PHEE

A forum for Academic Leaders in Electrical Engineering and Allied Technologies

Annual Conference 2019

"Opportunities for UK Engineering Higher Education"

In conjunction with PHOMME and EPC

Wednesday 16th January 2019

IMechE, Birdcage Walk

London

Academic Partners
The Institution of Engineering and Technology

Online digest – www.epc.ac.uk/phee

PHEE
A forum for Academic Leaders in Electrical Engineering and Allied Technologies

Professors and Heads of Mechanical and Manufacturing Engineering

Engineering Professors COUNCIL
The voice of engineering academics

PHEE ANNUAL CONFERENCE 2019

in conjunction with PHOMME and Co-sponsored by EPC

Wednesday 16 January 2019 at the IMechE, 1 Birdcage Walk, London SW1H 9JJ

THEME: "Opportunities for UK Engineering Higher Education"

09:30 Registration and Coffee

10:00 Welcome and Introduction – *Prof John Senior*, University of Hertfordshire

10:10 Morning Keynote Address: Engineering HE in the Post Brexit Global Economy by *Dr Peter Bonfield OBE*, Vice-Chancellor, University of Westminster

Session 1: International Delivery of UK Engineering Education - *Chair: - Professor Clive Neal-Sturgess,* University of Birmingham

10:40 Nottingham University in Malaysia by *Dr Stewart McWilliam*

11:00 Heriot-Watt University Dubai Campus by *Dr Keith Brown*

11:20 Queen Mary University of London Partnership with Beijing Telecommunications University by *Prof Yue Chen*

11:40 Discussion Panel

11:55 Tea/Coffee Break

Session 2: International Research Collaborative Opportunities – *Chair: - Professor Adrian Porch,* Cardiff University

12:10 Update on Newton and GCRF funding opportunities by *Jacqui Williams,* Head of Newton Fund, UKRI International Development Team, UK Research and Innovation

12:30 Engineering a Better World: The Royal Academy of Supporting Global Partnerships, *Shaarad Sharma,* Royal Academy of Engineering

12:50 A Solar Energy Partnership, a GCRF Case Study by *Dr Ian Mabbett,* COO for the GCRF SUNRISE Project, Swansea University

13:05 Discussion Panel

13:20 PHEE/PHOMME Meetings

13:30 *HOT LUNCH*

14:30 Afternoon Keynote Address: Update on the KEF and associated developments by *Alice Frost*, Director of Knowledge Exchange, Research England "

Session 3: Excellence in Innovation and Education – *Chair: Dr Misha Filip*, University of Portsmouth

15:00 Recent Developments at Innovate UK by *Simon Masters*, Head of High Value Manufacturing, Innovate UK

15:20 Update on Subject Level TEF by *Prof Nick Lieven,* University of Bristol

15:40 Discussion Panel

16:00 Close

PHEE Annual Conference 2019 Attendance List

Delegates

First Name	Last Name	Affiliation
John	Allport	University of Huddersfield
Nader	Anani	University of Chichester
Thomas	Baker	University of Hertfordshire
Dragana	Barjamovic	University of Westminster
Katherine	Bunting	The IET
Dan	Canty	The IET
David	Carey	University of Surrey
Anthony	Davies	King's College London & IEEE
Catherine	Dobson	University of Hull
Andy	Downton	The IET
Samuel	Evans	Cardiff University
Misha	Filip	University of Portsmouth
Andy	Gibson	Manchester Metropolitan University
Mark	Hadfield	Bournemouth University
Lorna	Hadfield	The IET
David	Hawkins	Staffordshire University
Barbara	Howell	Coventry University
Muhammad	Imran	University of Glasgow
Izzet	Kale	University of Westminster
Richard	Lillington	University of Warwick
Grant	Maxwell	The IET
Dik	Morling	University of Westminster
Susan	Murray	University of Hertfordshire
Clive	Neal-Sturgess	University of Birmingham
Lynsey	Plockyn	University of Portsmouth
Adrian	Porch	Cardiff University
Johnny	Rich	EPC
John	Robinson	University of York
Torfeh	Sadat-Shafai	Staffordshire University
Cem	Selcuk	TWI
John	Senior	University of Hertfordshire
Andrzej	Tarczynski	University of Westminster

