Arthur B. McDonald
Canadian Astroparticle Physics Research Institute

CANADA FIRST RESEARCH EXCELLENCE FUND

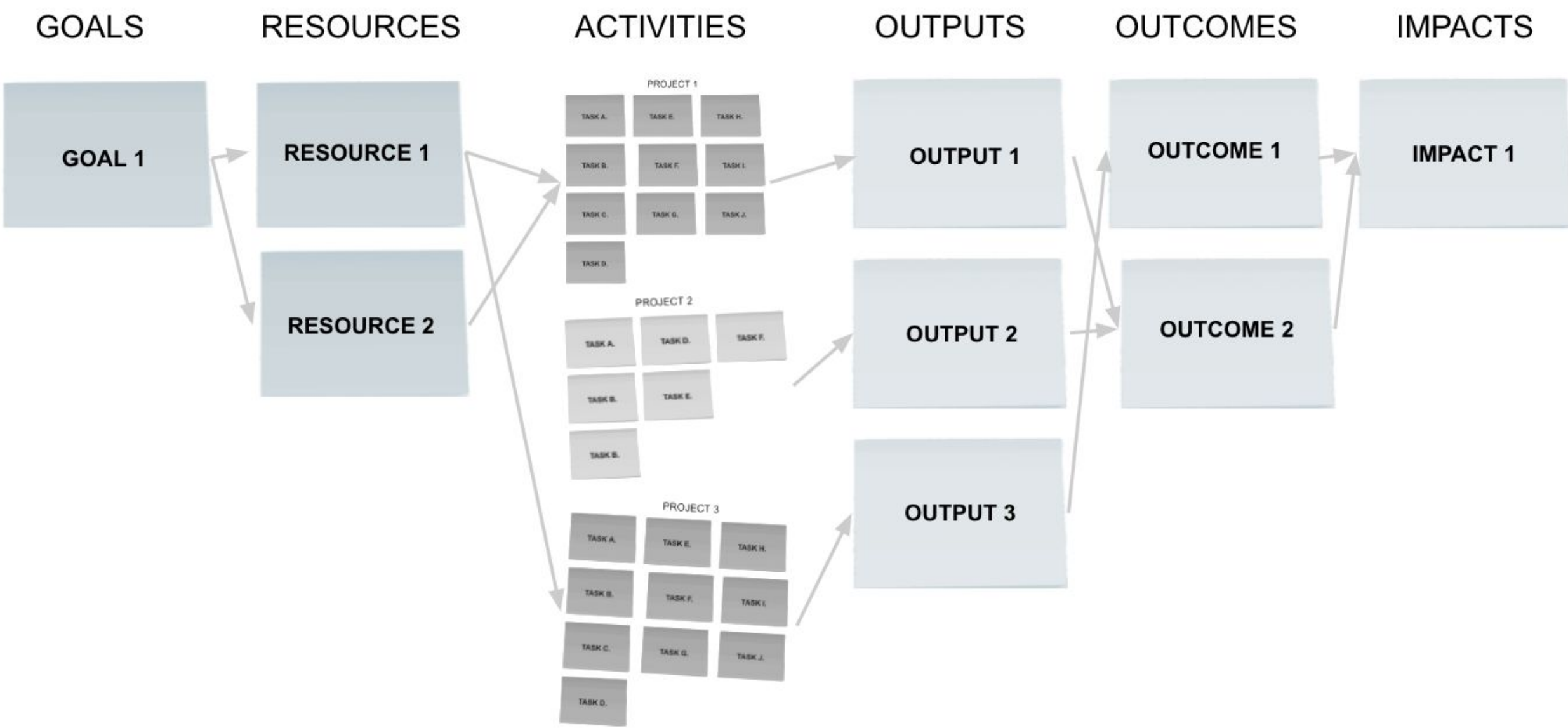
Industrial Engagement

Key learning during McDonald Institute's CFREF mandate 2016-2024

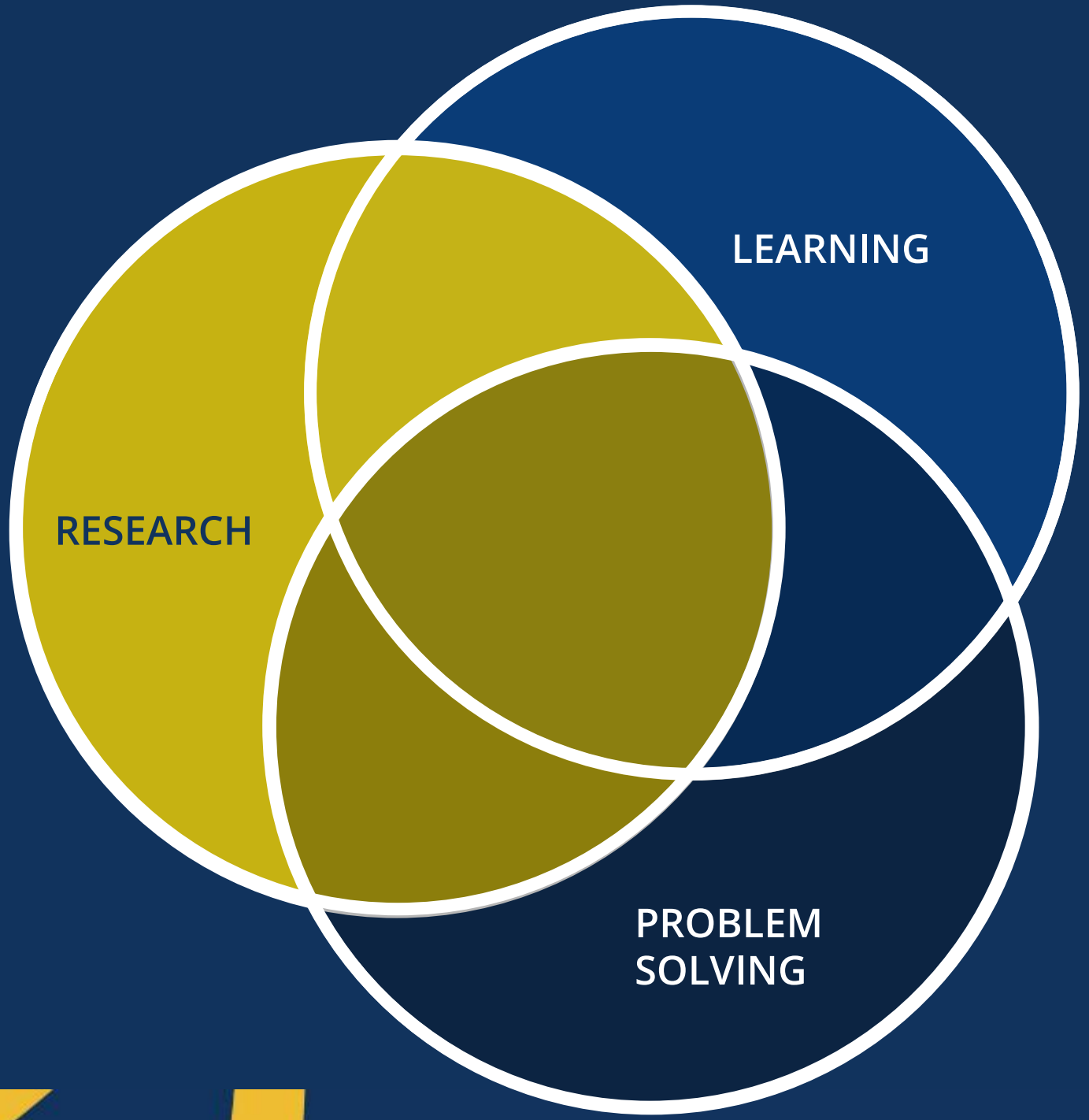
Edward Thomas, Associate Director
Aug. 9, 2024

THE BIG ASK:

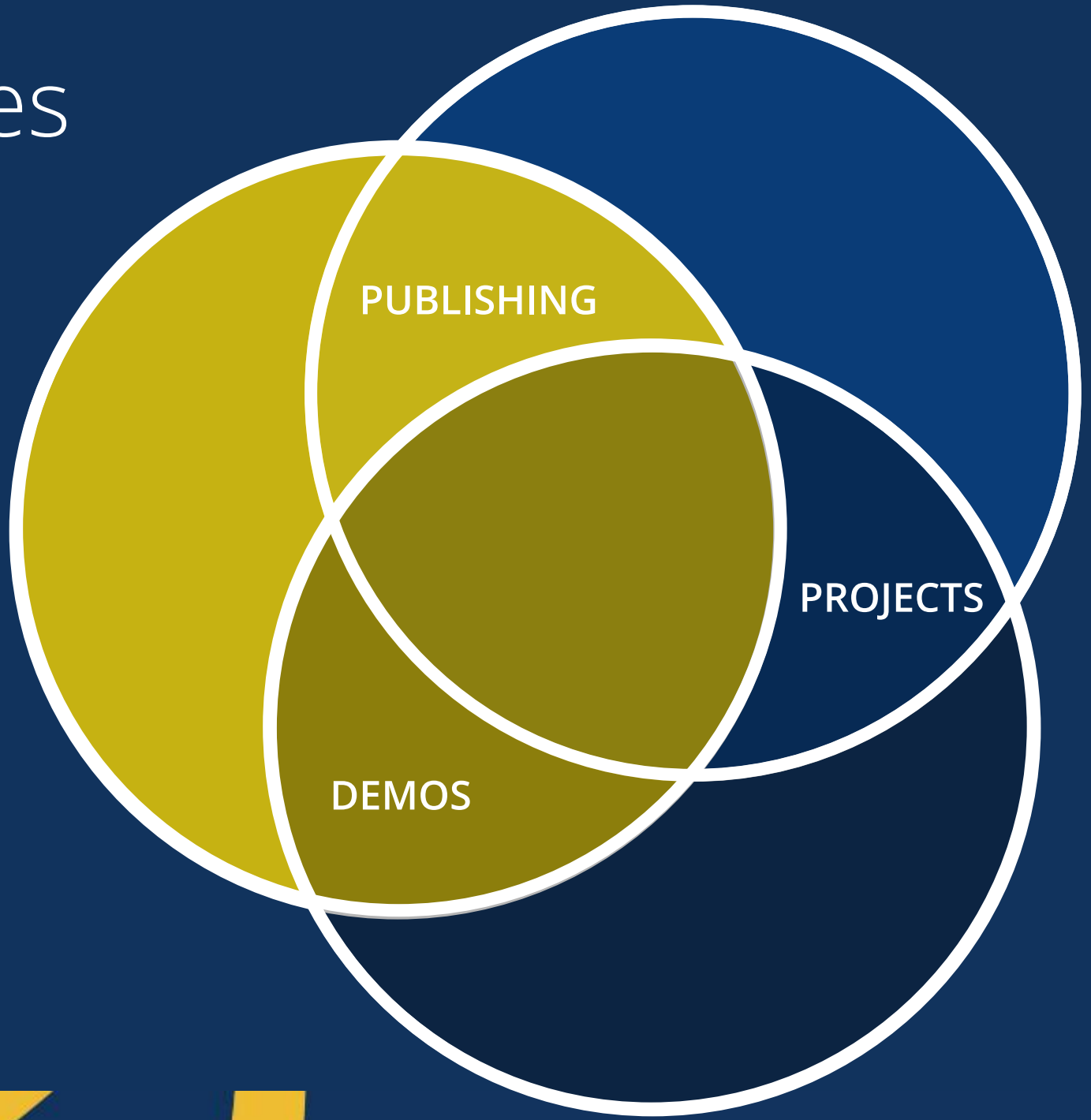
Bridge gaps between Canadian Big Science and innovation ecosystems


GOALS
RESOURCES
ACTIVITIES
OUTPUTS
OUTCOMES
IMPACTS
GOAL 1
RESOURCE 1
RESOURCE 2
PROJECT 1
TASK A.
TASK E.
TASK H.
TASK B.
TASK F.
TASK I.
TASK C.
TASK G.
TASK J.
TASK D.
PROJECT 2
TASK A.
TASK D.
TASK F.
TASK B.
TASK E.
TASK B.
PROJECT 3
TASK A.
TASK E.
TASK H.
TASK B.
TASK F.
TASK I.
TASK C.
TASK G.
TASK J.
TASK D.
OUTPUT 1
OUTPUT 2
OUTPUT 3
OUTCOME 1
OUTCOME 2
IMPACT 1

