

Session on Research and Innovation: Challenges and Opportunities

Industry Funded Research & Strategic Partnerships

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Vice Chancellor , Strathclyde University



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A forum for Academic Leaders in
Electrical Engineering and Allied Technologies



Professors & Heads of
Mechanical &
Manufacturing Engineering



Academic Partners

The Institution of
Engineering and Technology

CONTEXT

- Increasing linkage being made by international governments between HE sector and driving economic growth (Engineering and Physical Sciences key):
 - Fraunhofer, Catapults, Catalysts, South Korea, H2020, etc
- The “Innovation” agenda is focussed on exploitation of research base and increasing large & SME company engagement in innovation in technology, systems, commercialisation and product development
 - KTP, Catapults, Innovation Centres, Catalysts
- BIS industry and innovation strategies are impacting on funding/policy decision making and sectoral focus
- Important recognition of dependency on fundamental research base – e.g. David Willetts, “8 great technologies”; £600M allocated to:
 - Big Data; Satellites/Applications; Robotics/Autonomous Systems; LS/Genomics /SynBio; Regenerative Med; Agri-science; Adv Mats /Nanotech; Energy/Storage
- Increasing funding and prioritisation “coordination” between EPSRC/RCUK & TSB/BIS



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Business Expenditure on R&D

- OECD Countries for comparison - 2011 (NB strong correlation between BERD levels and economic / industrial growth statistics)

<u>Country</u>	<u>BERD as % of GDP</u>	<u>HERD as % of GDP</u>
Finland	2.67	0.76
Sweden	2.34	0.88
Denmark	2.09	0.92
Germany	1.90	0.52
USA	1.89	0.47
France	1.43	0.48
Ireland	1.17	0.47
UK	1.14 (£17.4B)	0.47 (£7.13B)
Canada	0.89	0.66
Norway	0.85	0.52
Italy	0.68	0.36
Scotland	0.56 (£689M)	0.77 (£953M)
(Israel)	(3.51)	(0.55)
(Korea)	(3.09)	(0.41)



President Obama
 'To win the future, we must educate, and our children must be able to compete in a global economy.'

- Educate the next generation to create a world-class economy
- Strengthen and modernize fundamental research and development

President Xi Jinping urges 'deepening reform, innovation-driven development'

- Deepen reform
- Promote innovation
- Upgrade industry
- Strengthen science and technology
- Promote entrepreneurship
- Improve the legal system
- Enhance the internationalization of science and technology

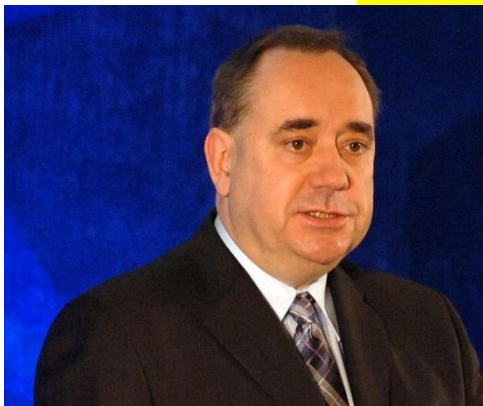
President Park Geun-hye
 Industrial shift
 Greater SME focus
 internationalisation of innovation system

Brazil: Science without Borders
India: 2013 – Science, Innovation & Technology Policy
Russia: Skolkovo Innovation City
Abu Dhabi: Masdar City



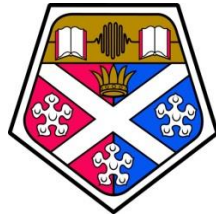
Willetts & Vince Cable
 BIS/TSB Industrial & Innovation Strategies

- Catapult Centres
- '8 great technologies'



Link between HE & Economy

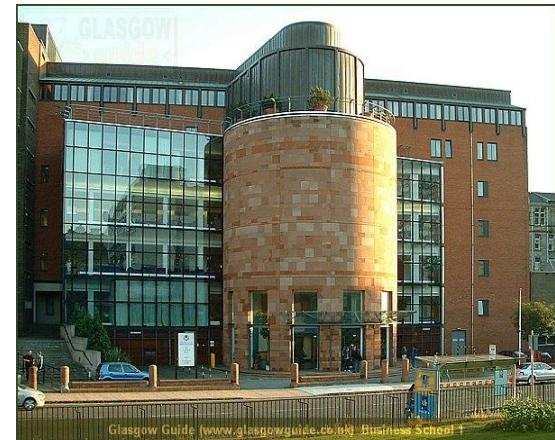
- Post-16 Education Reform
- Innovation Centres
- TIC, AFRC, PNDC, Eng-Acad
- SE- Key Sectors (incl. HE)
- Industry Leadership Groups