Speakers

First Name	Last Name	Affiliation
Peter	Bonfield	University of Westminster
Keith	Brown	Heriot-Watt University
Yue	Chen	Queen Mary University of London
Alice	Frost	Research England
Nick	Lieven	University of Bristol
Ian	Mabbett	Swansea University
Simon	Masters	Innovate UK
Stewart	McWilliam	University of Nottingham
Shaarad	Sharma	Royal Academy of Engineering
Jacqui	Williams	UK Research and Innovation

Engineering HE in the Post Brexit Global Economy

Dr Peter BONFIELD OBE FREng FIET FICE FIOM3 FCIOB HonFIStructE HonFCABE CEng

VICE-CHANCELLOR AND PRESIDENT

UNIVERSITY OF WESTMINSTER

Biography

Peter joined The University of Westminster as Vice-Chancellor and President in May 2018. A University with a proud and distinctive reputation which dates back to 1838, which has focussed on teaching and research for students from very diverse backgrounds. Prior to this he worked Chief Executive of the BRE Group of companies who conduct multi-disciplinary research, training and education in the built environment sectors in the UK and around the world.

From 2006 until 2012 he was on part-time secondment to the Olympic Delivery Authority where he co-created the sustainable development strategy and took the lead on the sustainable procurement of construction products.

Peter has conducted 4 Independent Reviews for UK Government since 2012. These include UK Forests and Woodlands (Grown in Britain), Public Sector Food Procurement, Flood Resilience, and Consumer Protection on Energy Efficiency and Renewable Technologies (Each Home Counts). He has also served on the Government's Grenfell Expert Panel focussed on broader UK people fire safety. He has served as a Non Executive Director of Defra between 2015 and 2018 and the Talent Advisory Group which focuses on development, retention and recruitment of civil servants.

He was awarded an OBE for services to research and innovation in the Built Environment in 2012. He is Deputy President of the Institution of Engineering and Technology.

Peter is a former National Cycling Champion.

Nottingham University in Malaysia

Dr Stewart McWilliam

Associate Professor

University of Nottingham

Biography

Dr Stewart McWilliam is Associate Professor in Mechanical Engineering at the University of Nottingham, UK and currently leads industrially funded research developing state-of-the-art MEMS inertial sensors. He worked at the University of Nottingham Malaysia in 2008-10 as Director of Studies, Mechanical Engineering and in 2013-17 as Associate Dean Teaching and Learning for the Faculty of Engineering.

University of Nottingham
UK | CHINA | MALAYSIA

Delivering UK Engineering Education at University of Nottingham Malaysia

Dr Stewart McWilliam
Associate Professor
Faculty of Engineering
University of Nottingham

PHEE ANNUAL CONFERENCE
16th January 2019

PHEE
A forum for Academic Leaders in Electrical Engineering and Allied Technologies