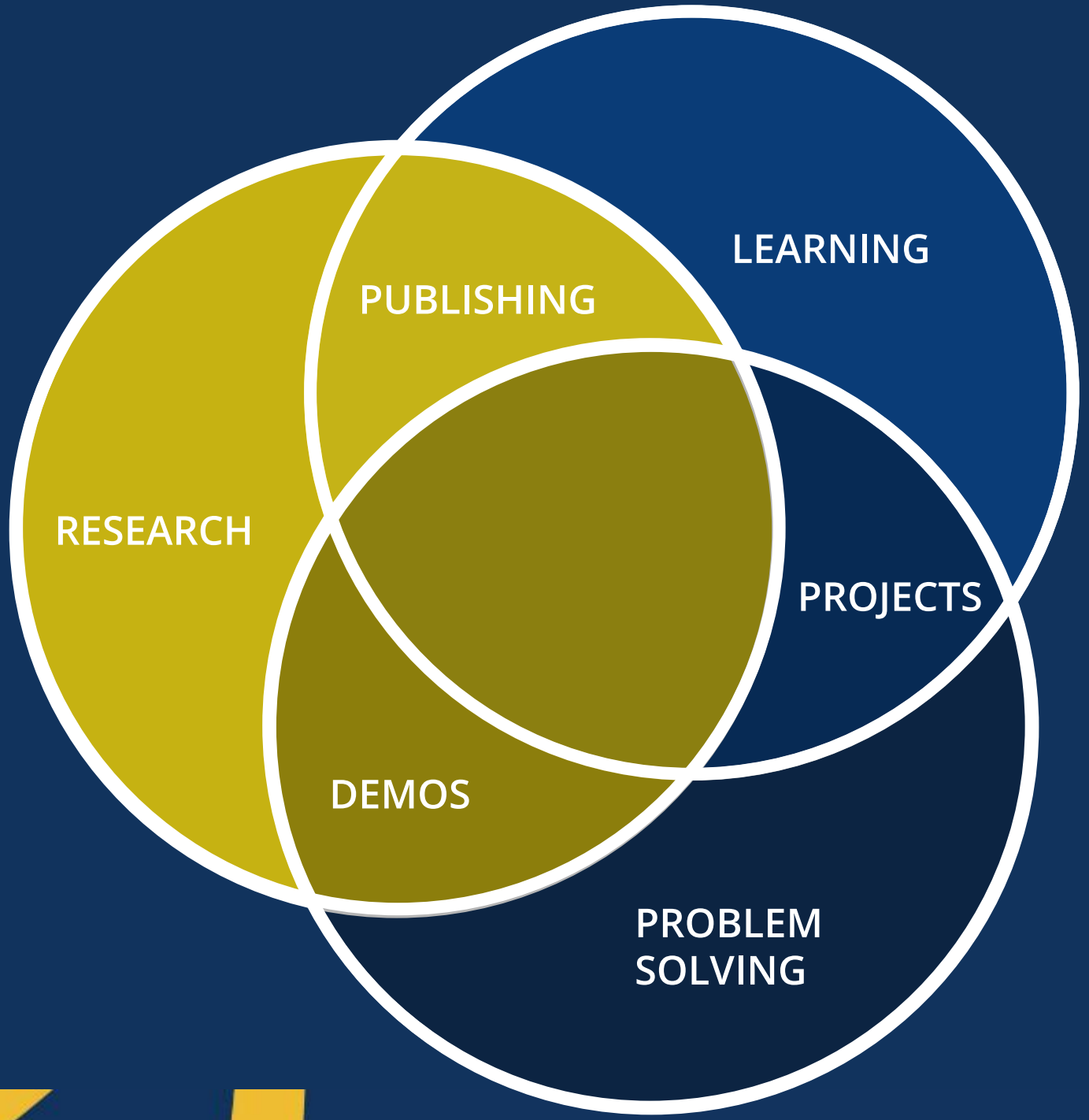
Goals



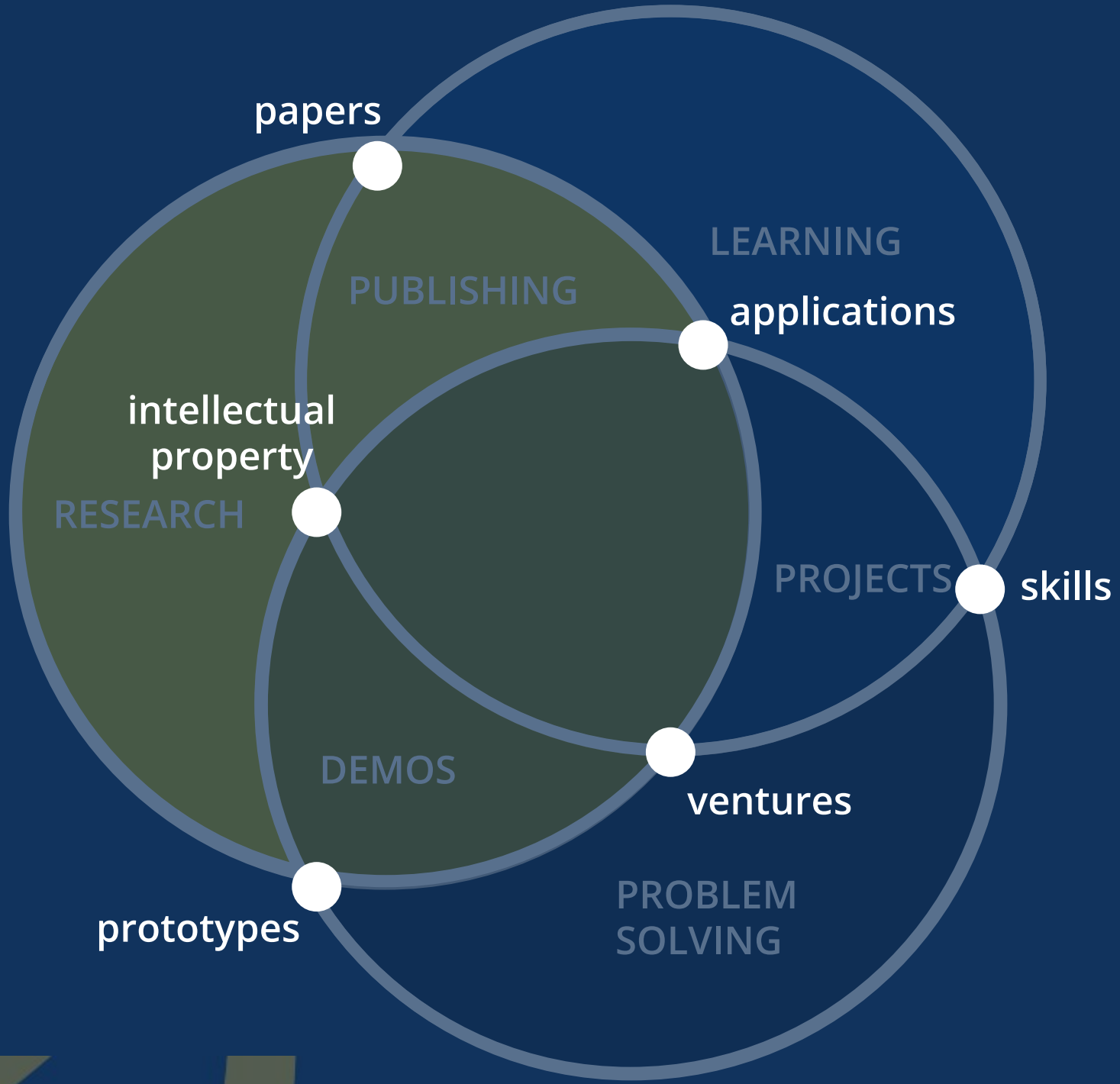
Objectives



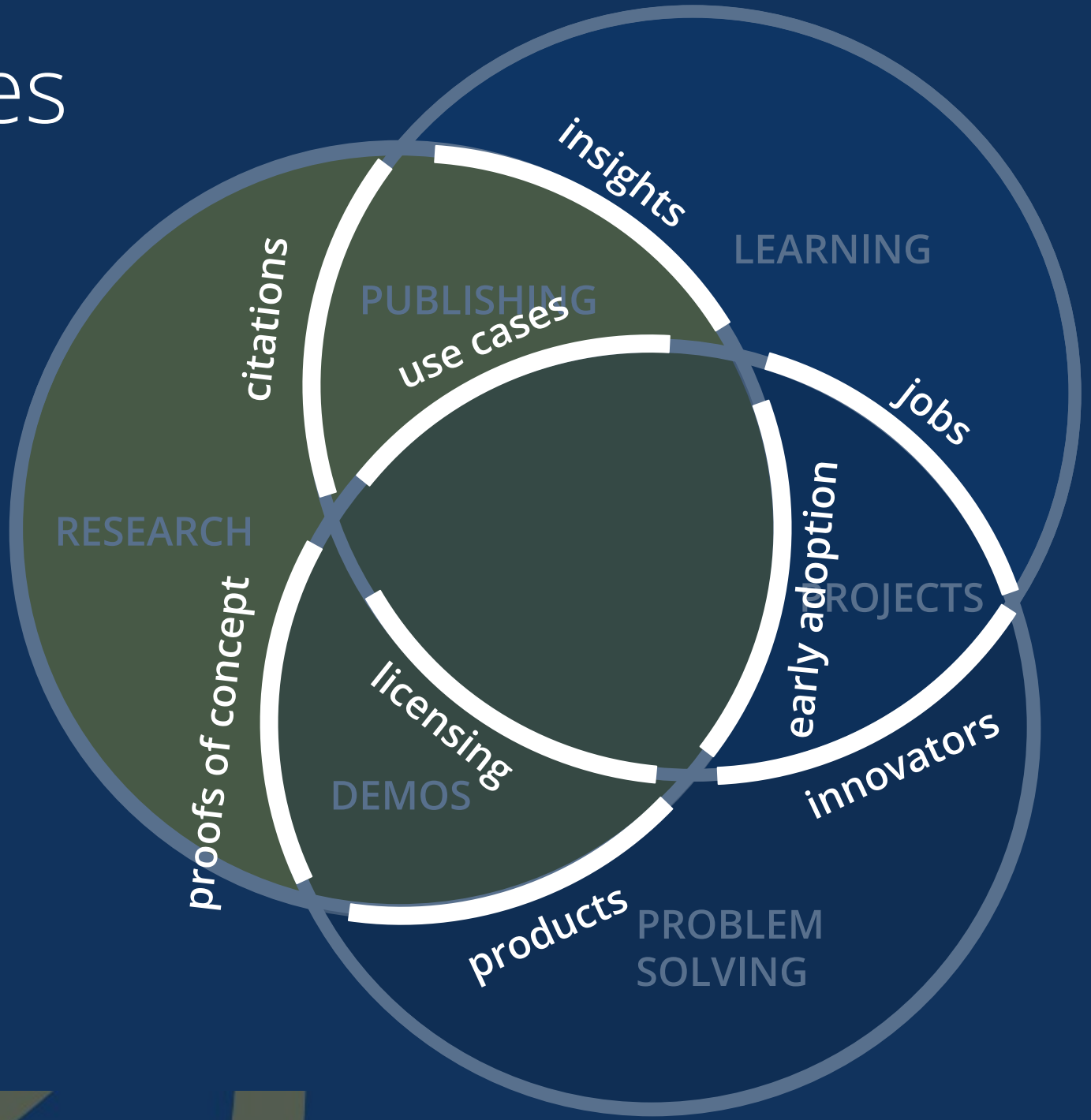
Activities


LEARNING
PUBLISHING
RESEARCH
PROJECTS
DEMOS
PROBLEM
SOLVING

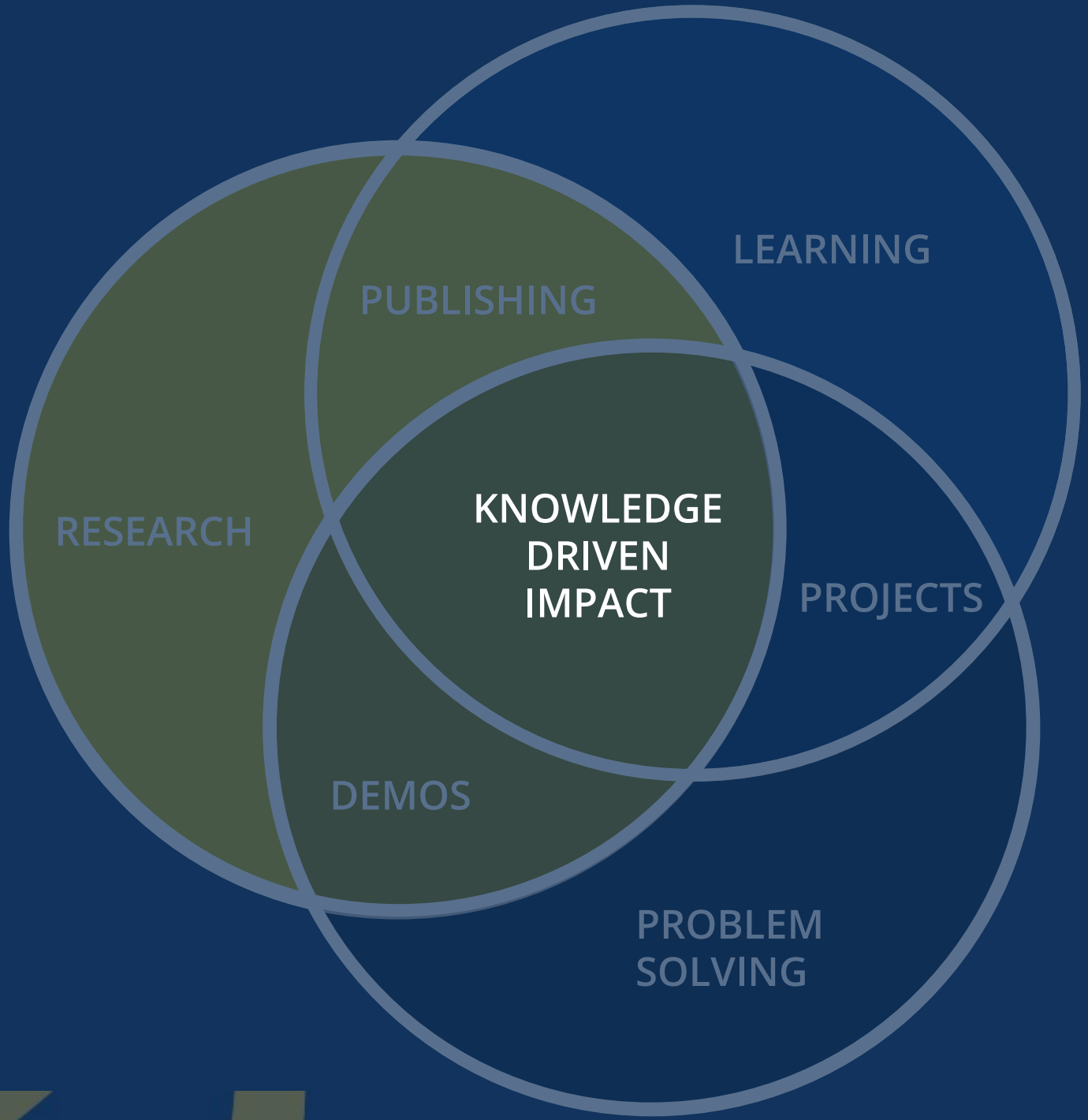
Outputs


papers
LEARNING
PUBLISHING
applications
intellectual
property
RESEARCH
PROJECTS
skills
DEMOS
ventures
PROBLEM
SOLVING
prototypes

