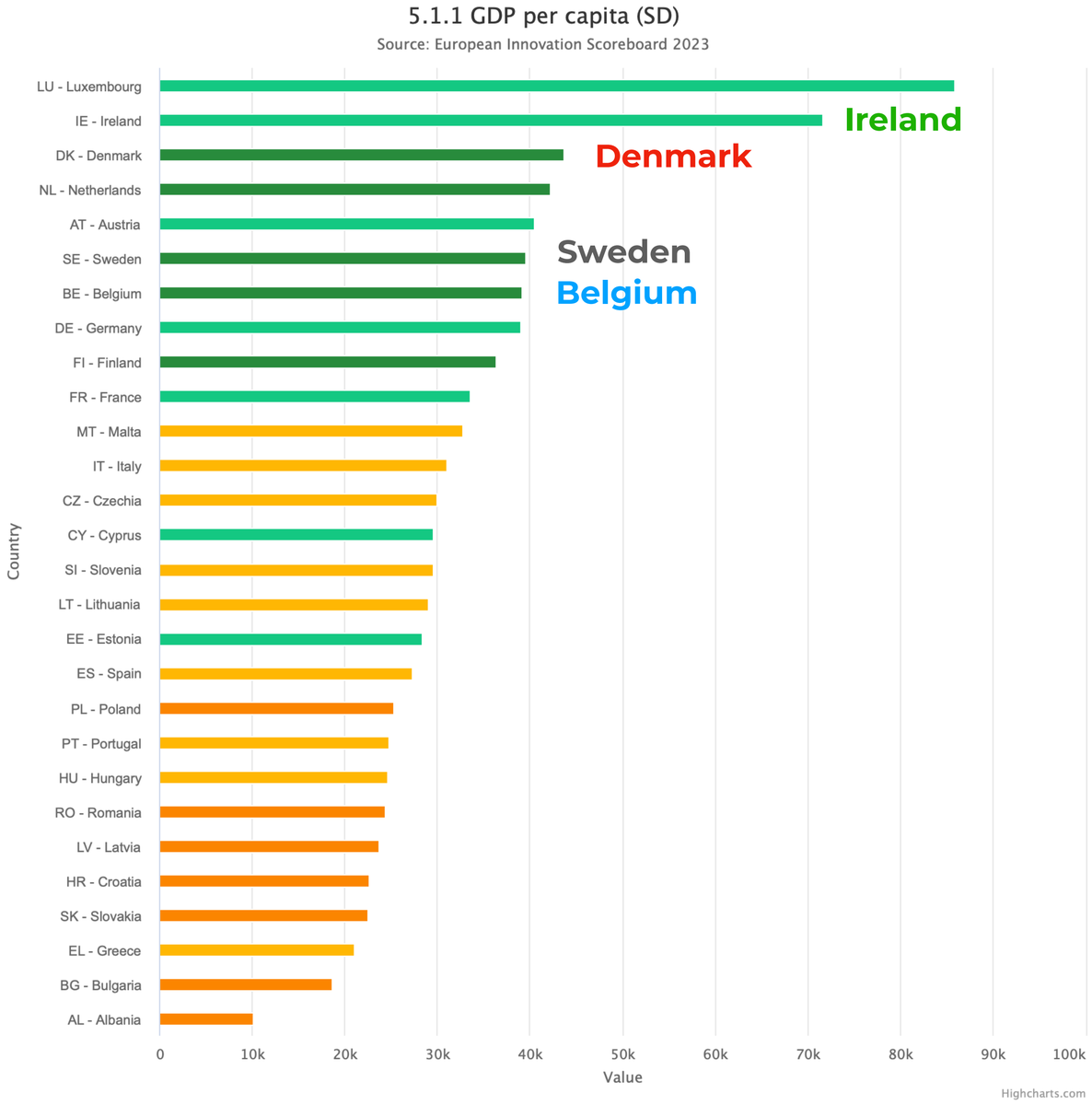


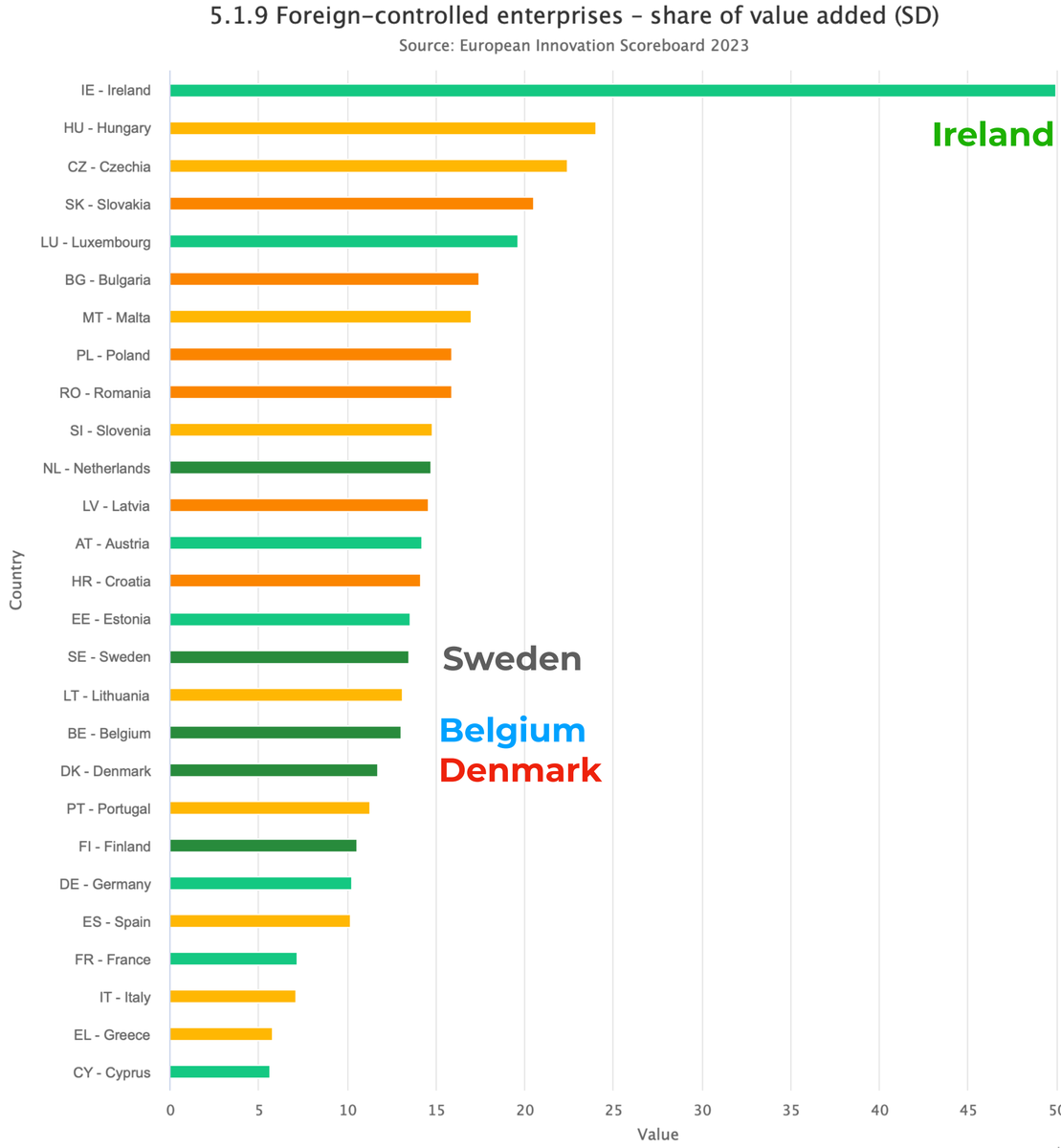
Maybe is not all about money but once you have it, life is easier

(mind the fact I excluded Ireland & Luxemburg, clear outliers on the x-axis)



a few remarks; on the long run, mind property:





can we measure the major outcome of innovation policies?

Ann Reg Sci (2018) 60:265–284
https://doi.org/10.1007/s00168-017-0841-6

CrossMark

SPECIAL ISSUE PAPER

Innovation and regional economic resilience: an exploratory analysis

Gillian Bristow[1] · Adrian Healy[1]

Dictionary

Definitions from Oxford Languages · Learn more

resilience

/rɪˈzɪlɪəns/

noun

noun: **resiliency**

1. the capacity to withstand or to recover quickly from difficulties; toughness.
   "the remarkable resilience of so many institutions"
2. the ability of a substance or object to spring back into shape; elasticity.
   "nylon is excellent in wearability and resilience"

Similar: flexibility · pliability · suppleness · plasticity · elasticity · springiness

How did country respond to the 2008 shock?

- regions classified according to the EU scoreboard, at regional level (NUTS 1 + NUTS 2 classification)

- qualifier: recovery of the employment level within 3 years

Table 2 Distribution of regions across resilient states and innovation categories

	Resistant		Recovered		Not Recovered: Upturn		Not Recovered: Downturn		Total
	No.	%	No.	%	No.	%	No.	%	No.
Innovation leader	6	17.1	16	45.7	12	34.3	1	2.9	35
Innovation follower	4	6.8	12	20.3	27	45.8	16	27.1	59
Moderate innovator	1	2.5	6	15.0	19	47.5	14	35.0	40
Modest innovator	7	13.5	3	5.8	17	32.7	25	48.1	52
Total	18	9.7	37	19.9	75	40.3	56	30.1	186

Final remarks:

Knowledge & Technology Transfer: shall I really DO it?

- do not feel obliged!
- do not feel compelled even by who refers to the ACCOUNTABILITY of Science
- however:
  - think a bit in terms of SOCIAL RESPONSABILITY
  - turn **TRANSFER** into **EXCHANGE**

(here)

and you will discover it does represent a great **OPPORTUNITY**