Engineering Professors COUNCIL

Professors and Heads of Mechanical and Manufacturing Engineering

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A global university

A global outlook
is part of the University's DNA

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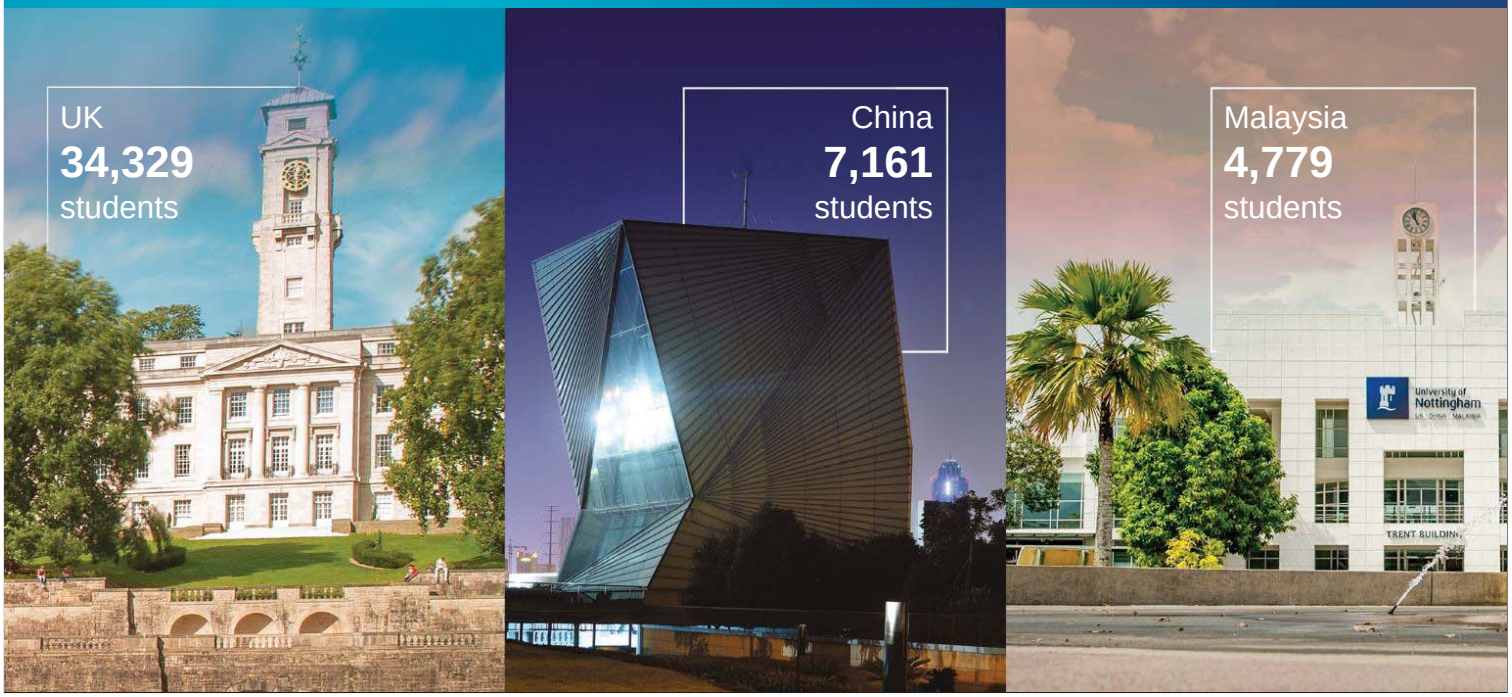
Student numbers