Outcomes

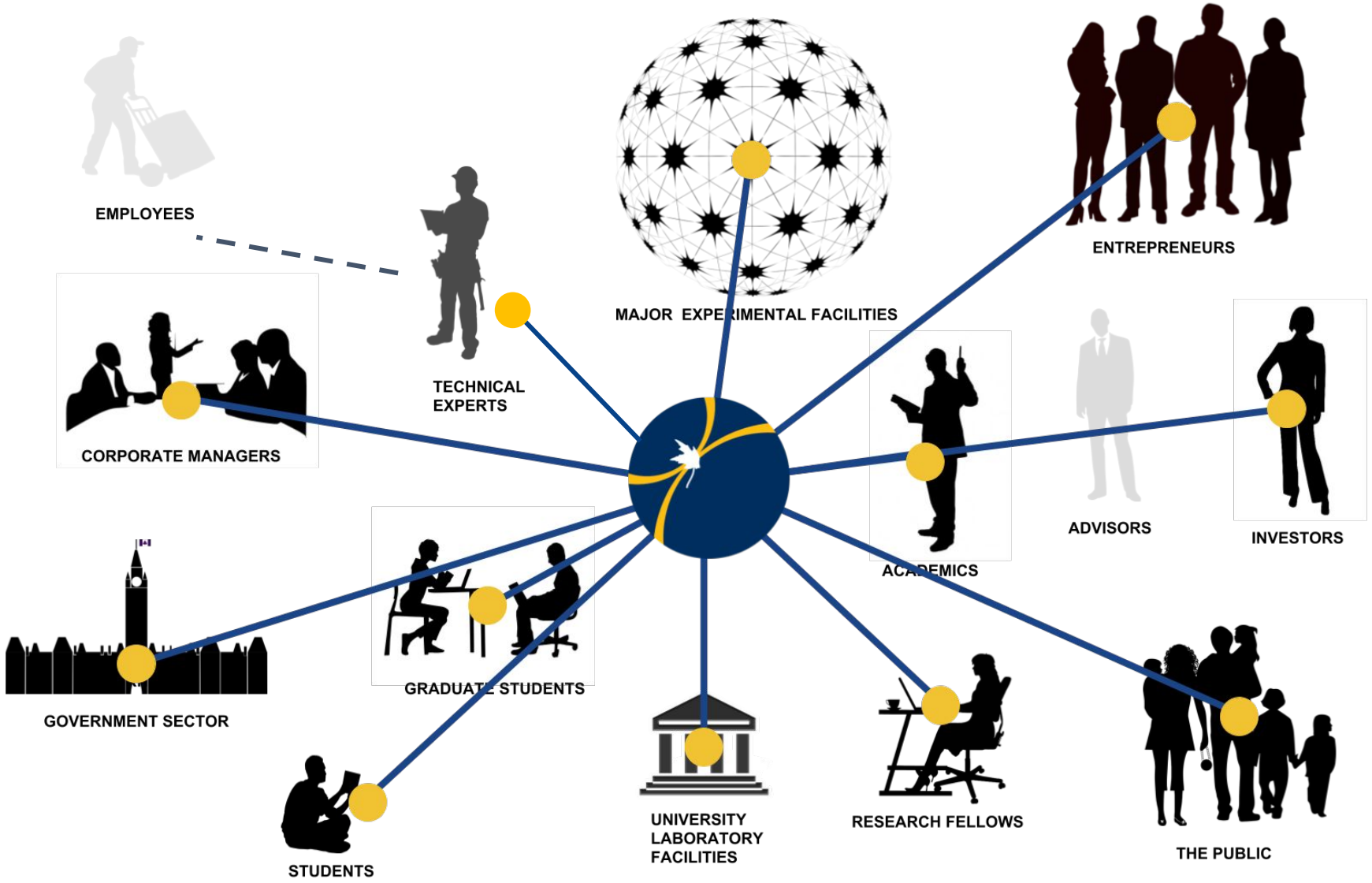

insights
LEARNING
citations
PUBLISHING
use cases
jobs
RESEARCH
early adoption
PROJECTS
proofs of concept
licensing
DEMOS
innovators
products
PROBLEM SOLVING

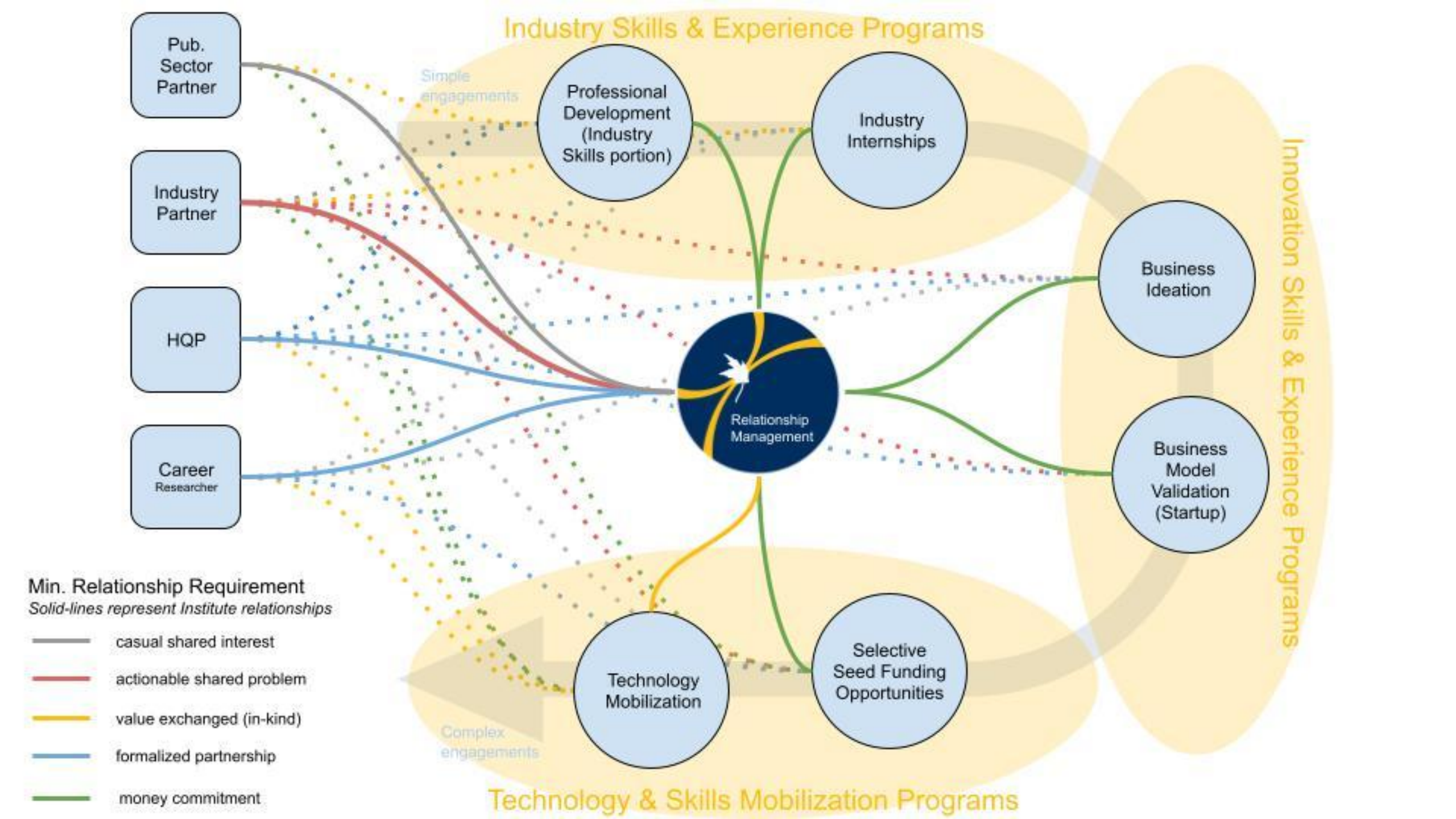
Impacts


LEARNING
PUBLISHING
RESEARCH
KNOWLEDGE
DRIVEN
IMPACT
PROJECTS
DEMOS
PROBLEM
SOLVING

CONNECTING WITH INDUSTRY

Strengthen the astroparticle physics network within and beyond the laboratory.




Industry Skills & Experience Programs
Simple engagements
Pub. Sector Partner
Industry Partner
HQP
Career Researcher
Professional Development (Industry Skills portion)
Industry Internships
Relationship Management
Business Ideation
Business Model Validation (Startup)
Innovation Skills & Experience Programs
Technology Mobilization
Selective Seed Funding Opportunities
Complex engagements
Technology & Skills Mobilization Programs
Min. Relationship Requirement
Solid-lines represent Institute relationships
casual shared interest
actionable shared problem
value exchanged (in-kind)
formalized partnership
money commitment