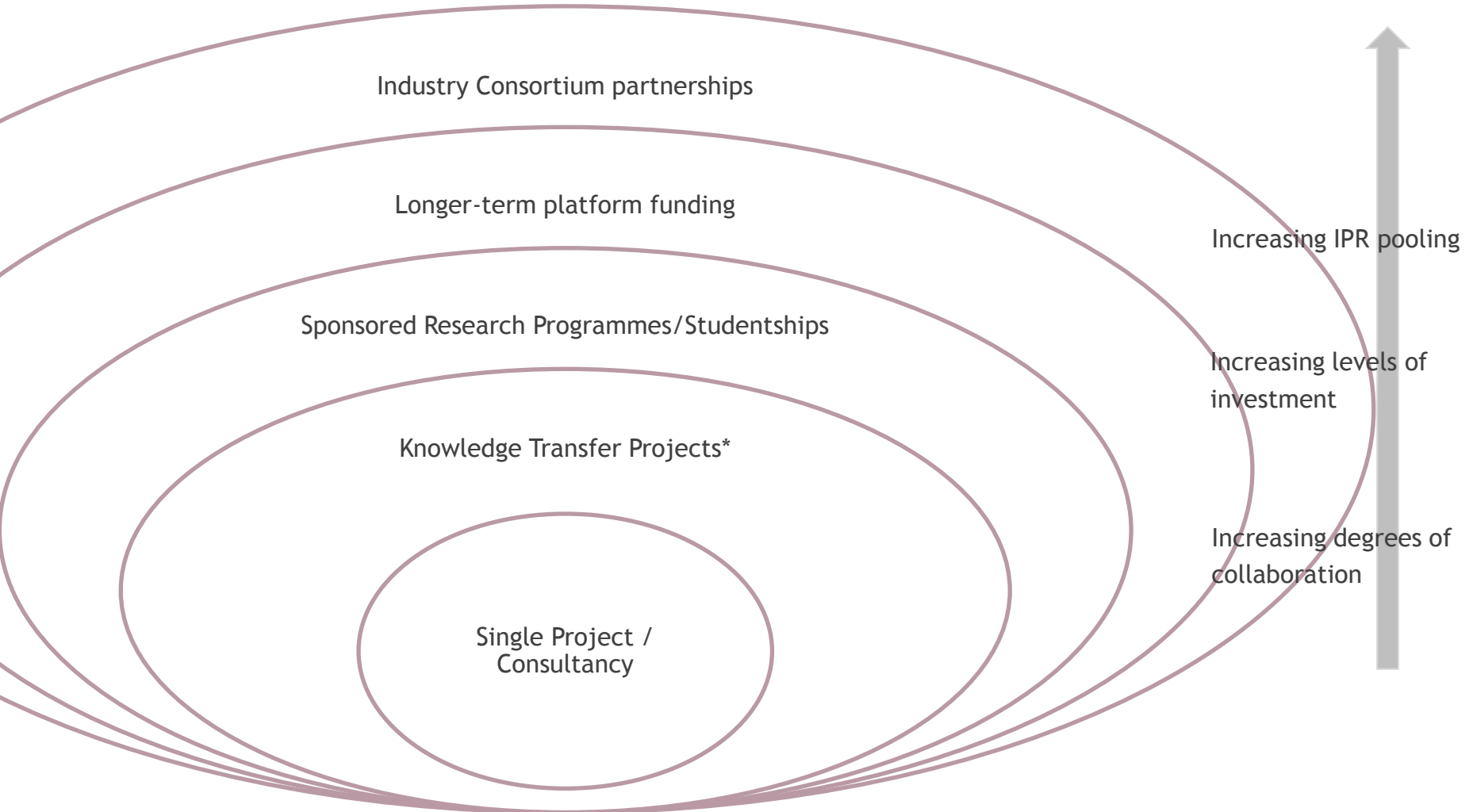
The University of Strathclyde



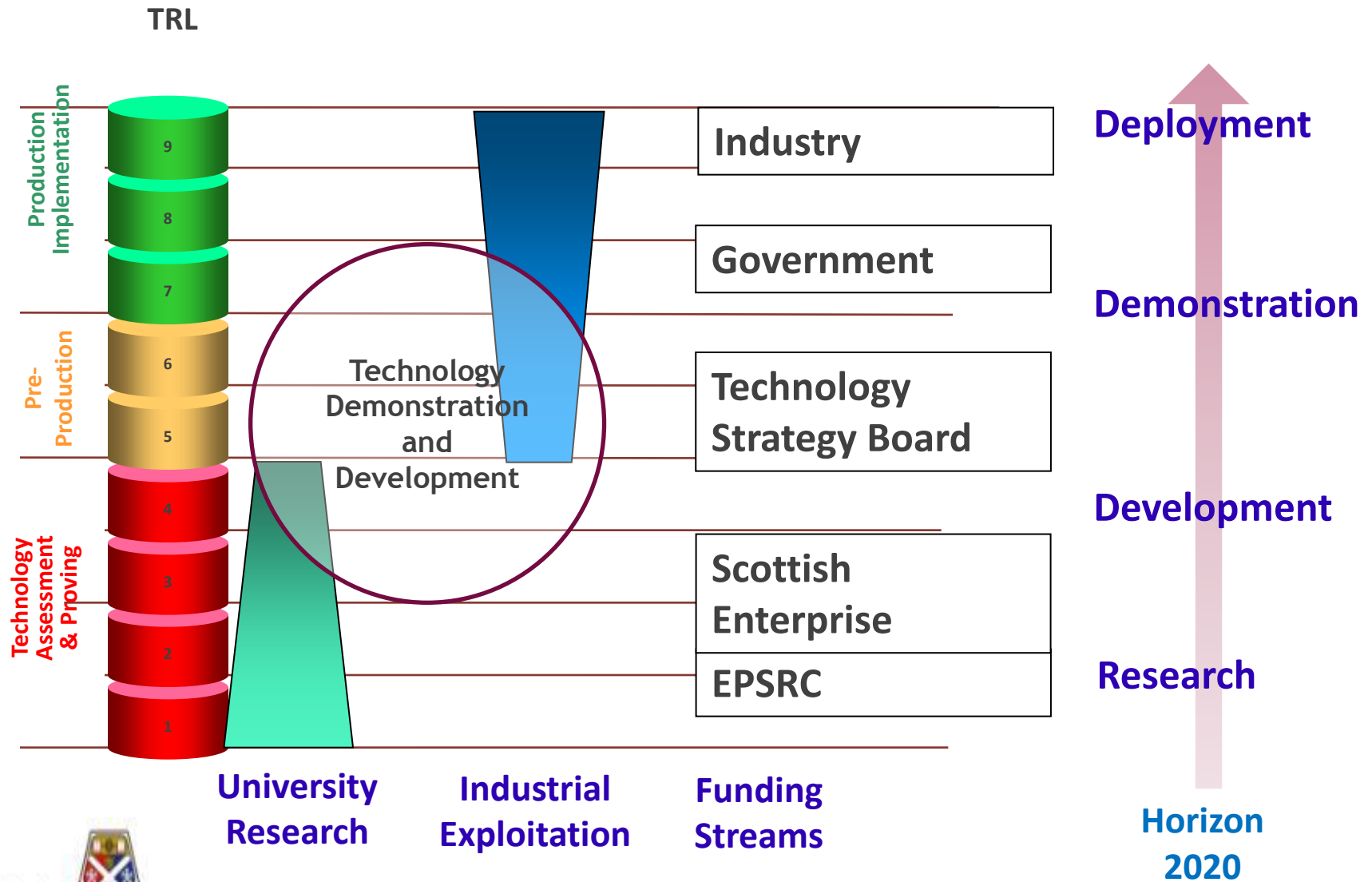
Industrial Engagement and Models for Industry/Academic Research Collaboration



Industry partnership “escalation” model



Research & Innovation - Industry Collaborations



Industrial collaborative examples

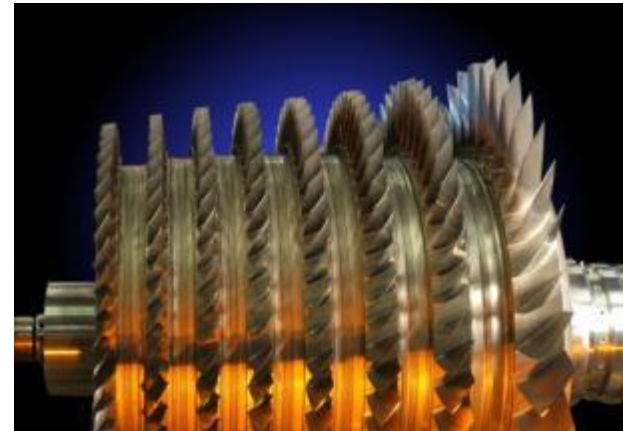
Advanced Forming Research Centre
(Launch 2010 - £95m funding):
£40m CAPEX (50:50) build/equip
£15m Industry Core Income
£4m EPSRC
£5m Other sources
£31m - TSB
'Catapult' in High Value Manuf.



Bodycote



Forged/Formed Components



High Value Manufacturing Catapult

CATAPULT



- TSB funded - £25 - £35m+ per annum
- 7 centres plus overarching organisation – including AFRC
- Launched October 2011
- Through HVM Catapult, AFRC is doubling capacity and broadening sectoral coverage
- New equipment for flow forming, rotary forging, larger SPF rig.



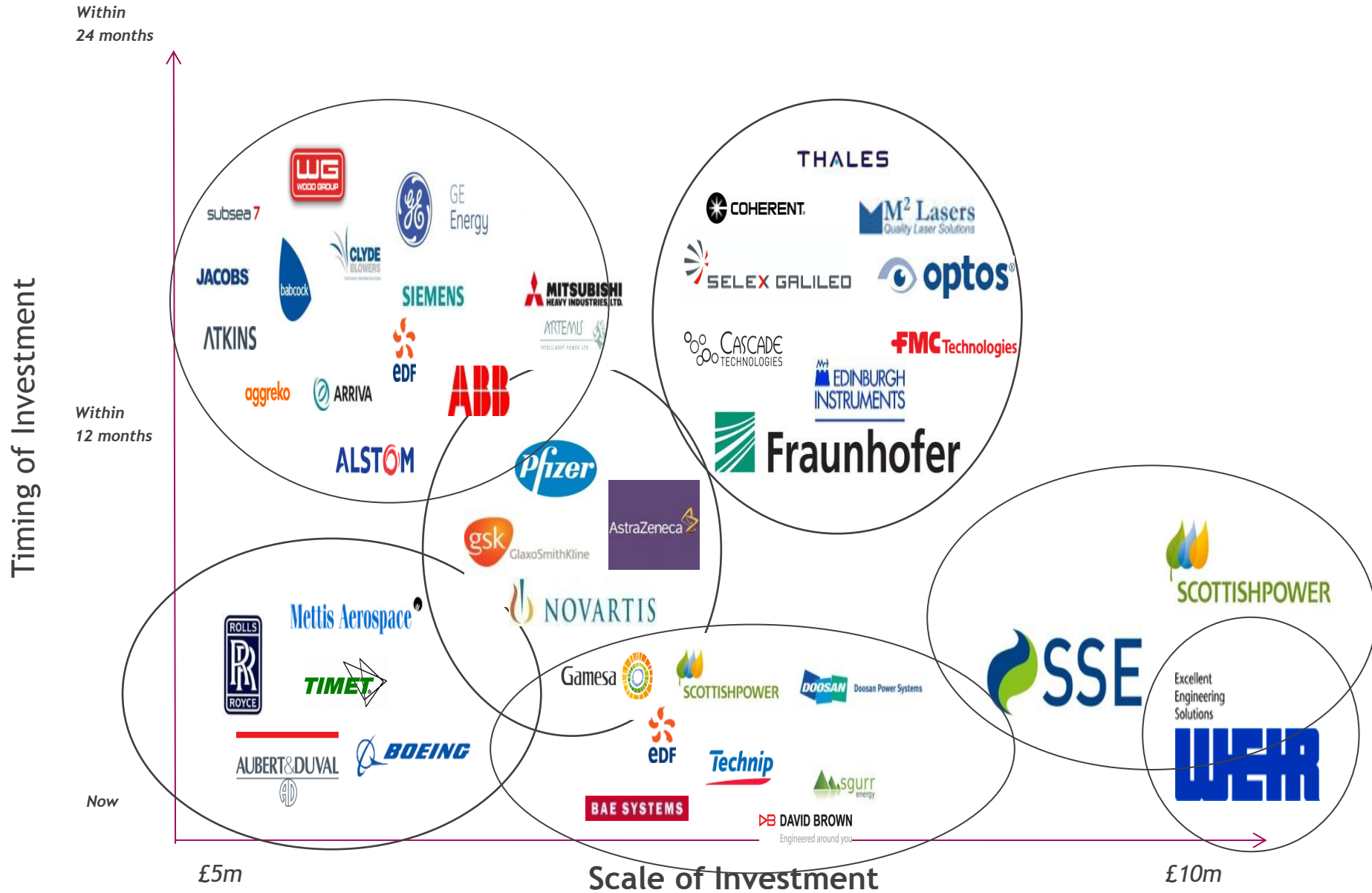
- **World-class centre for translational & collaborative Research and Development with Industry**
- **Technology development accelerator**
- **£100m capital investment in R&D complex**
- **Co-location of 1,200 University + Industry Researchers, Engineers, Students and Project managers**
- **£125m+ in international, collaborative R&D programmes**
- **700 new R&D posts**

Research Areas



- Power, and energy
- High Value Manufacturing and Engineering
- Sensors, Photonics and Laser technologies
- Bio-Photonics
- Low Carbon technologies
- Bio-Nano metrology
- Renewables

TIC - Industry Engagement





A close-up photograph of a white wind turbine's hub and three blades against a clear blue sky. A black smartwatch with a metal link band is wrapped around the central hub where the blades meet. The watch face shows a circular gauge with various indicators. The blades are slightly weathered and show some texture.