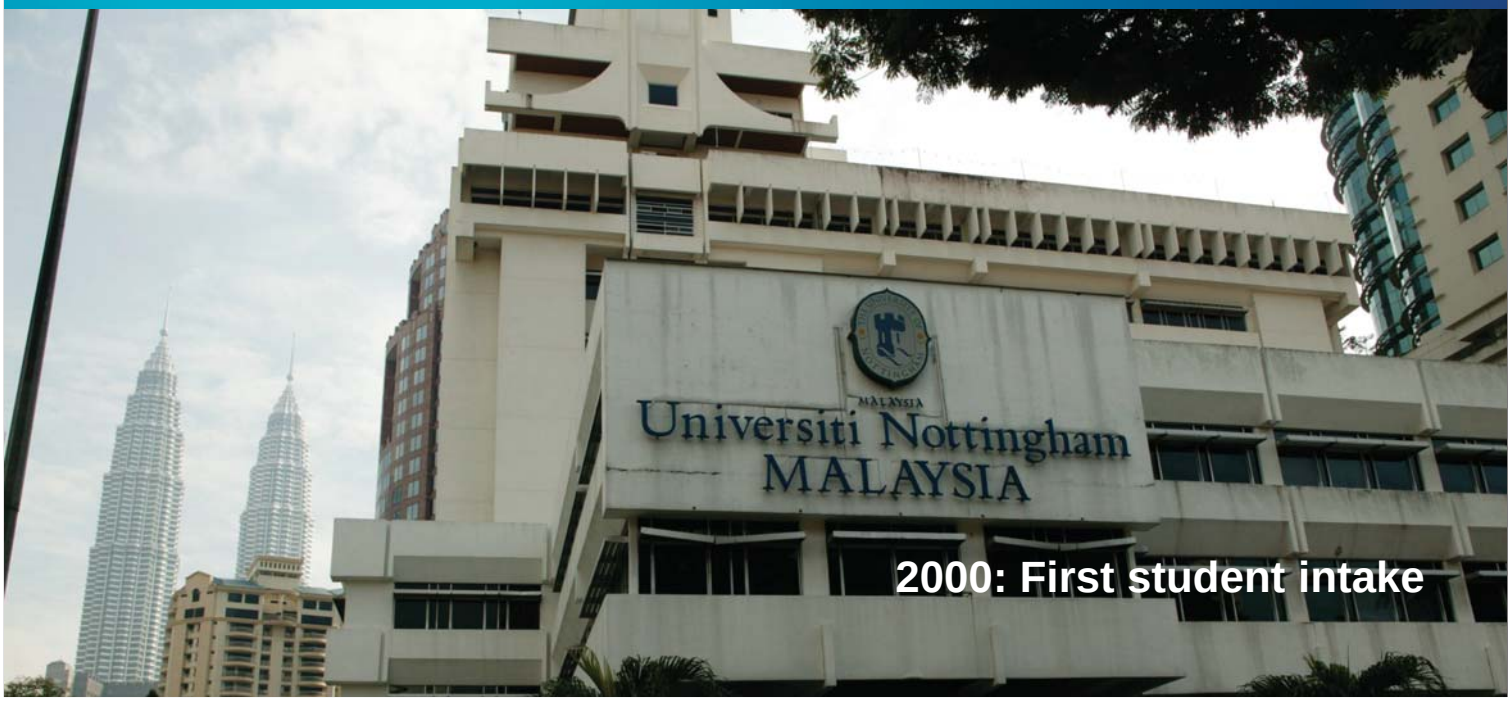


University of Nottingham
UK | CHINA | MALAYSIA

Malaysia

University of Nottingham
UK | CHINA | MALAYSIA

Malaysia



2000: First student intake

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Malaysia

2005: Opened purpose-built campus

University of Nottingham
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Malaysia

Recent photograph

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Engineering Departments

Faculty of Engineering is the largest of the Faculties at UNM

The engineering departments are

- Department of Chemical and Environmental Engineering
- Department of Civil Engineering
- Department of Electrical and Electronic Engineering
- Department of Mechanical, Materials and Manufacturing Engineering
- Foundation in Engineering

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Engineering Programmes

Foundation in Engineering

BEng/MEng

Chemical Engineering, Chemical Engineering with Environmental Engineering, Civil Engineering, Electrical and Electronic Engineering, Mechanical Engineering, Mechatronic Engineering

MSc

Chemical Engineering, Environmental Engineering, Civil Engineering, Electronic Communications and Computer Engineering Mechanical Engineering

PhD

Same degree programmes and quality assurance procedures across all campuses

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Quality Assurance

Departments offering programmes at different campuses are classed as "multi-campus" departments

Local responsibility

Admissions, Student Experience, Assessment processes, HR planning and recruitment, Resources and facilities

Cross-campus consultation

Curriculum developments and teaching provision (accreditation, student mobility, resources and facilities), Overall standards of assessment and degree award

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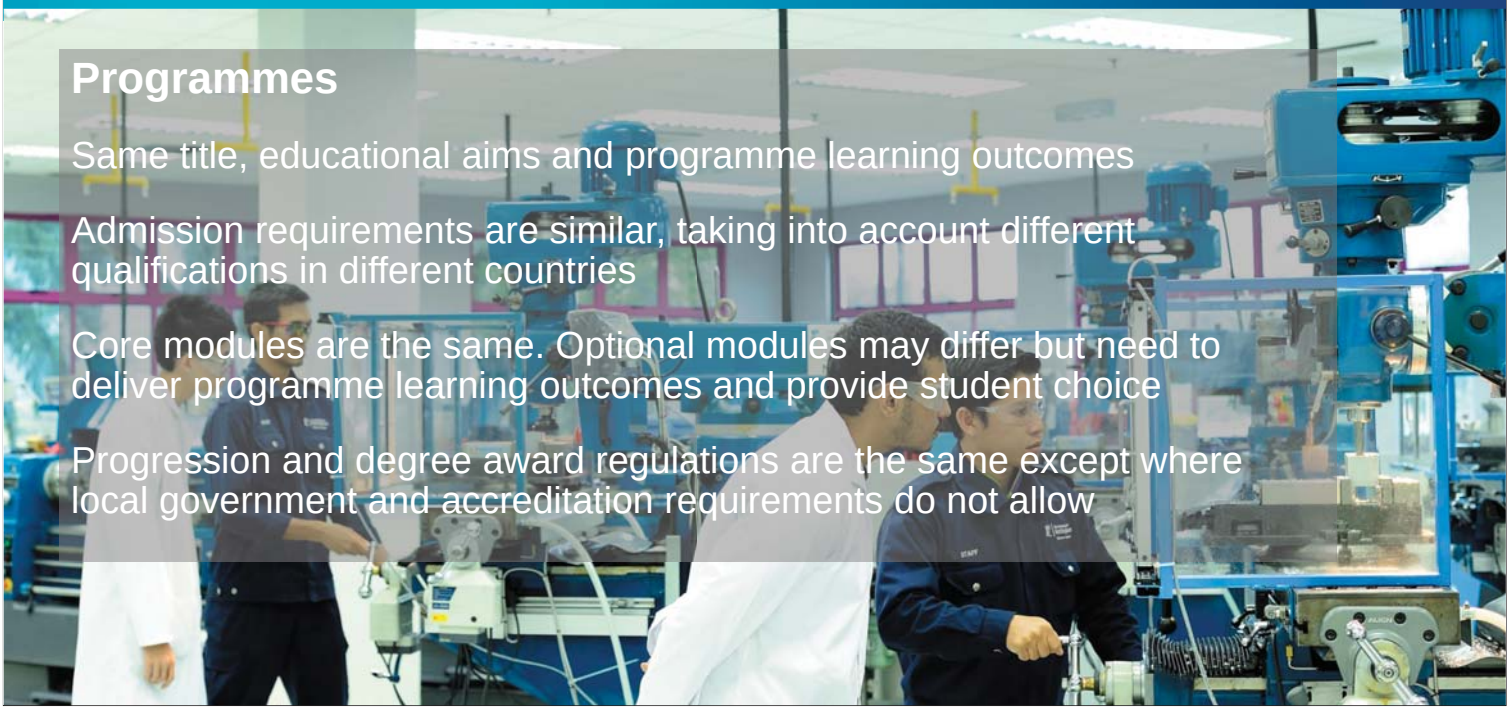
Quality Assurance