PD&L
Professional
Development
&Learning
Series

Young Persons' Lecture Competition

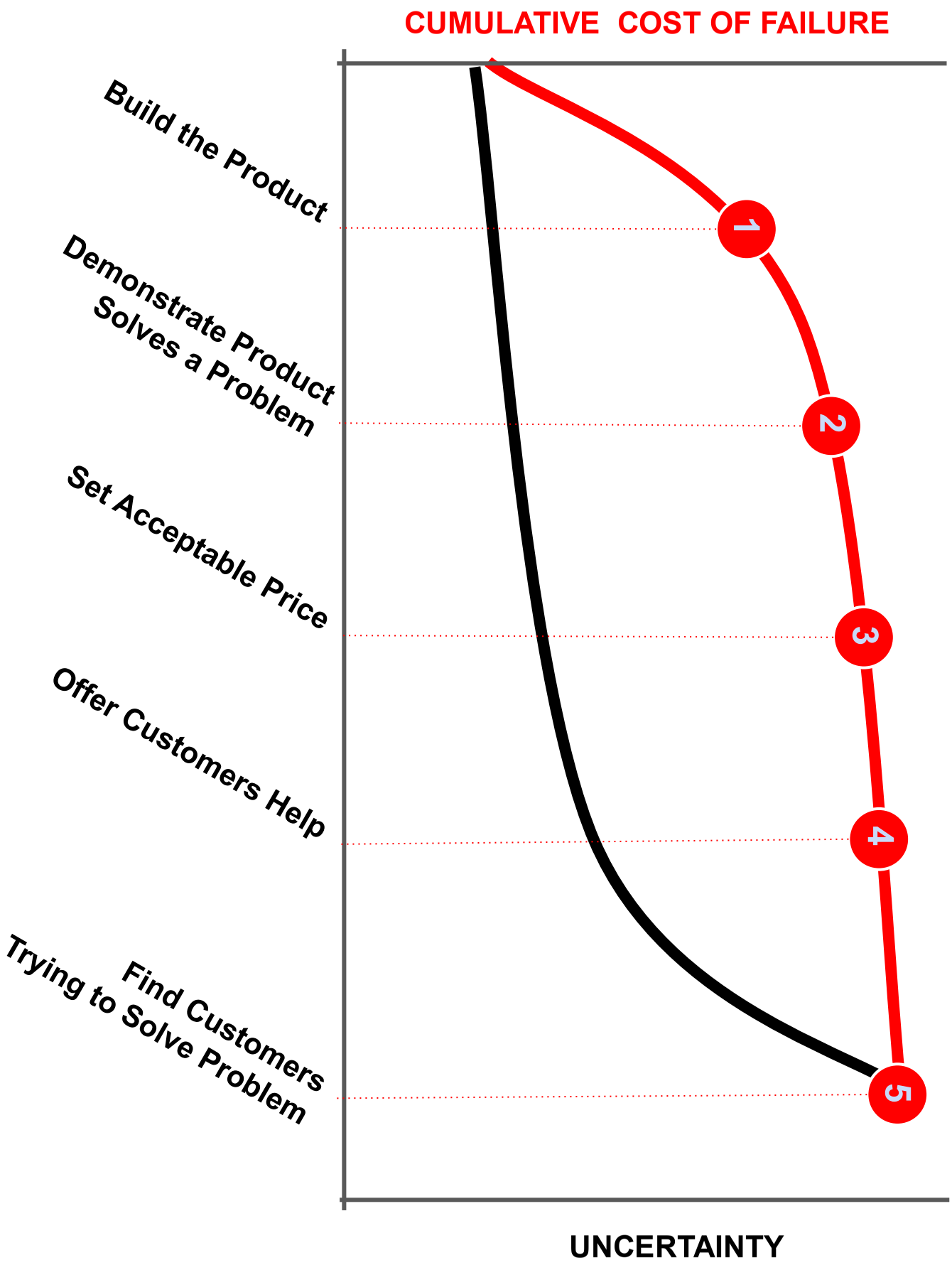
(Un)Hacking Downstream Consequences

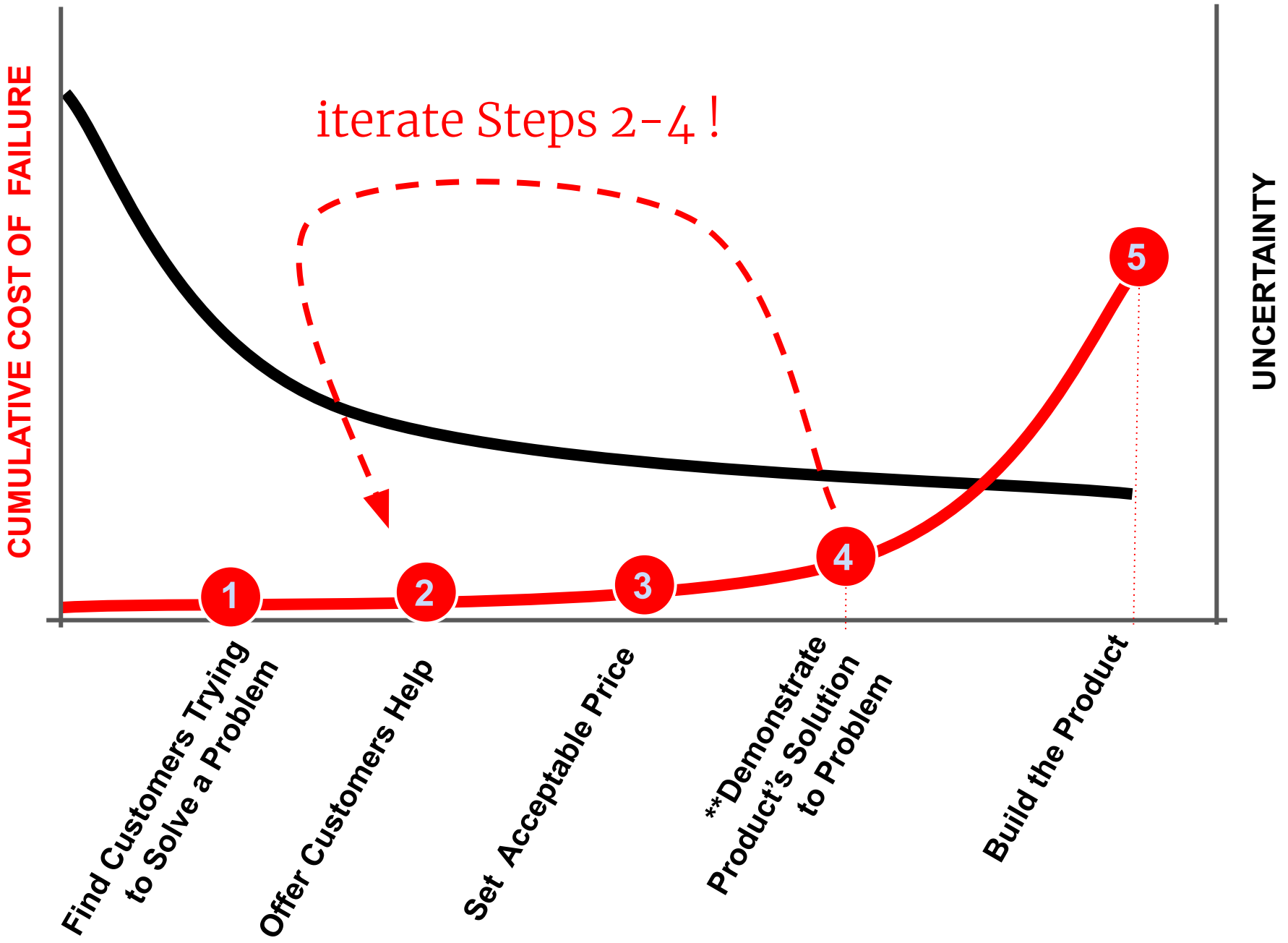
February 22 - March 3, 2022

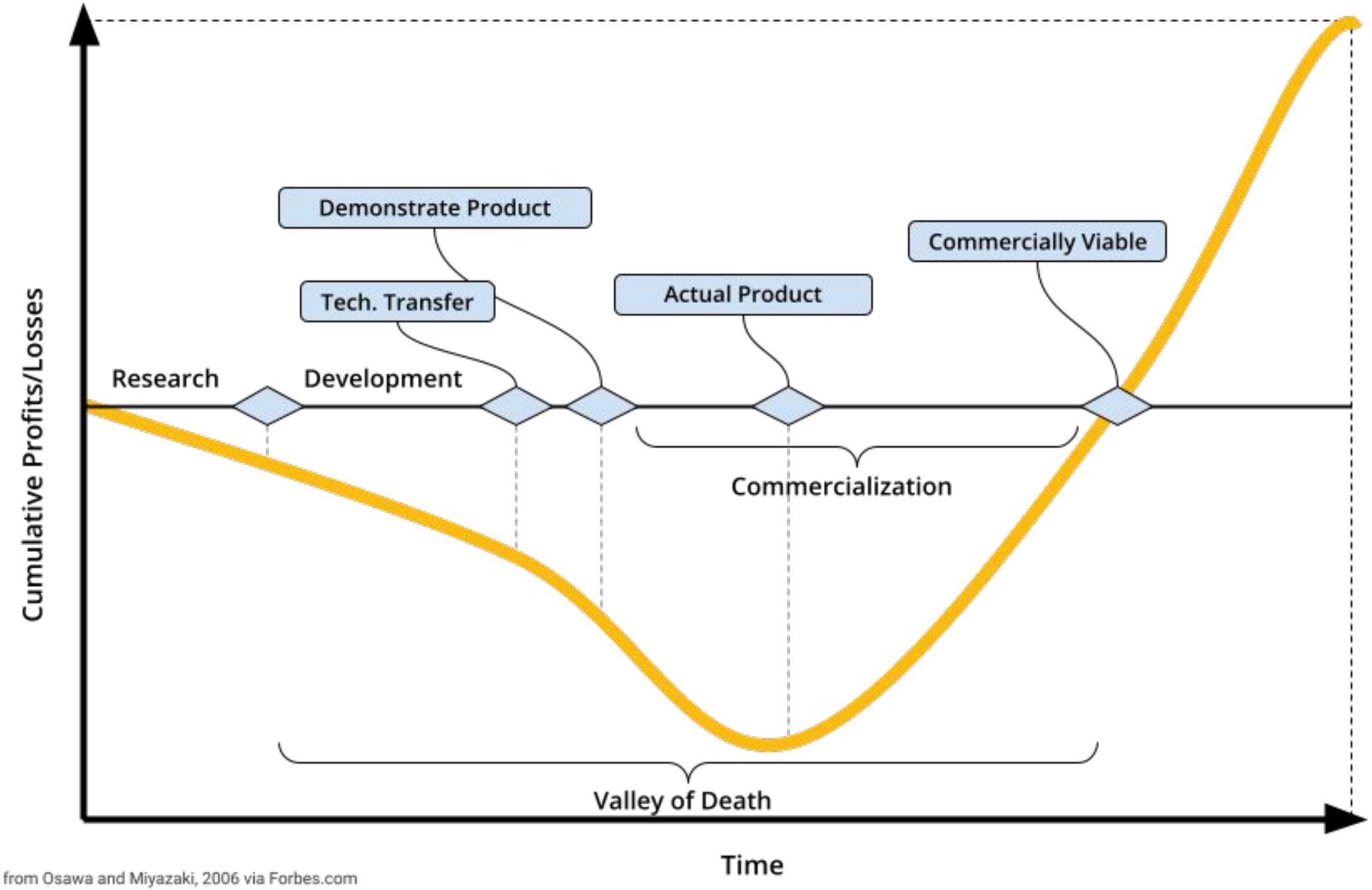
…And many others

- Instrumentation Equip.
- Mining & Mineral Processing
- Geoengineer Safety
- Pharmaceutical
- Civil & Military Monitoring
- Manufacturing

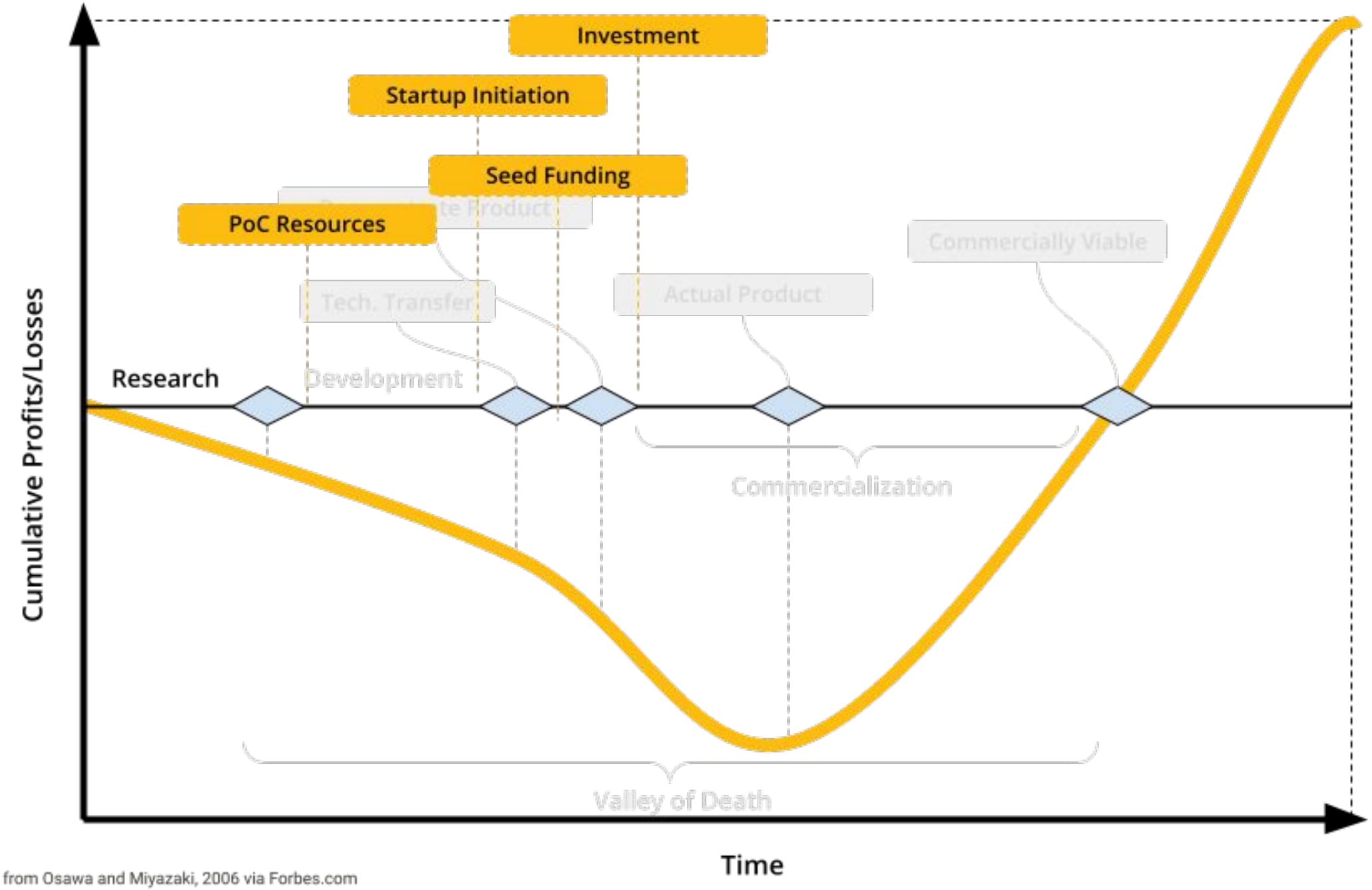
DE-RISKING


CUMULATIVE COST OF FAILURE
Build the Product
Demonstrate Product Solves a Problem
Set Acceptable Price
Offer Customers Help
Find Customers Trying to Solve Problem
1
2
3
4
5
UNCERTAINTY