Power Network Demonstration Centre

Electricity that is....

1. Reliable
2. Affordable
3. Environmentally Responsible

... while transforming to a *cleaner, more efficient, modern generation fleet* with an *interactive electrical grid*.



Future Grid



Energy Transfer



Long-Term Operations



Renewables

an open membership demonstration facility



- Collaborative research directed by member companies
- Bespoke testing directed by research partner
- 11kV network with fault testing capability
- Grid voltage and frequency variations can be applied

PNDC as a Collaborative Technology Developer

Help Move Technologies to the Commercialisation Stage...



- National Laboratories
- Universities
- Research Councils

PNDC

- Suppliers
- Vendors
- Utilities

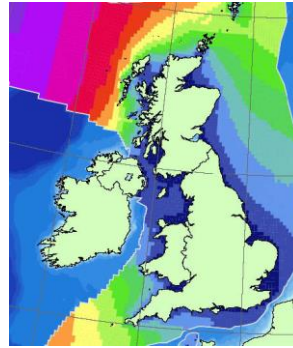
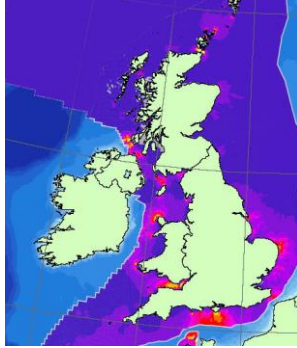
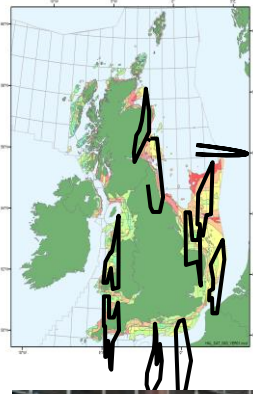
Offshore Renewable Energy Catapult

Catapult is a Technology Strategy Board programme

CATAPULT
Offshore Renewable Energy

Recap: Offshore renewable energy represents a significant opportunity for the UK

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Unrivalled offshore renewable resources:

- 50% of Europe's wind energy resource;
- 35% of Europe's wave resource;
- 50% of Europe's tidal resource.

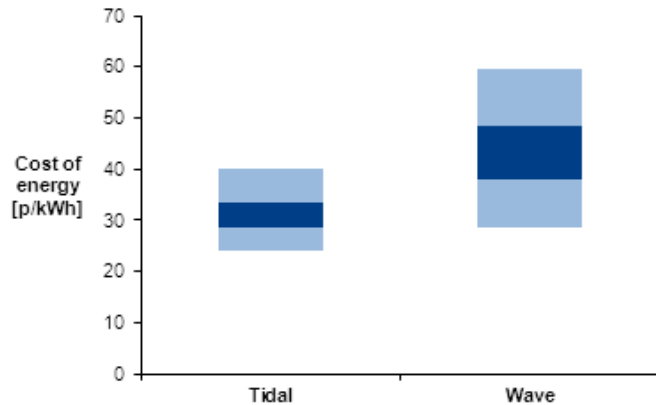


If exploited, these resources will have a significant impact on the UK economy, e.g.

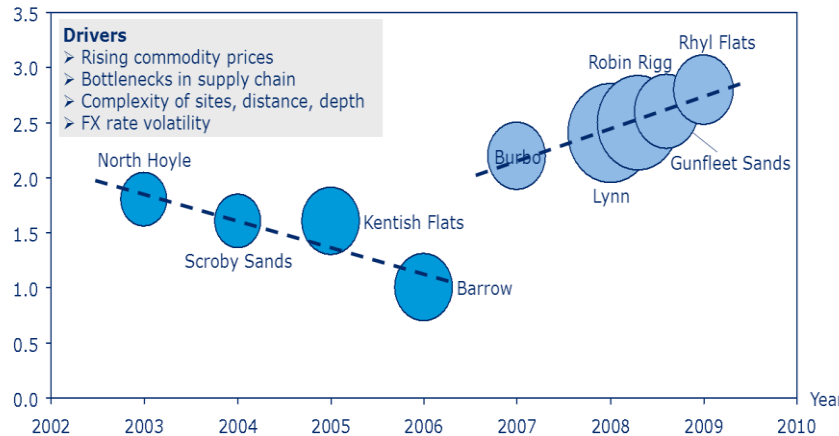
- 78GW deployed by 2050 could:
 - Provide £28bn revenues
 - Employ 70,000 people
 - Position the UK at the forefront of a global industry.

There are challenges to be overcome to exploit the opportunity

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Cost per MW installed (€m/MW)



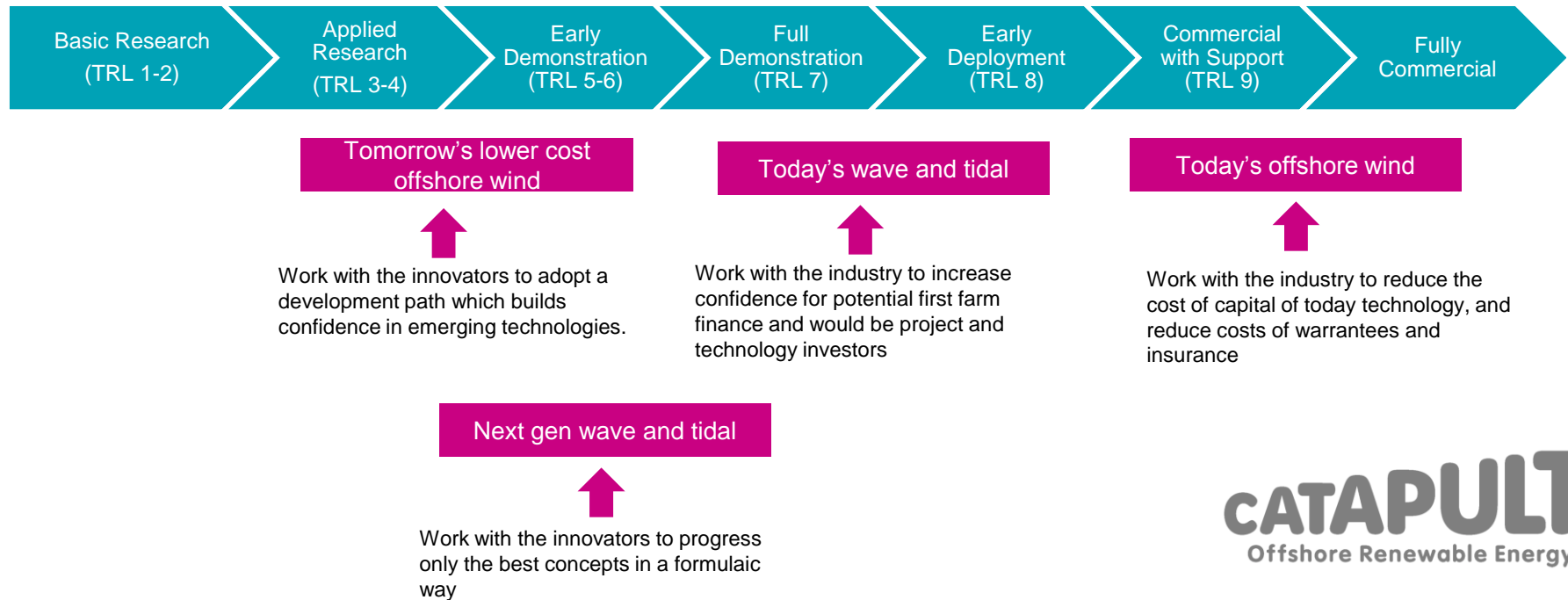
- **Capital costs must be reduced:** Offshore wind is currently more than £3M/MW compared with £1.6M/MW for onshore wind. When deployed, the first wave and tidal arrays are expected to cost £7-8M/MW
- **Financial risk** is a key uncertainty and impacts the pace of growth. We need to de-risk technologies to become bankable and insurable propositions at scale.
- Risk around repair liabilities and warranties are a key component to cost in today's industry – the Catapult will work to bring this down.