Programmes

Same title, educational aims and programme learning outcomes

Admission requirements are similar, taking into account different qualifications in different countries

Core modules are the same. Optional modules may differ but need to deliver programme learning outcomes and provide student choice

Progression and degree award regulations are the same except where local government and accreditation requirements do not allow

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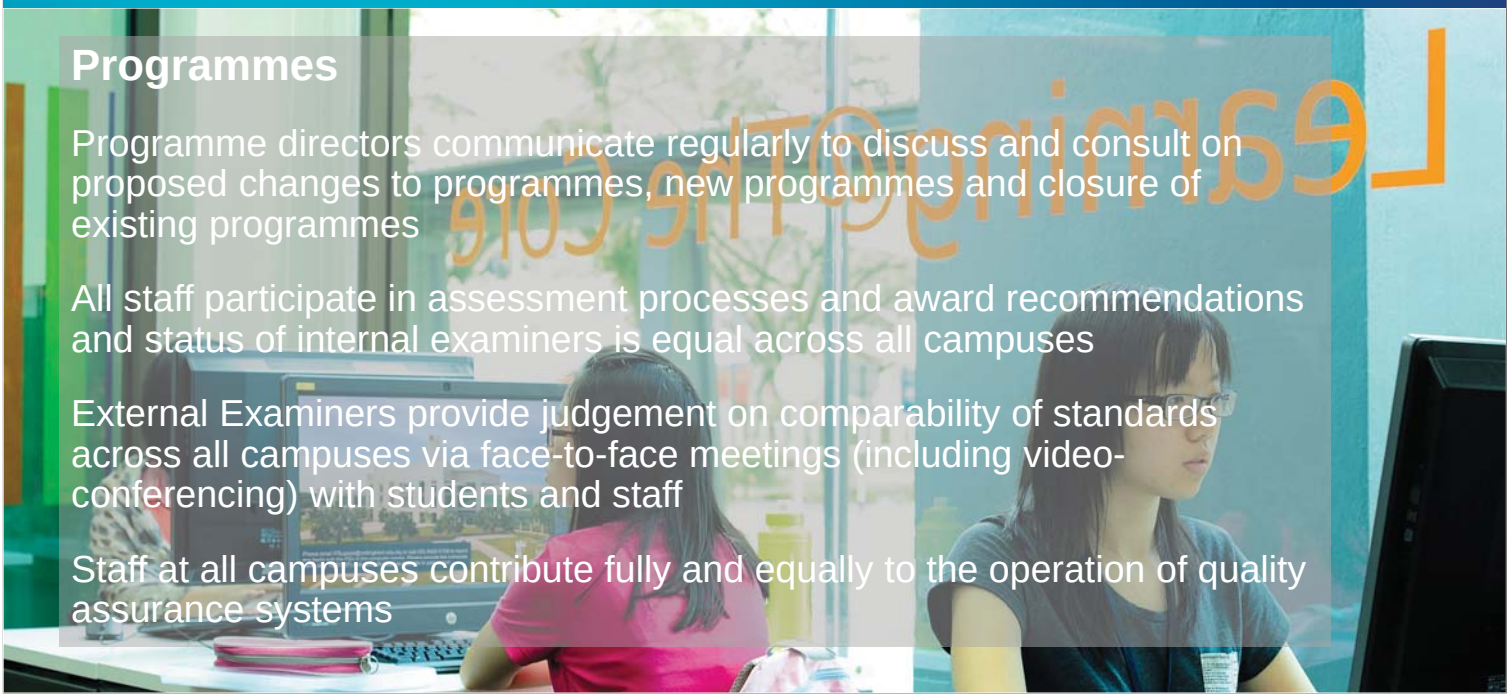
Quality Assurance