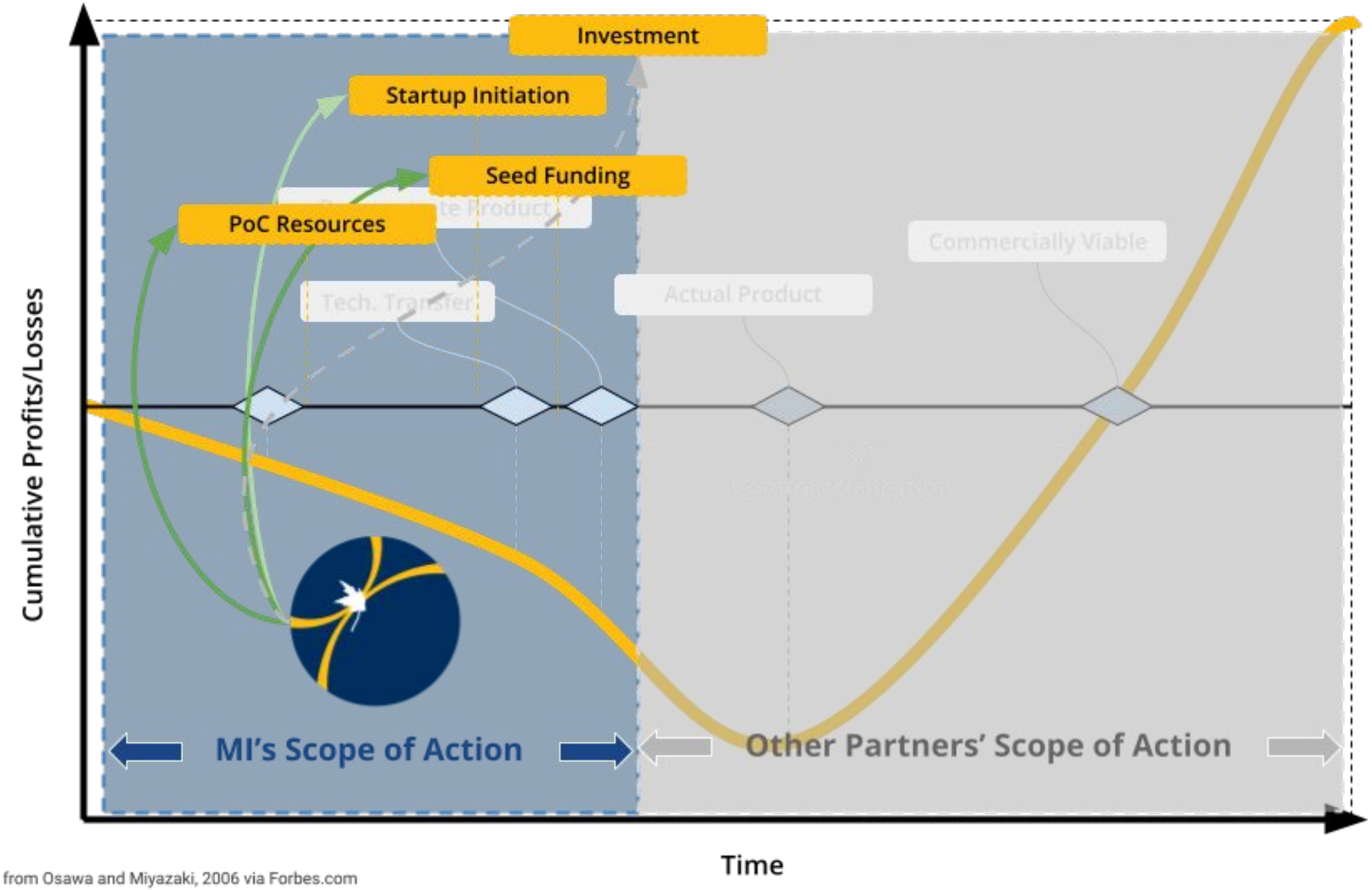

CUMULATIVE COST OF FAILURE
iterate Steps 2-4 !
UNCERTAINTY
1
2
3
4
5
Find Customers Trying to Solve a Problem
Offer Customers Help
Set Acceptable Price
**Demonstrate Product's Solution to Problem
Build the Product



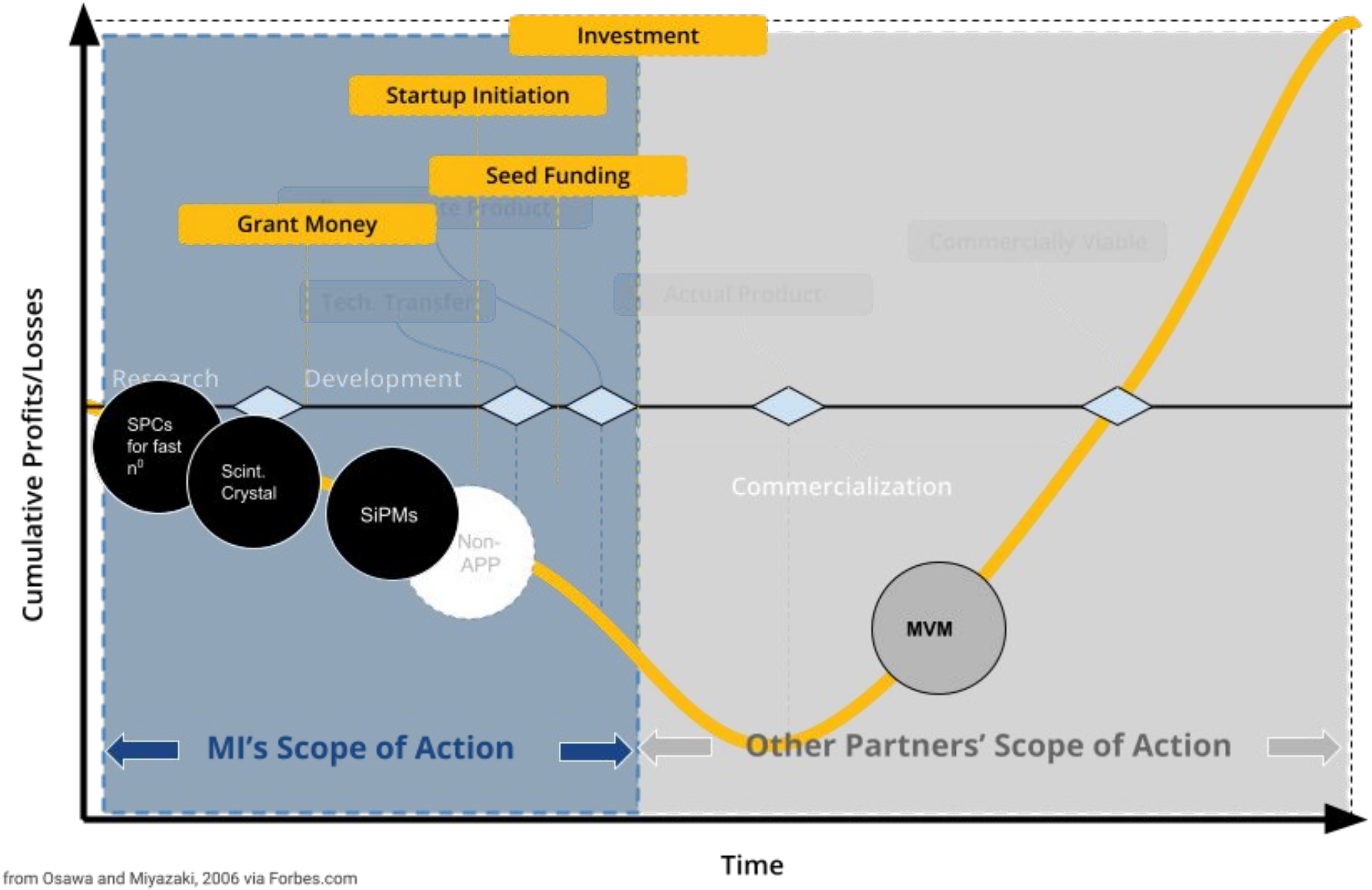
Taken from Osawa and Miyazaki, 2006 via Forbes.com



Taken from Osawa and Miyazaki, 2006 via Forbes.com



Taken from Osawa and Miyazaki, 2006 via Forbes.com



Taken from Osawa and Miyazaki, 2006 via Forbes.com

Demo Fund

Proof of Concept Fund

Frontier Venture Fund

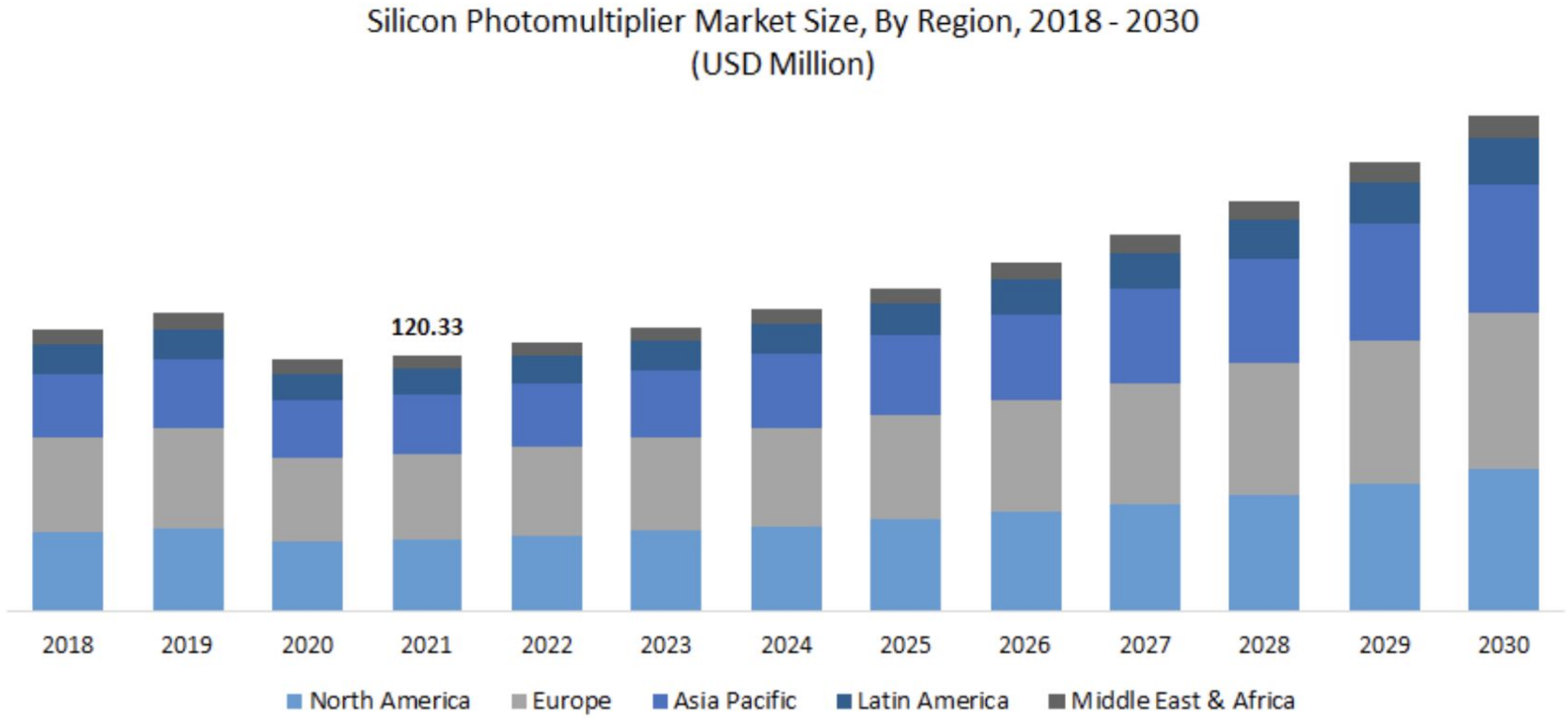
INNOVATION “CATALYSIS”

MVM

Mechanical Ventilator Milano (MVM):
A Novel Mechanical Ventilator Designed for Mass Production in Response to the COVID-19 Pandemic