The ORE Catapult intends to focus on cost and risk reduction

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- Capital and O&M costs need to be reduced for offshore wind, wave and tidal
- Initial technologies also still need to be proven for wave and tidal
- Financial risk is a key uncertainty and impacts the pace of growth. We need to de-risk technologies to become **bankable and insurable** propositions at scale

Reducing Risk



Conclusions

- Need for continued recognition of the key requirement to support the UK HE basic engineering and physical sciences base
- There must be continued emphasis on innovation and translation of low TRL activity to higher (industry ready) TRL outcomes
- Engagement of SMEs can be enhanced through supply chain clusters in key sectors e.g. manufacturing, aerospace, energy etc
- International partnerships are significant and valuable (cf H2020)
- An acceleration of the “triple helix” approach to research and innovation is essential for the UK (private-public-academic partnerships)
- Last – but not least – attraction, retention and development of the engineering and physical sciences “talent pool”



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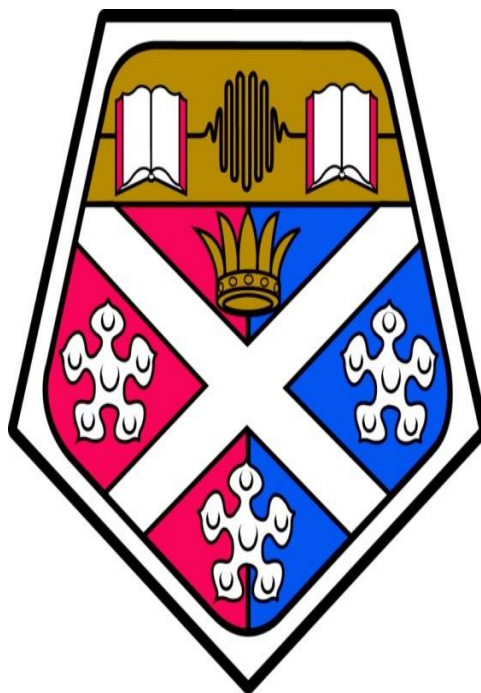


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The Place of Useful Learning



Knowledge Exchange: Leadership, Governance and Organisation of Strategic Centres'

Tim Bedford

David McBeth

Jim McDonald

Strategic Research & KE Centres - External issues

- Intense competition for large government grant applications.
- External funders require robust governance than conventional research.
- UK and Scottish Governments “national centre” based strategy regularly references Strathclyde.
- *Strathclyde’s unparalleled approach to creating / supporting major strategic research concentrations is positioning us competitively to win more major funding and build relationships*

Critical success factors

- Research critical mass
- Significant grant/project portfolio
- Performance/output quality
- Multi-disciplinary potential
- International connectivity
- Impact focussed institutional strategy & ethos
- Track record of industry and business collaboration
- One or more anchor partners
- Robust governance shared with external partners

Strategic Research & KE Centres - Building out from existing strength

- Long standing experience across all four faculties provides platform to build from
- Over the past five years we have accelerated to create additional Strategic Research & KE Centres
- Greater internal participation encouraged in multi-disciplinary research & KE
- *Greater coherence and credibility to partners has positioned us to be more influential in the Scottish, UK, EU and international HE sectors – and new partnerships are with high quality institutions.*

Long standing centres

- Engineering:
 - Rolls-Royce-UTC, CEPE, RC-NDE, BRE-Trust Centre
- Science:
 - CPACT
- Business:
 - Fraser of Allander Institute
- HaSS:
 - Glasgow School of Social Work, CELCIS

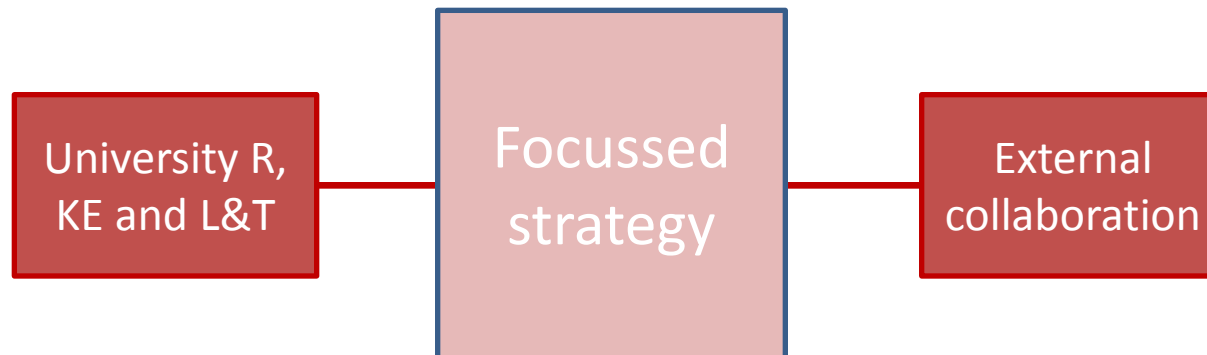
Strategic Research & KE Centres – positioning for the future

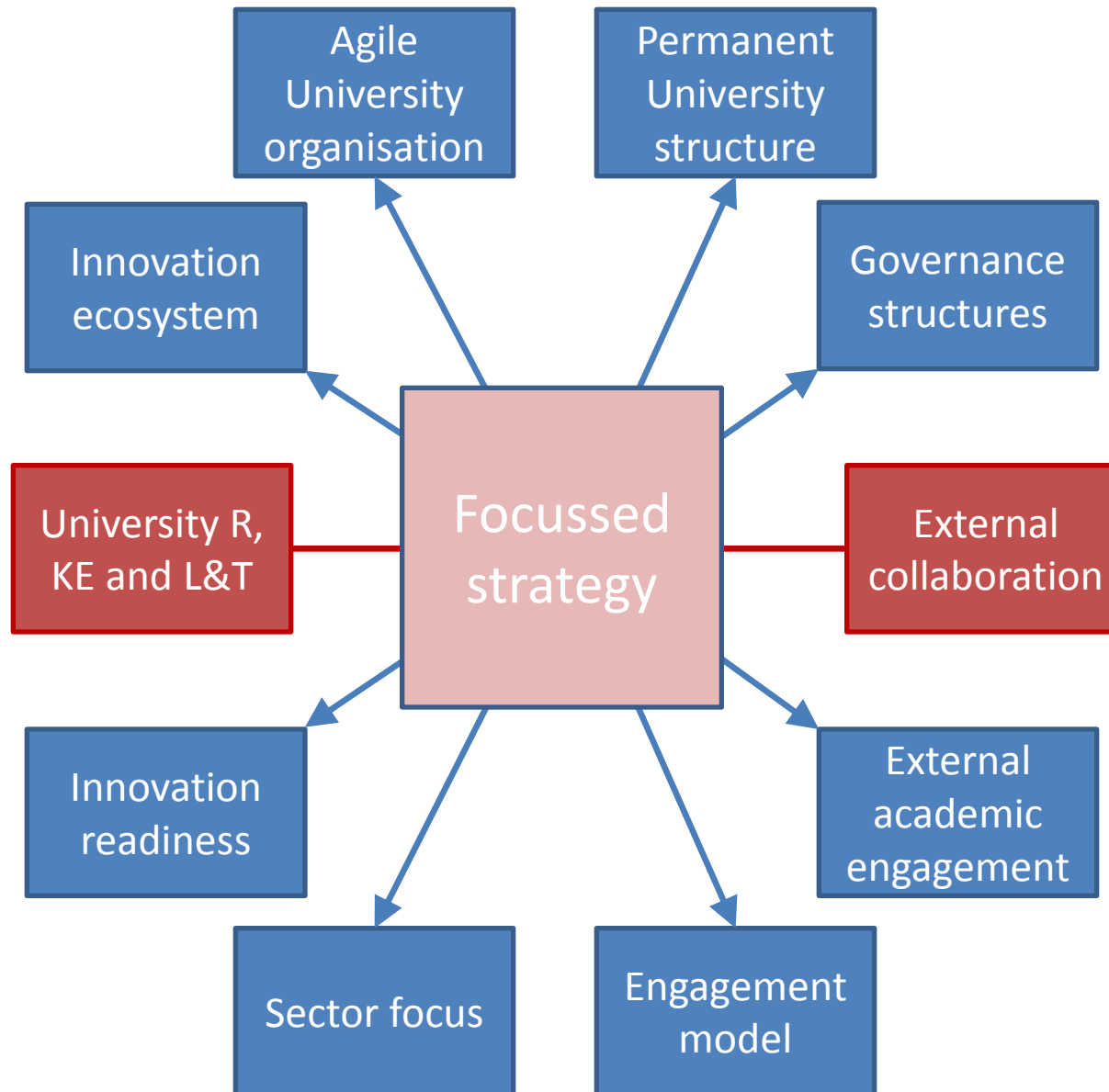
- The creation of our portfolio of *Strategic Research & KE Centres* positions us to:
 - Attract funding for EPSRC Centres for Doctoral Training
 - Give us unparalleled advantage in the UK Catapult Centre Programmes
 - Attract Fraunhofer Gesellschaft to us as their inaugural UK partner
 - Be a credible bidder to play a leadership / ownership role in the evolution of the UK National Physical Laboratories (NPL)
 - Attract and retain world-class academics, researchers and students
 - Collaboratively bid for Horizon 2020 projects
 - Derive benefit for our U/G students – sponsorship, internship, employment
 - Establish and grow links internationally – including Stanford, NYU, NTU, Tsinghua, MIT, CMU, HK-UST
 - Underpin the delivery of our Outcome Agreement and Institutional targets