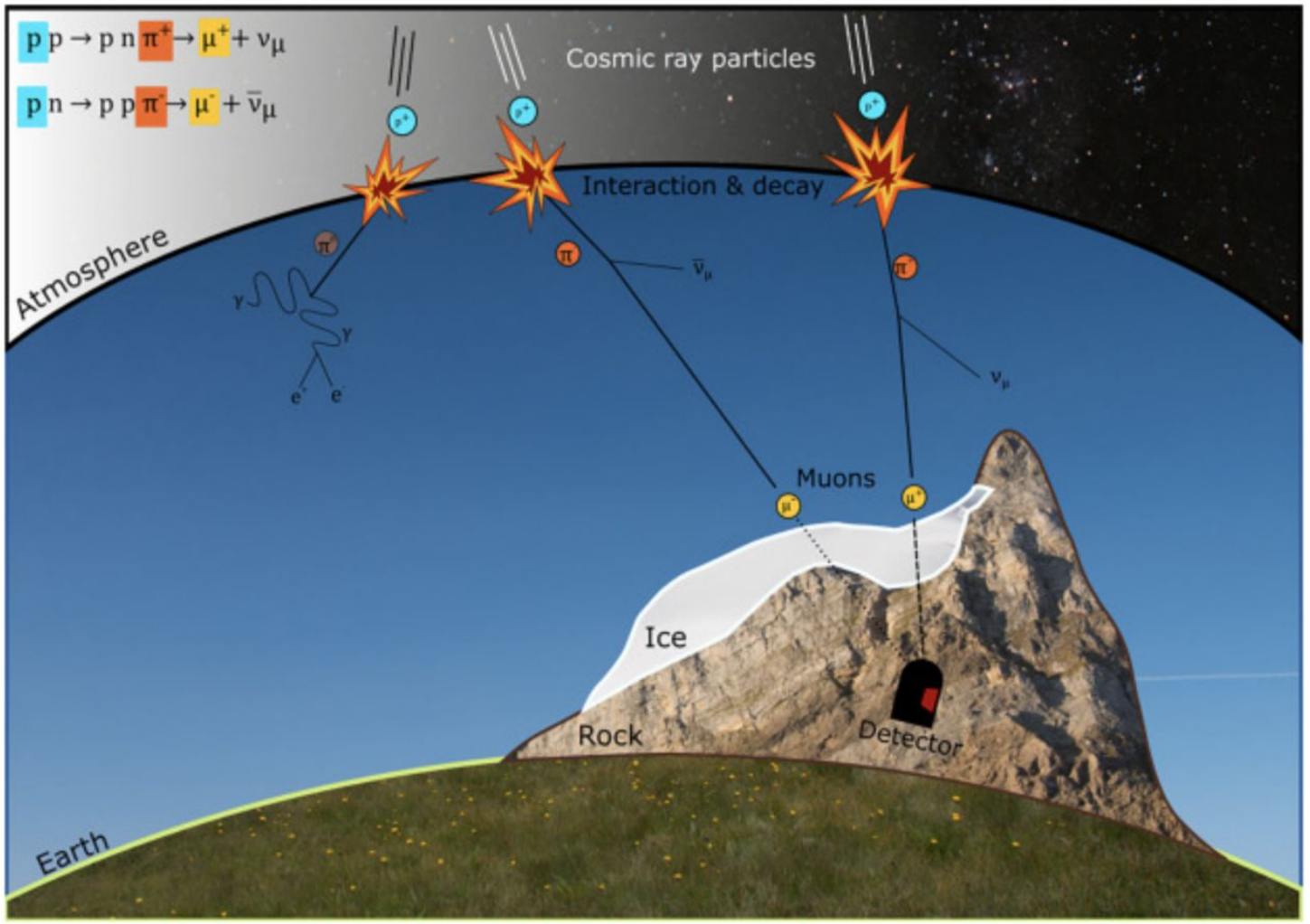
C. Galbiati,[1,2,3,4] A. Abba,[5] P. Agnes,[6] P. Amaudruz,[7] M. Arba,[8] F. Ardellier-Desages,[9] C. Badia,[2] G. Batignani,,[10,11] G. Bellani,[12] G. Bianchi,[13] D. Bishop,[7] V. Bocci,[14] W. Bonivento,[8] B. Bottino,[15] M. Bouchard,[16] S. Brice,[17] G. Buccino,[2,18] S. Bussino,[19,20] A. Caminata,[15] A. Capra,[7] M. Caravati,[8] M. Carlini,[2,18] L. Carrozzi,[21] J. M. Cela,[22] B. Celano,[23] C. Charette,[16] S. Coelli,[24] M. Constable,[7] V. Cocco,[8] G. Croci,[25] S. Cudmore,[16] A. Dal Molin,[25] S. D'Auria,[26] G. D'Avenio,[27] J. DeRuiter,[16] S. De Cecco,[28,14] L. De Lauretis,[29] M. Del Tutto,[17] A. Devoto,[8] T. Dinon,[13] E. Druszkiewicz,[30] A. Fabbri,[19,20] F. Ferroni,[2,14] G. Fiorillo,[31,23] R. Ford,[32] G. Foti,[12] D. Franco,[9] F. Gabriele,[3] P. Garcia Abia,[22] L. S. Giarratana,[33] J. Givoletti,[34] Mi. Givoletti,[34] G. Gorini,[25] E. Gramellini,[17] G. Grosso,[35] F. Guescini,[36] E. Guetre,[7] T. Hadden,[16] J. Hall,[32] A. Heavey,[17] G. Hersak,[16] N. Hessey,[7] An. Ianni,[1] C. Ienzi,[16] V. Ippolito,[14] C. L. Kendziora,[17] M. King,[16] A. Kittmer,[16] I. Kochanek,[3] R. Kruecken,[7] M. La Commara,[37,23] G. Leblond,[16] X. Li,[1] C. Lim,[7] T. Lindner,[7] T. Lombardi,[29] T. Long,[16] S. Longo,[38] P. Lu,[7] G. Lukhanin,[17] G. Magni,[39] R. Maharaj,[7] M. Malosio,[13] C. Mapelli,[40] P. Maqueo,[16] P. Margetak,[7] S. M. Mari,[19,20] L. Martin,[7] N. Massacret,[7] A. McDonald,[41] D. Minuzzo,[42] T. A. Mohayai,[17] L. Molinari Tosatti,[13] C. Moretti,[43] A. Muraro,[35] F. Nati,[25] A. J. Noble,[41] A. Norrick,[17] K. Olchanski,[7] I. Palumbo,[44] R. Paoletti,[45,11] N. Paoli,[34] L. Parmeggiano,[46] S. Parmeggiano,[46] C. Pearson,[7] C. Pellegrino,[4] V. Pesudo,[22,47] A. Pocar,[48] M. Pontesilli,[49] R. Pordes,[17] S. Pordes,[17] A. Prini,[13] O. Putignano,[25] J.L. Raaf,[17] M. Razeti,[8] A. Razeto,[3] D. Reed,[50] A. Renshaw,[6] M. Rescigno,[14] F. Retiere,[7] L. P. Rignanese,[51] J. Rode,[9,52] L. J. Romualdez,[1] R. Santorelli,[22] D. Sablone,[3] E. Scapparone,[51] T. Schaubel,[16] B. Shaw,[7] A.S. Slutsky,[53] B. Smith,[7] N.J.T. Smith,[32] P. Spagnolo,[11] F. Spinella,[11] A. Stenzler,[54] A. Steri,[8] L. Stiaccini,[45,11] C. Stoughton,[17] P. Stringari,[55] M. Tardocchi,[35] R. Tartaglia,[3] G. Testera,[15] C. Tintori,[34] A. Tonazzo,[9] J. Tseng,[56] E. Viscione,[24] F. Vivaldi,[34] M. Wada,[57] H. Wang,[58] S. Westerdale,[8] S. Yue,[16] and A. Zardoni[42]

SiPMs



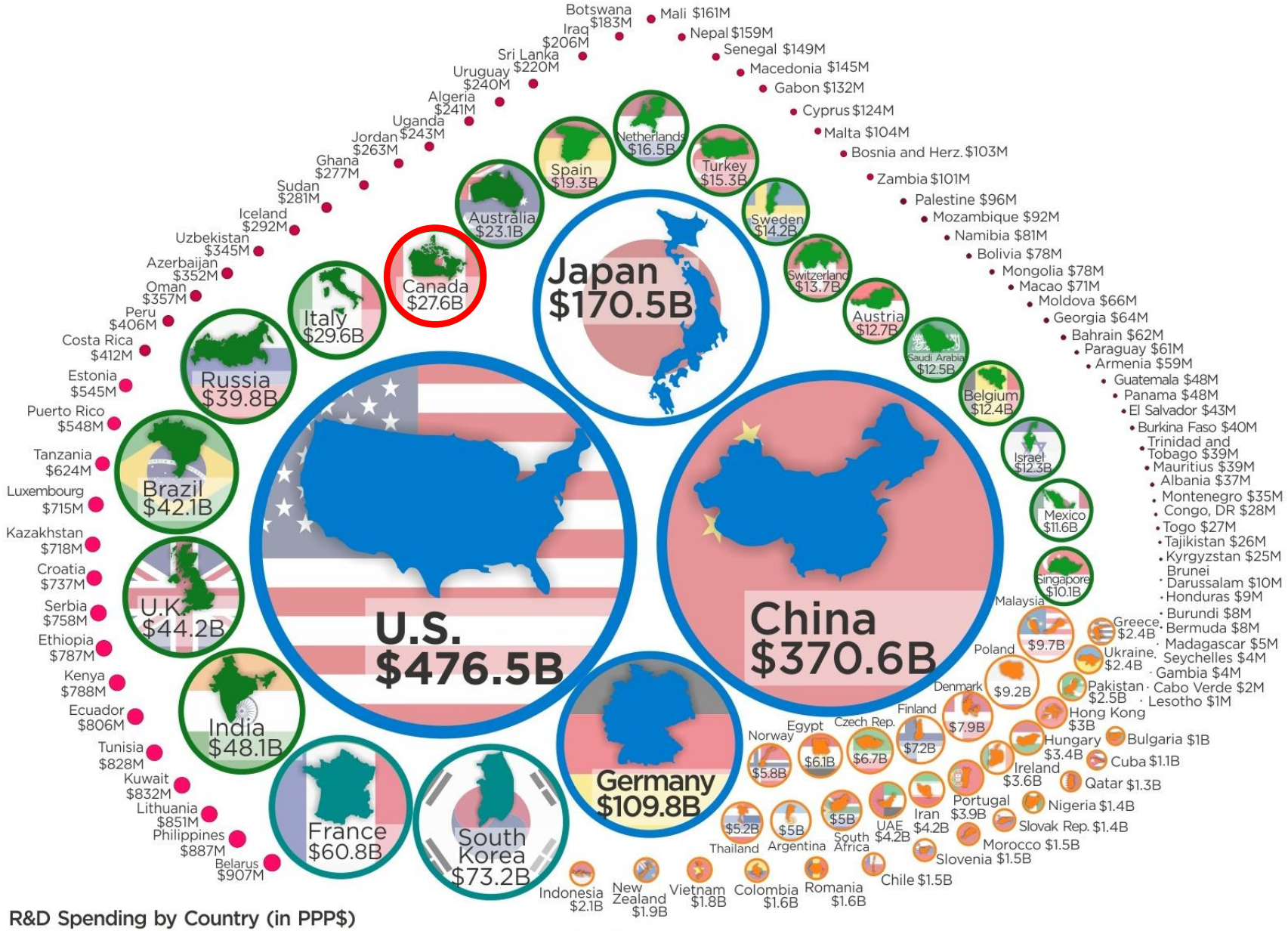
Source: Polaris Market Research Analysis

Muon Tomography



Lechmann, Alessandro, David Mair, Akitaka Ariga, Tomoko Ariga, Antonio Ereditato, Ryuichi Nishiyama, Ciro Pistillo, Paola Scampoli, Fritz Schlunegger, and Mykhailo Vladymyrov. 2021. "Muon Tomography in Geoscientific Research – A Guide to Best Practice." Earth-Science Reviews 222 (November): 103842.

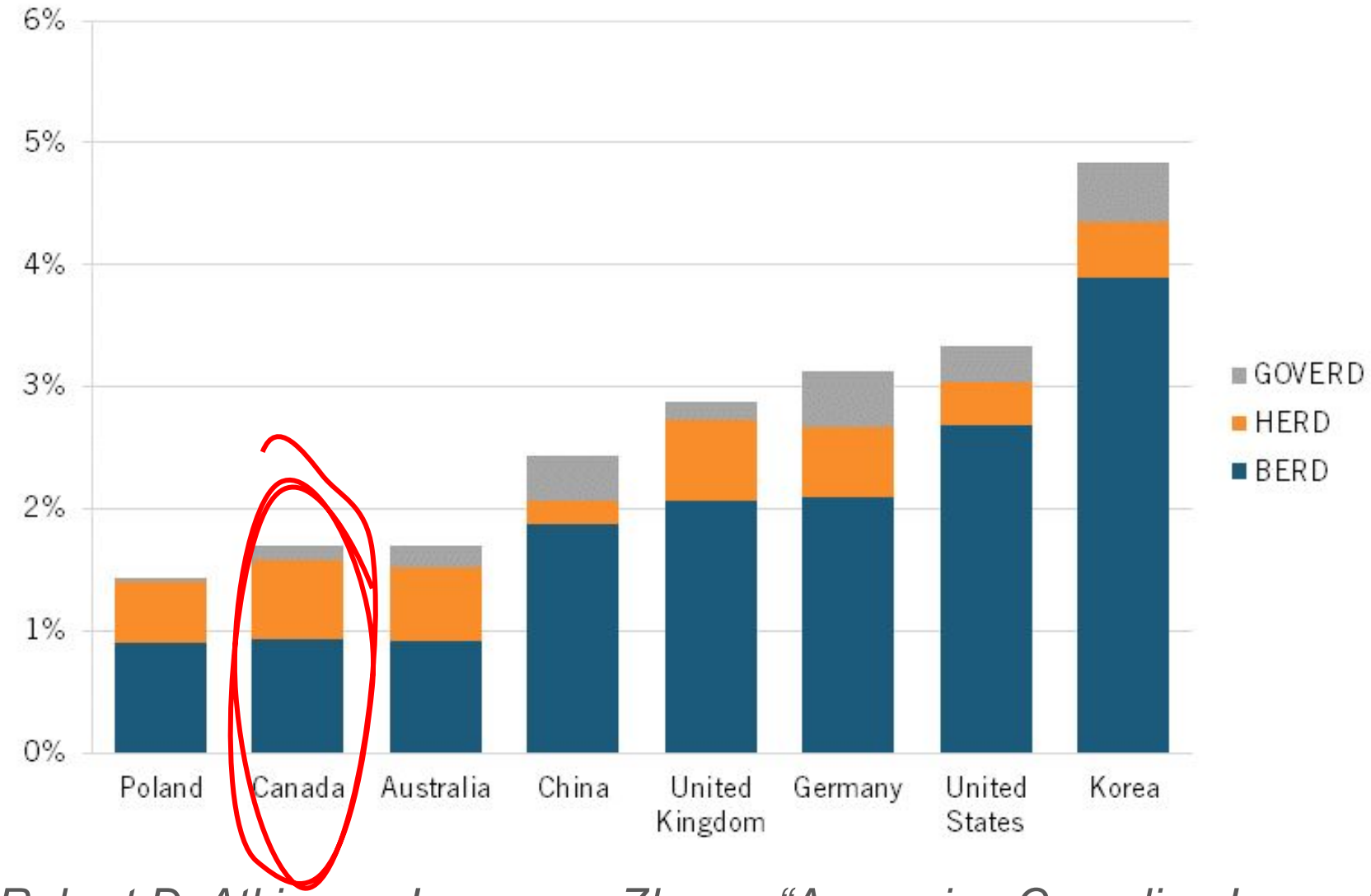
CURRENT CANADIAN CONTEXTS



Article & Sources:
https://howmuch.net/articles/research-development-spending-by-country
http://uis.unesco.org

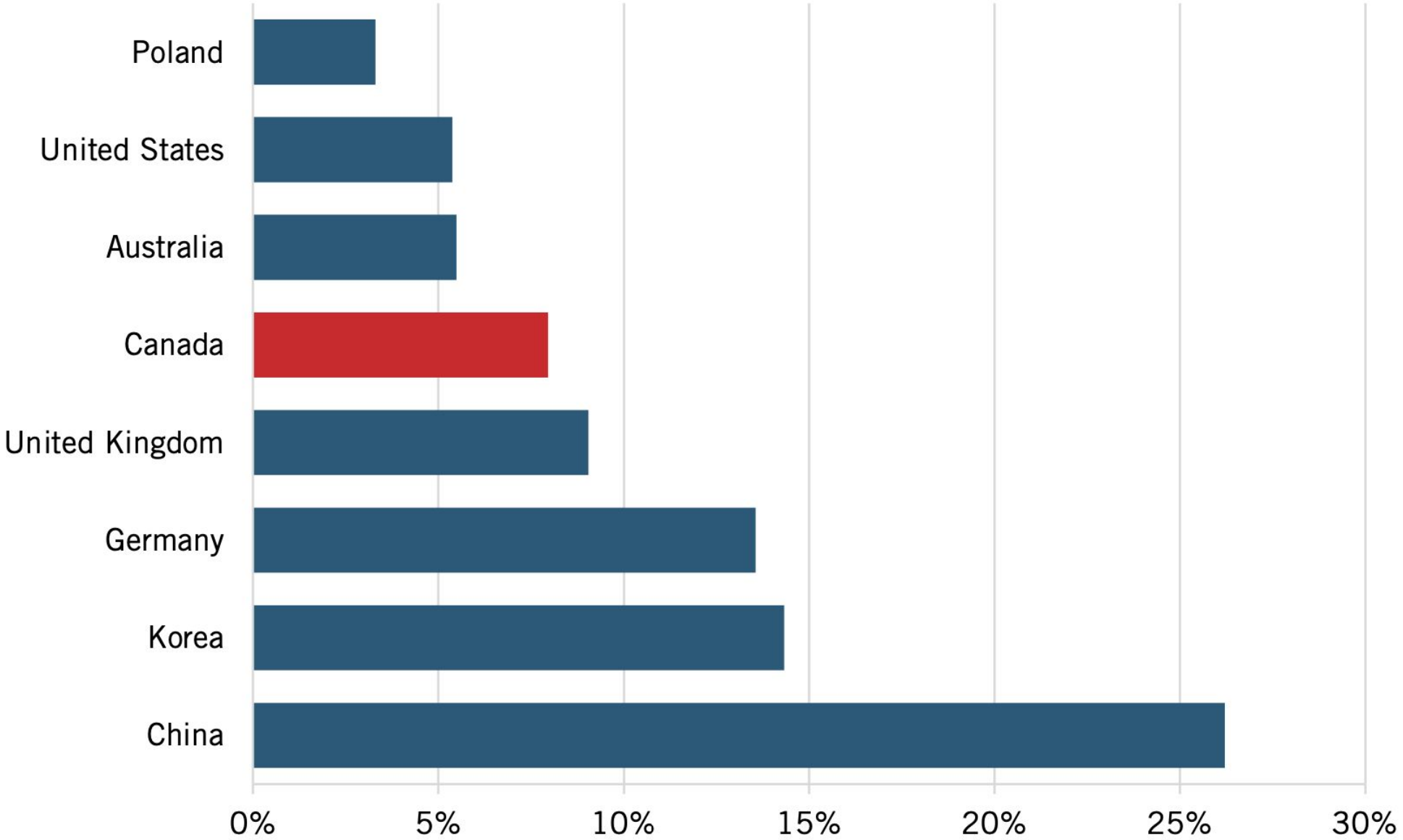
howmuch.net

Figure 2: R&D composition as a percentage of GDP (2021)[14]



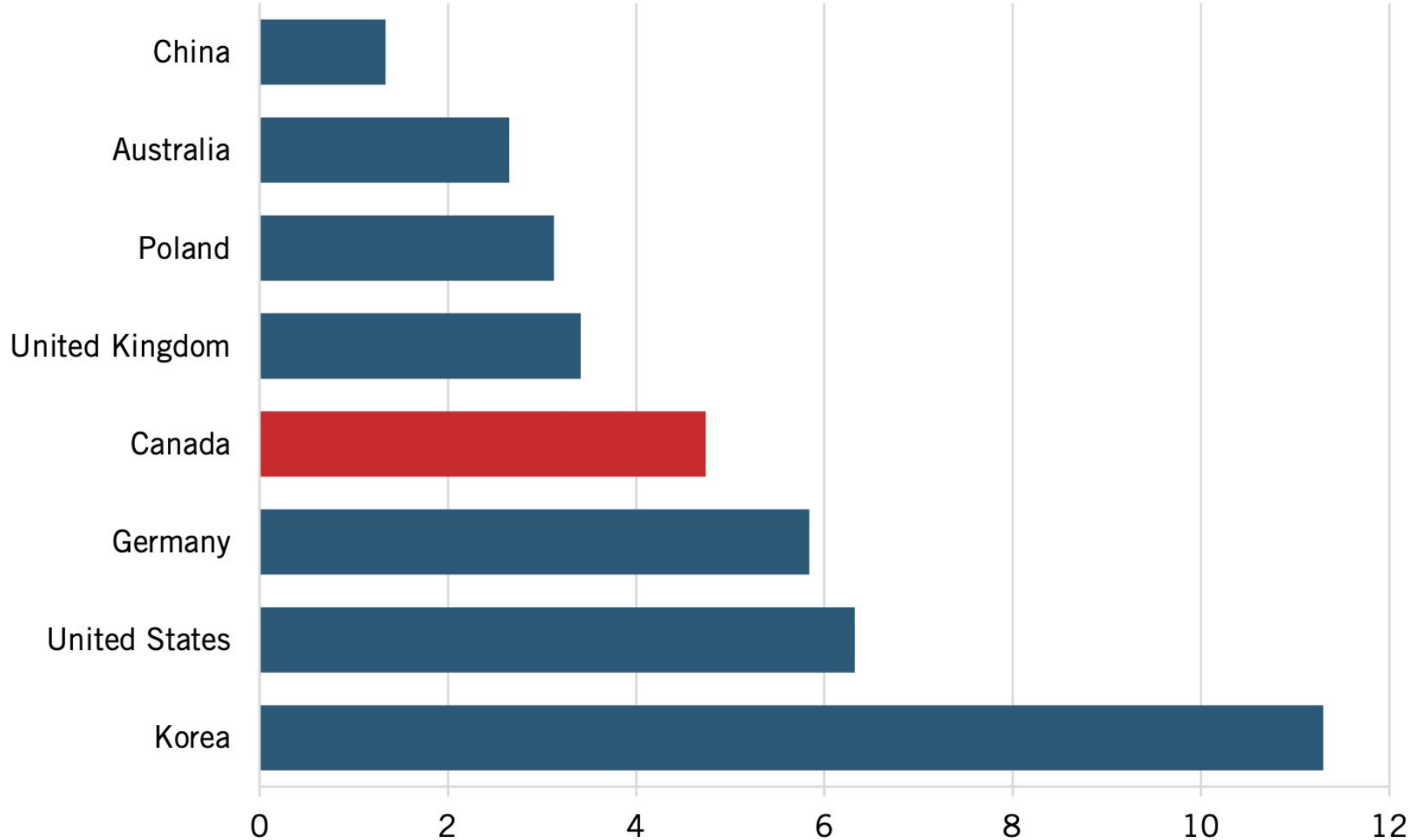
Taken From: Robert D. Atkinson, Lawrence Zhang. "Assessing Canadian Innovation, Productivity, and Competitiveness." Centre for Canadian Innovation and Competitiveness. April 2024.

Figure 8: Percentage of higher-education R&D financed by the business sector (2019)[32]



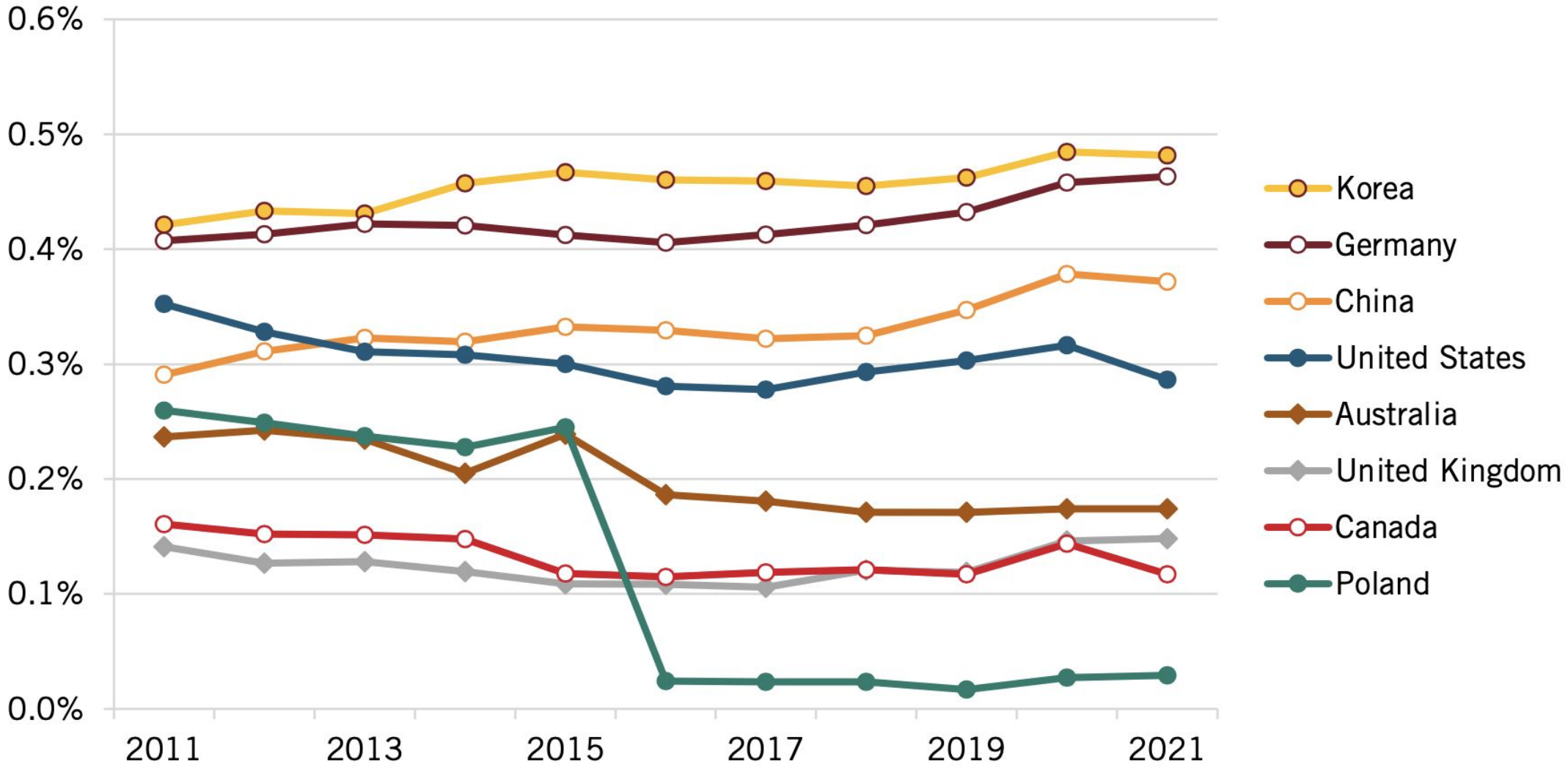
Taken From: Robert D. Atkinson, Lawrence Zhang. "Assessing Canadian Innovation, Productivity, and Competitiveness." Centre for Canadian Innovation and Competitiveness. April 2024.

Figure 19: Business enterprise researchers per thousand labour force (2017) [46]



Taken From: Robert D. Atkinson, Lawrence Zhang. "Assessing Canadian Innovation, Productivity, and Competitiveness." Centre for Canadian Innovation and Competitiveness. April 2024.