Delivering an ecosystem where academics can be successful

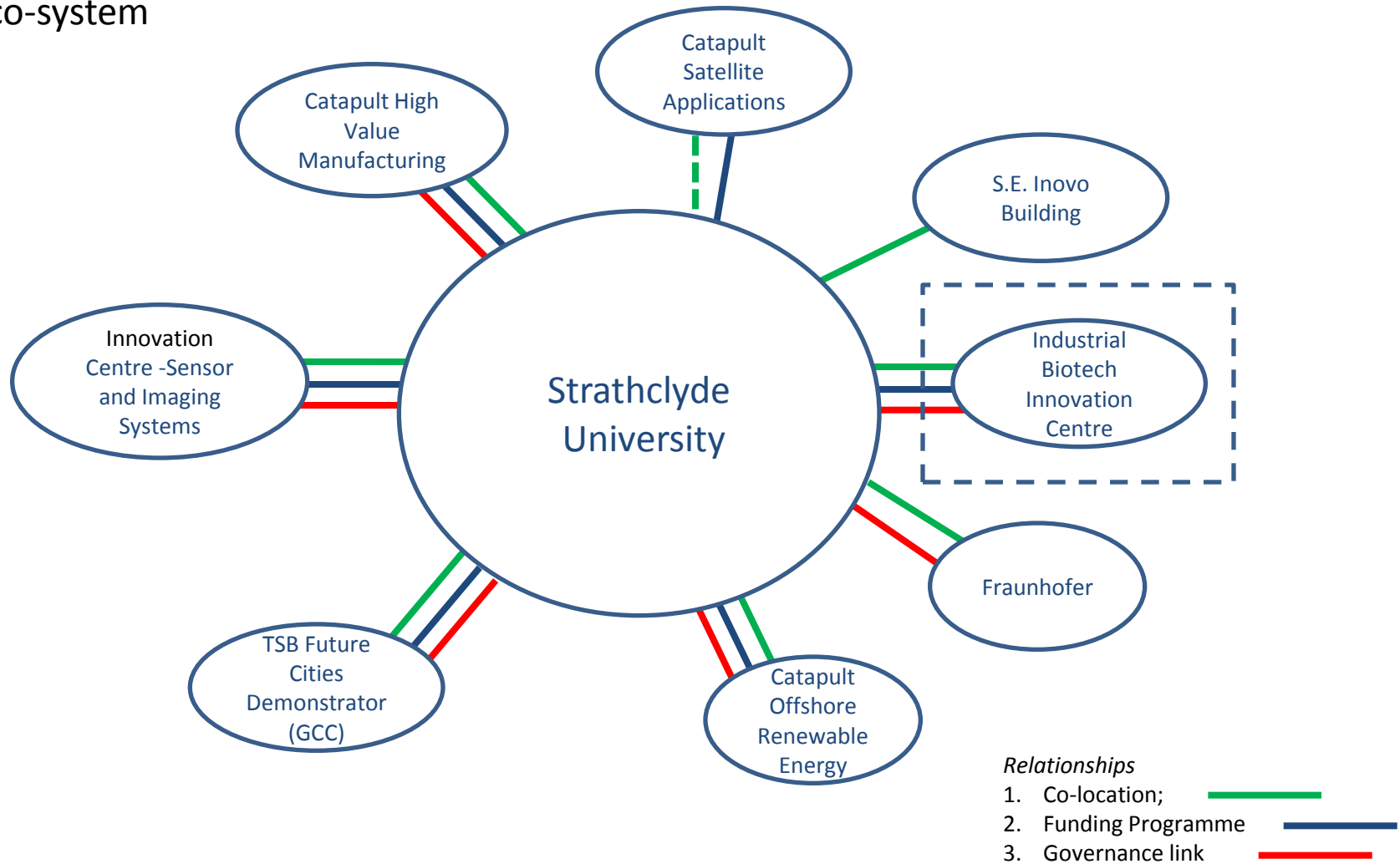
University R,
KE and L&T

External
collaboration



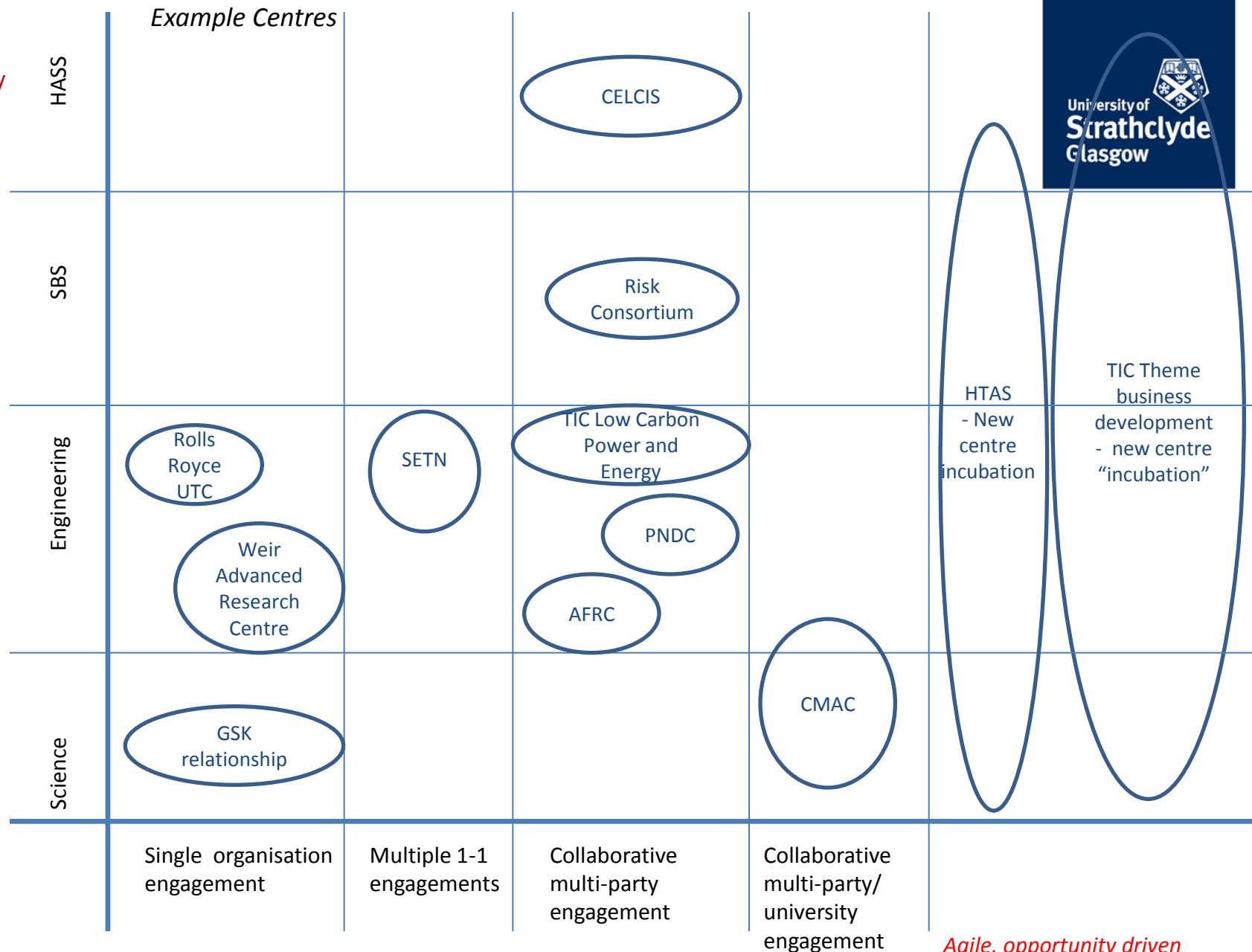


Institutions in the Strathclyde Innovation Eco-system



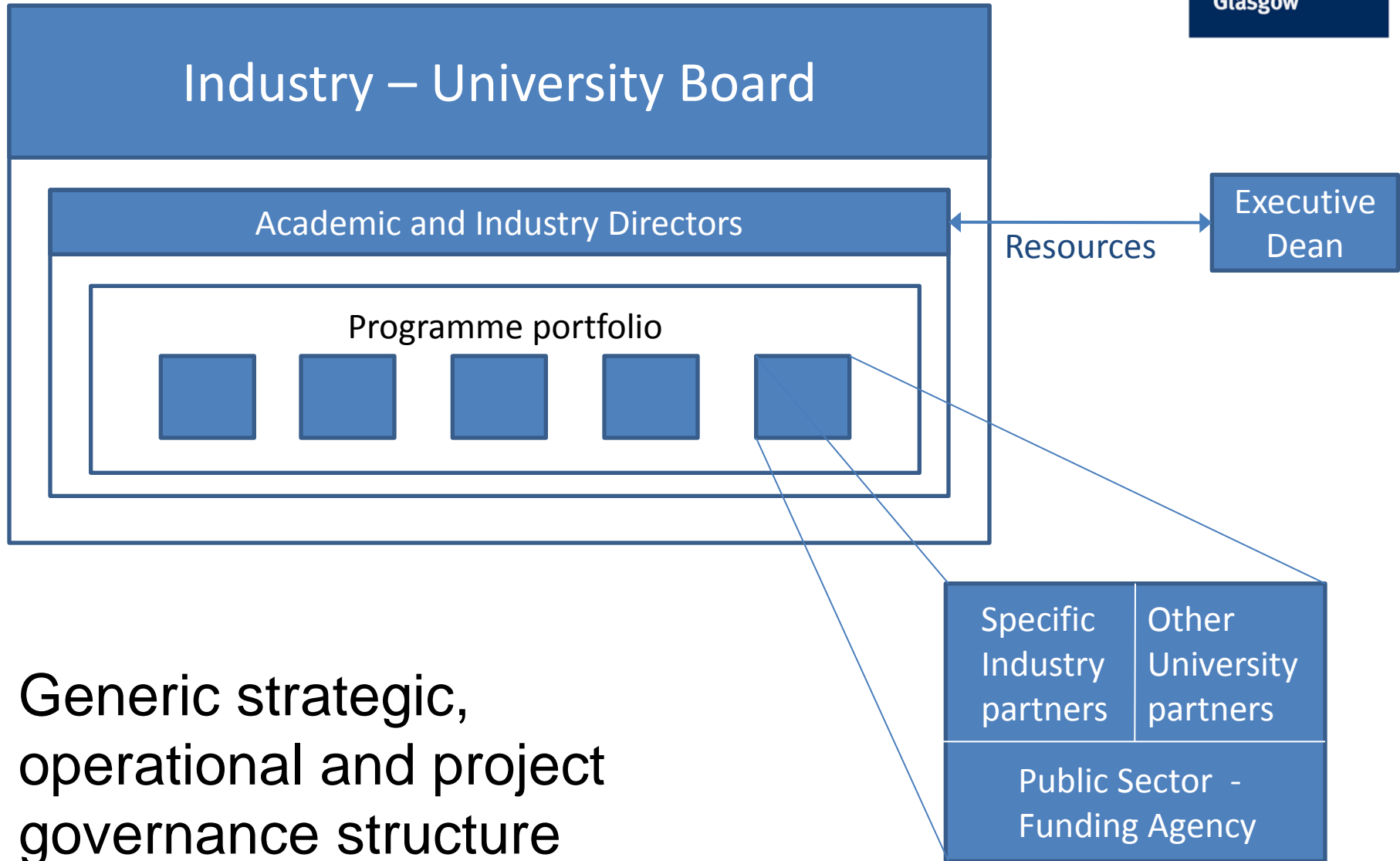
University
structure

University Strategic Management (ET)
Staff line management
Institutional Financial and KPI reporting



University structure and agile organisation

*Agile, opportunity driven
engagements, aiming for at
least 5-10 years sustainability*