Figure 9: Government expenditure on R&D as a percentage of GDP[35]

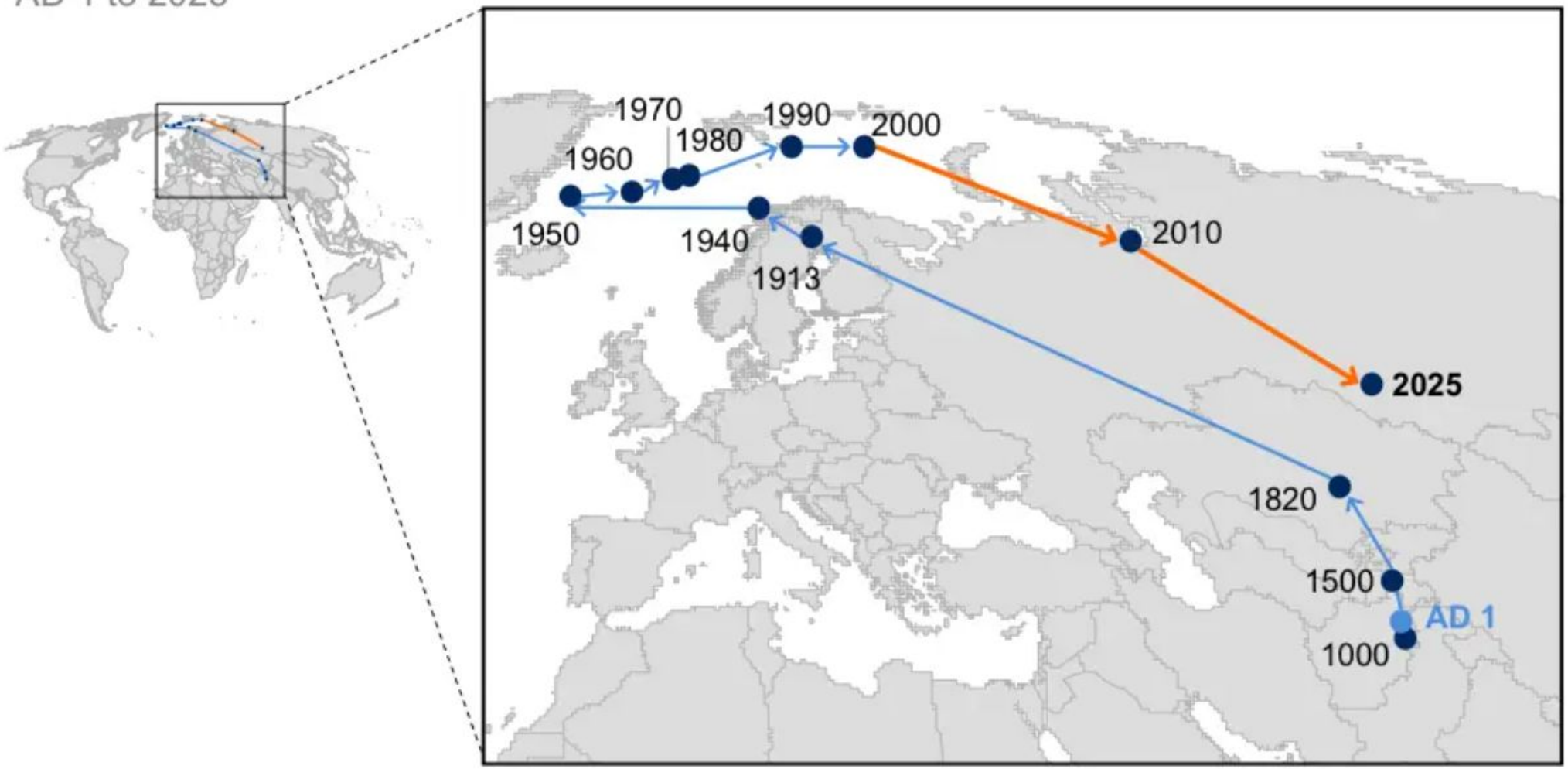


Taken From: Robert D. Atkinson, Lawrence Zhang. "Assessing Canadian Innovation, Productivity, and Competitiveness." Centre for Canadian Innovation and Competitiveness. April 2024.

Bold
Greer

Evolution of the earth's economic center of gravity[1]

AD 1 to 2025



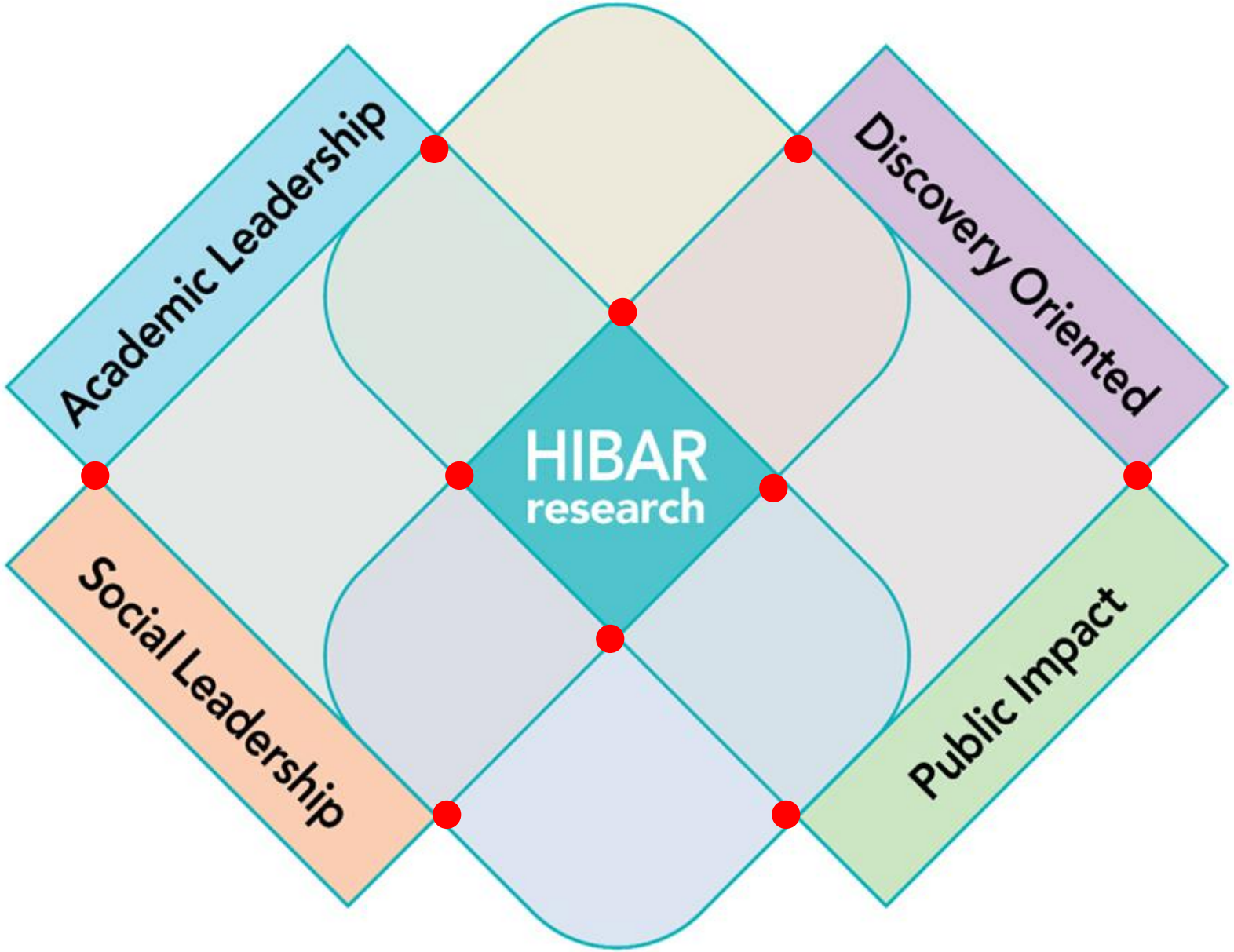
1 Economic center of gravity is calculated by weighting locations by GDP in three dimensions and projected to the nearest point on the earth's surface. The surface projection of the center of gravity shifts north over the course of the century, reflecting the fact that in three-dimensional space America and Asia are not only "next" to each other, but also "across" from each other.

SOURCE: McKinsey Global Institute analysis using data from Angus Maddison; University of Groningen

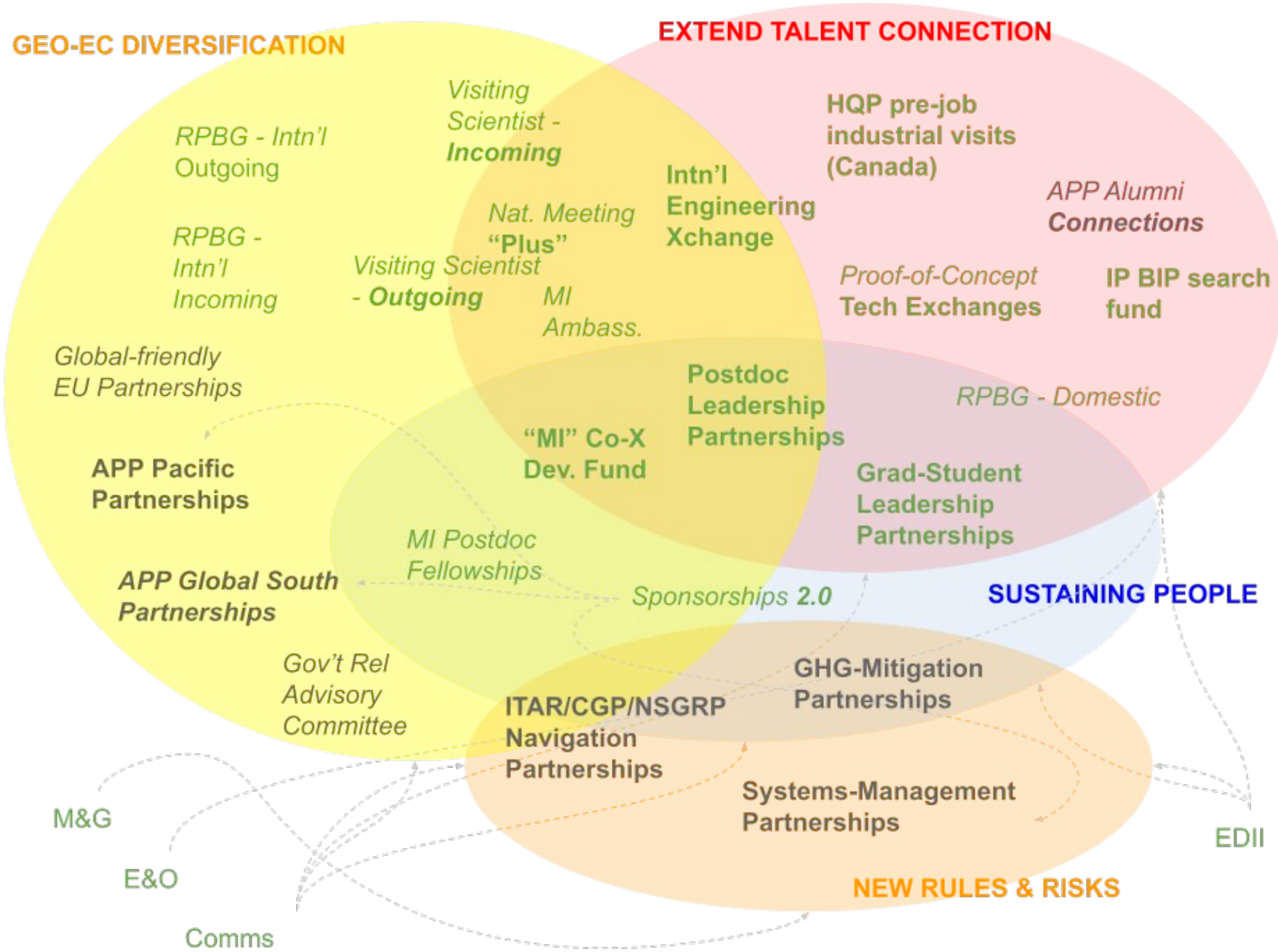
BfKipN-c/edit

OUR NEXT MOVES

https://researchoutreach.org/articles/hibar-research-alliance-reinvigorating-research-21st-century/



Highly **I**ntegrative **B**asic **A**nd **R**esponsive


GEO-EC DIVERSIFICATION
EXTEND TALENT CONNECTION
RPBG - Intn'l Outgoing
Visiting Scientist - Incoming
HQP pre-job industrial visits (Canada)
Intn'l Engineering Xchange
APP Alumni Connections
Nat. Meeting "Plus"
RPBG - Intn'l Incoming
Visiting Scientist - Outgoing
MI Ambass.
Proof-of-Concept Tech Exchanges
IP BIP search fund
Global-friendly EU Partnerships
Postdoc Leadership Partnerships
RPBG - Domestic
"MI" Co-X Dev. Fund
APP Pacific Partnerships
Grad-Student Leadership Partnerships
MI Postdoc Fellowships
APP Global South Partnerships
Sponsorships 2.0
SUSTAINING PEOPLE
Gov't Rel Advisory Committee
GHG-Mitigation Partnerships
ITAR/CGP/NSGRP Navigation Partnerships
Systems-Management Partnerships
M&G
E&O
Comms
EDII
NEW RULES & RISKS