Industry – University Board

Academic and Industry Directors

Programme portfolio

Executive
Dean

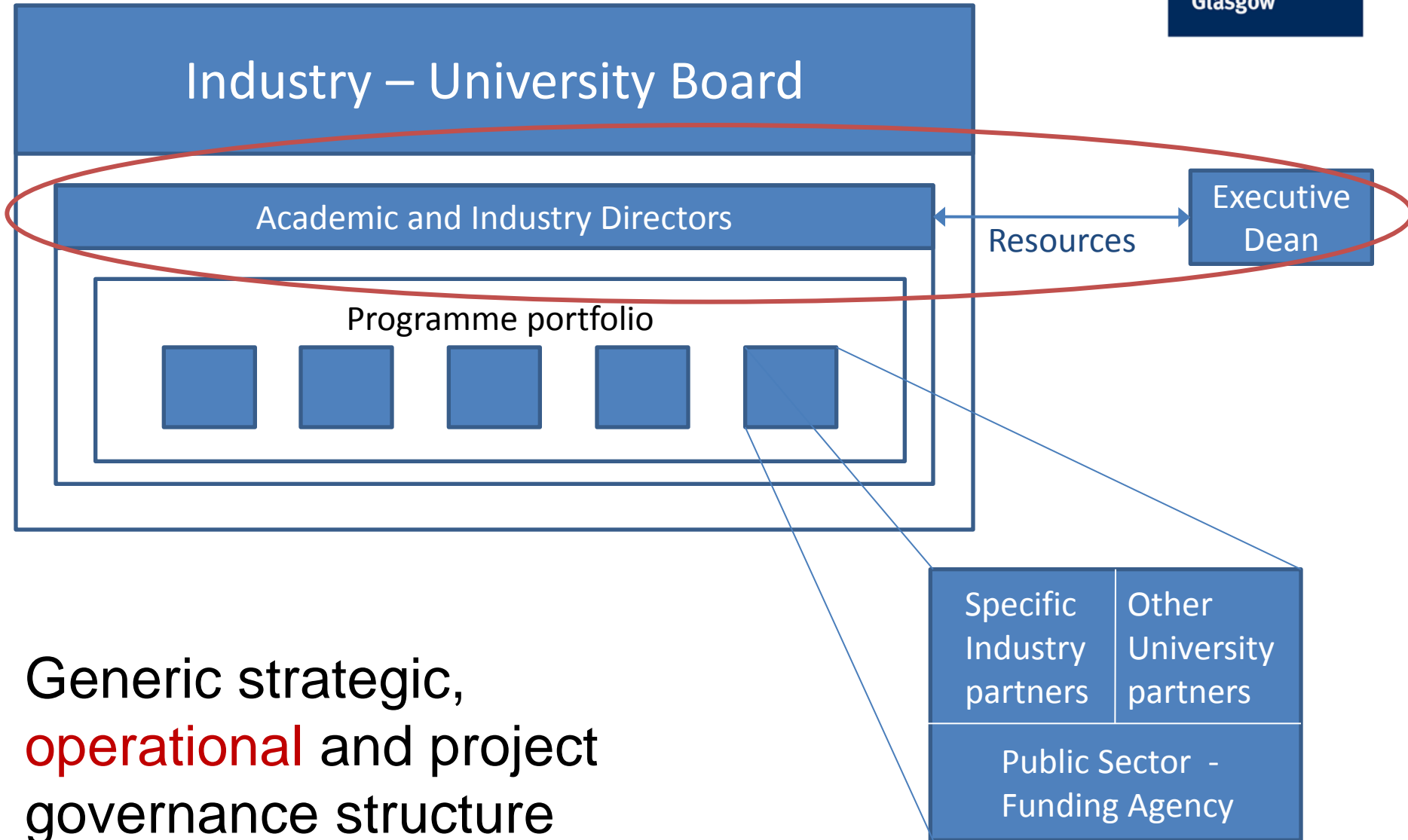
Resources

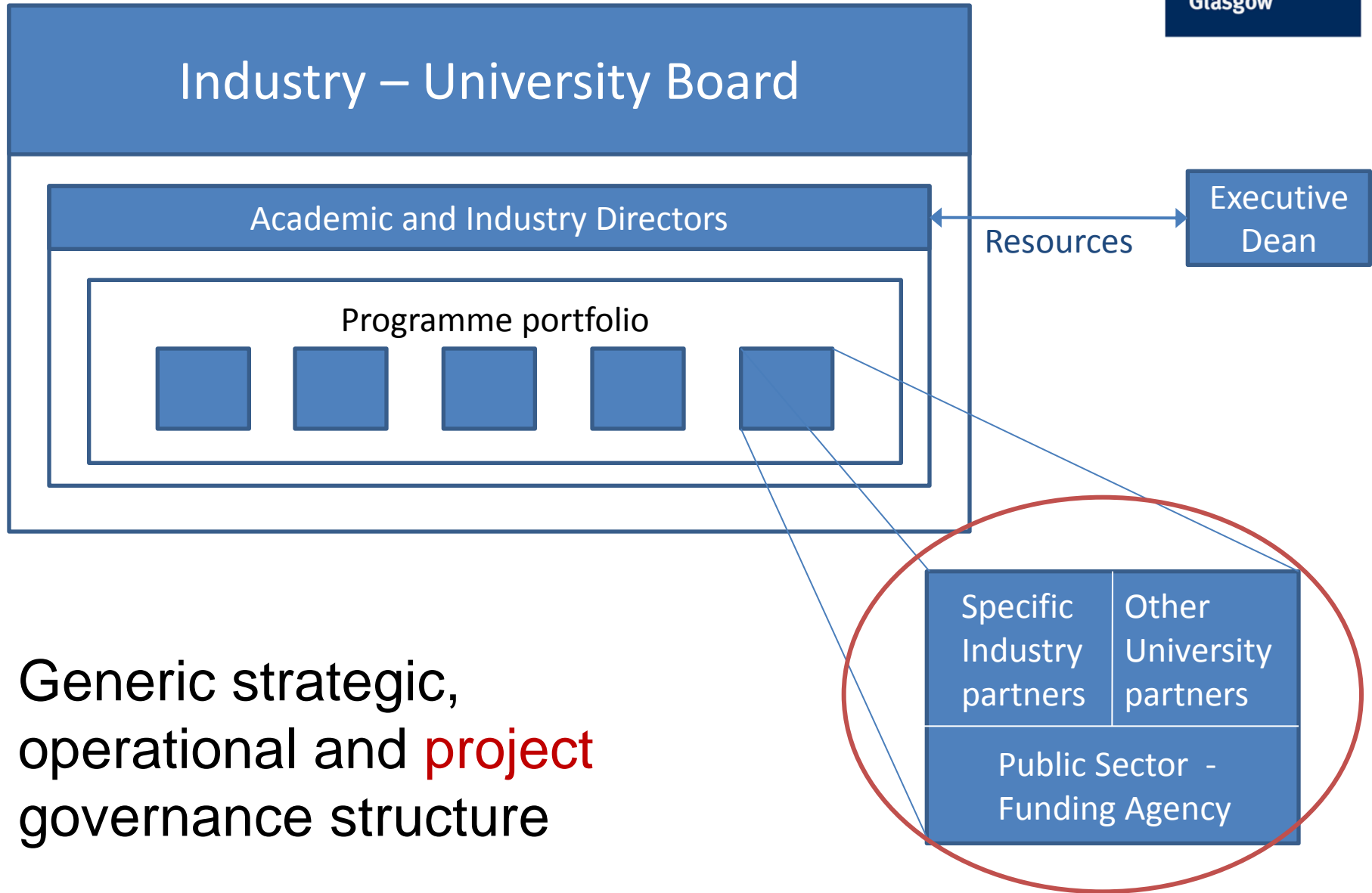
Specific
Industry
partners

Other
University
partners

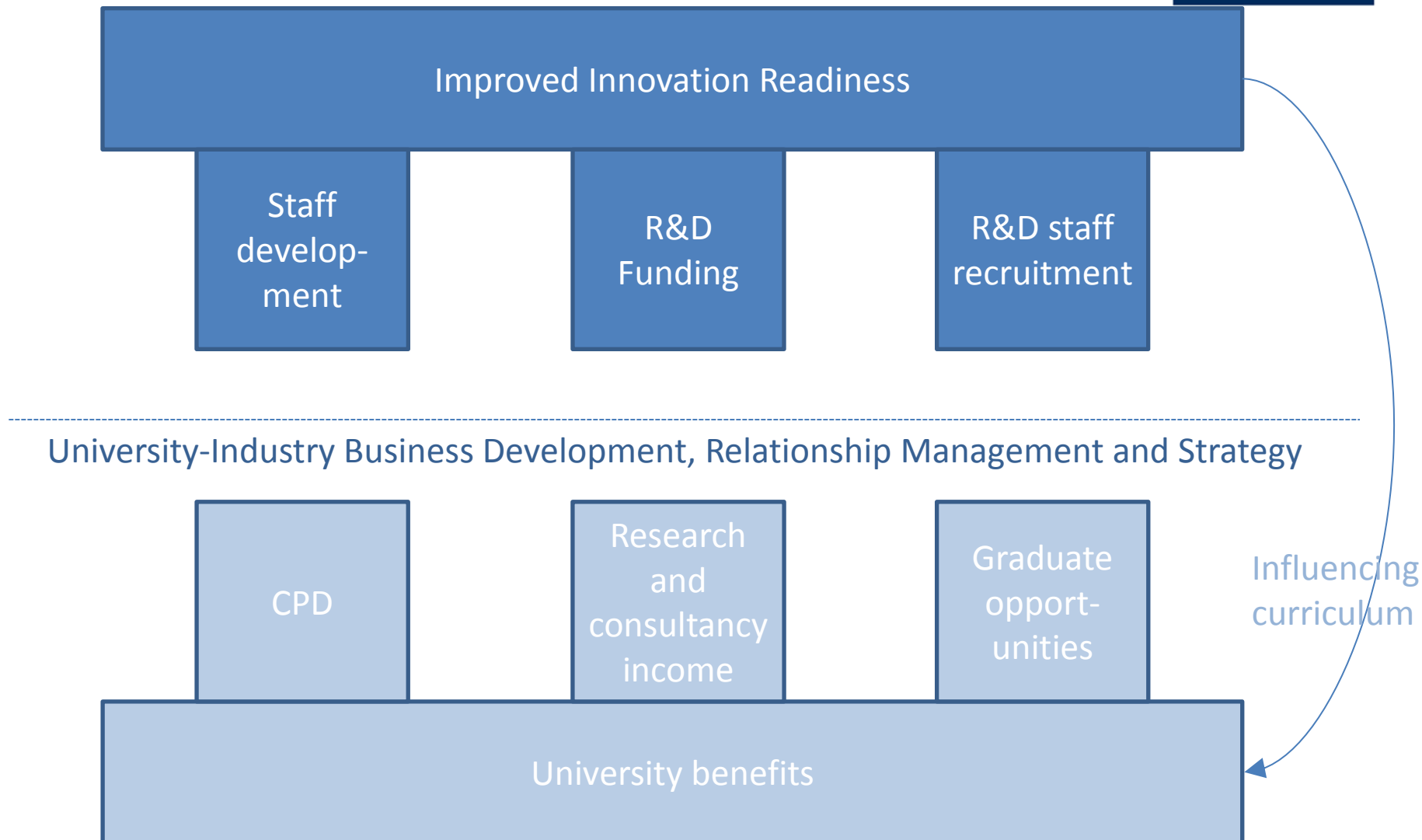
Public Sector -
Funding Agency

Generic **strategic**,
operational and project
governance structure

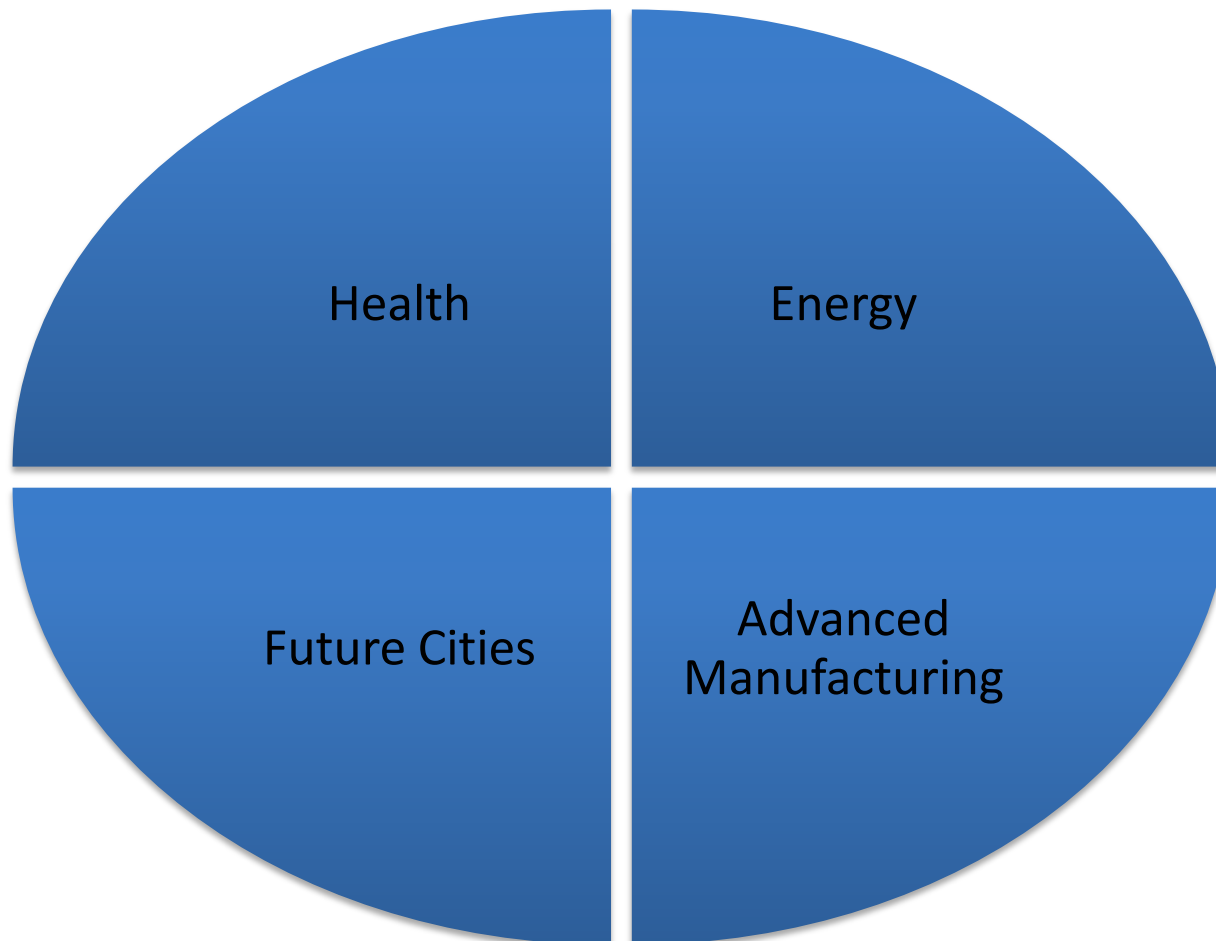




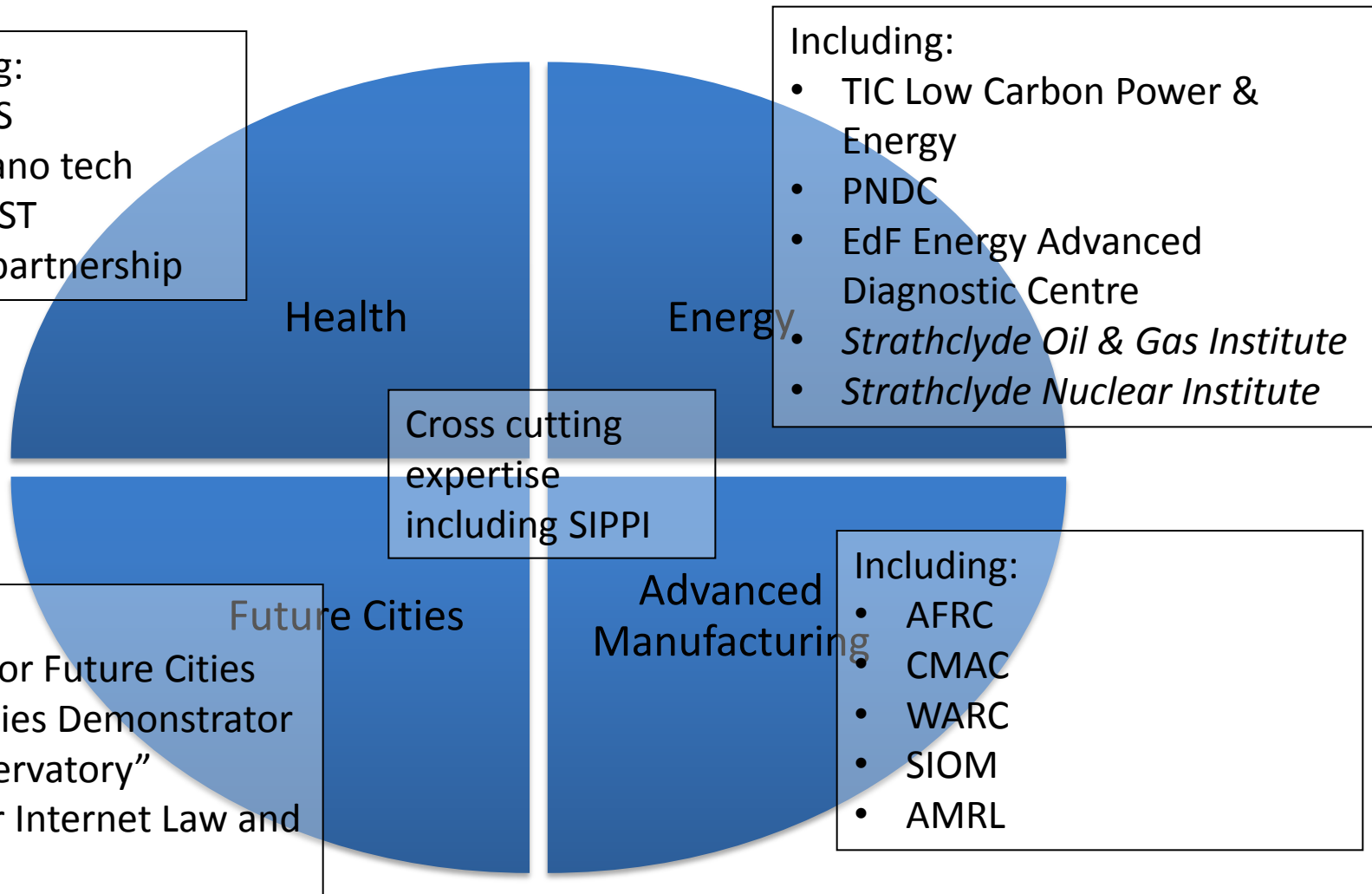
Innovation Readiness



Sector based centres and themes



Sector based centres and themes



Acronyms

- AFRC: Advanced Forming Research Centre
- AMRL: Advanced Materials Research Laboratory
- BRE-Trust Centre: Building Research Establishment Trust Centre
- CELCIS: Centre for Excellence for Looked After Children
- CEPE: Centre for Electrical Power Engineering
- CPACT: Centre for Process Analysis and Control Technology
- CMAC: Centre for Continuous Manufacturing and Crystallisation
- HT@S: Health Technologies at Strathclyde
- RC-NDE: Research Centre for Non-Destructive Evaluation
- ROLEST: Robertson Trust Laboratory for Electronic Sterilisation Technologies
- Rolls-Royce-UTC: Rolls Royce University Technology Centre
- SIOM: Strathclyde Institute for Operations Management
- WARC: Weirs Advanced Research Centre

CIAB - Progress Update

- Court approved creation (June 2012) of Interim Investment Committee (now CIAB) with an independent chair to (i) oversee the development of the new approach on behalf of the Executive Team and (ii) to recommend to the Executive Team individual investments for approval.
- CIAB established and meetings in Dec 2012, April 2013 and October 2013.
- Independent Chair: Dr Frank Blin, with the Treasurer and Margaret McGarry among members.
- 4 more CIAB meets planned in 13/14 with next scheduled for 11 December 2013

CIAB - Progress Update

CIAB business to date :

– Strategic

- Revised policy for company creation & investment - launched
- Commercial investment processes & procedures - launched
- Strategy for Investor networks & investor relations work - approved
- Pipeline of new dealflow - shared
- Portfolio management – proposals to be shared at forthcoming CIAB(s)
- Major new fund proposals (Donation Fund & I2I Fund) - ongoing

– Operational

- Smarter Grid Solutions Ltd £3M investment (2t) / University
£300k / 11.4% of the equity
- mLED Ltd £600k investment / University £100k /
16% of the equity
- Insignia Technologies Ltd £870k investment / University
£87k / 10% of the equity



University of **Strathclyde** Glasgow

Core TIC Themes and Collaboration Clusters

*Open
Innovation* *Strategic
relationships* *Leveraged
funding*

Co-location

*Student
experience*

Commercialisation

Energy

Host TSB Offshore
Renewable Energy
(ORE) *Catapult* HQ

Manufacturing

AFRC – TSB High Value
Manufacturing (HVM)
Catapult

Health Technologies

Smart Cities
Core partner in TSB
Future Cities *Catapult*
Demonstrator Project

Collaboration

*Research
Impact*

*Postgraduate
research
opportunities*

*Local and
global
partnerships*

*Accelerated
development*

TIC Corporate Partners