Programmes

Programme directors communicate regularly to discuss and consult on proposed changes to programmes, new programmes and closure of existing programmes

All staff participate in assessment processes and award recommendations and status of internal examiners is equal across all campuses

External Examiners provide judgement on comparability of standards across all campuses via face-to-face meetings (including video-conferencing) with students and staff

Staff at all campuses contribute fully and equally to the operation of quality assurance systems

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Quality Assurance

Modules

Same title, number of credits, pre- and co-requisites, aims, summary of content and module learning outcomes

Content is closely aligned for core modules. Detailed content and delivery may differ for optional modules

Materials (hand-outs, ppt slides, example questions, etc) may vary and lecturers are encouraged to develop their own teaching materials

Basic assessment details and assessment criteria are the same

Final examination papers may be common across campuses, provided a concurrent examination can be timetabled

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Quality Assurance

Modules

Development and enhancement is regarded as a collaborative process involving relevant staff across all campuses

Module Convenors share materials (delivery and assessment) with their counter-parts

Modules (learning outcomes, content/curriculum, delivery, assessment) are reviewed and best practice shared across campuses using a single Module Review form

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Accreditation

All programmes are accredited by the Engineering Accreditation Council (EAC) Malaysia

All programmes are accredited by relevant UK professional engineering institutions (IChemE, IED, IET, IMechE, JBM) with each campus visited by accrediting panels to consider human, physical and material resources, and meet students

UK and Malaysia are both signatories to the Washington Accord and accreditation requirements are broadly the same with some differences in requirements for industrial training and the role of external examiners

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Heriot-Watt University International Programmes Dubai and Malaysia

Dr Keith Brown

Associate Professor

Heriot-Watt University

Biography

Keith Brown completed his PhD at the University of Edinburgh and then joined the Department of Electrical and Electronic Engineering at Heriot-Watt University in November 1987. In 2002 when the University re-structured into schools he took on the head of teaching for the Electrical, Electronic and Computer Engineering. He finished that role in 2014 and he is currently leading the discipline's move to doing more learning by doing.

HERIOT WATT UNIVERSITY

LEADERS IN IDEAS AND SOLUTIONS

Heriot-Watt University International Programmes Dubai and Malaysia

Keith Brown

HERIOT WATT UNIVERSITY

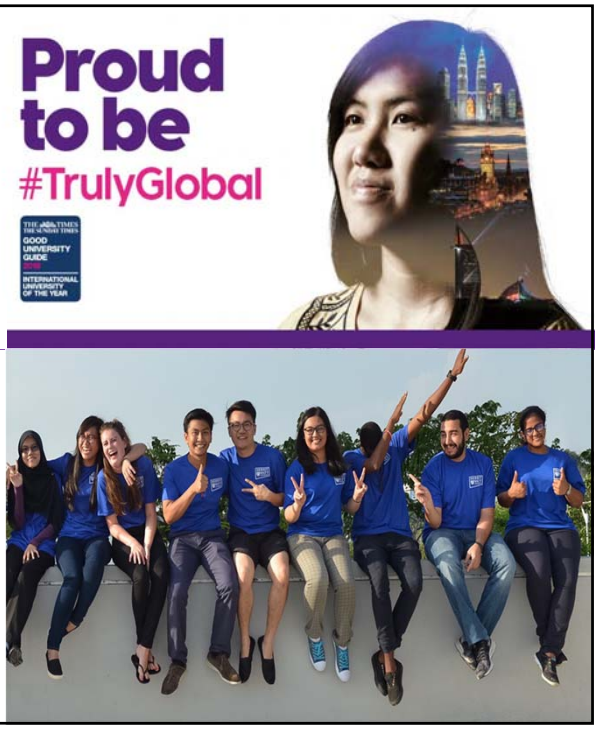
EDINBURGH, GALASHIELS AND ORKNEY

DUBAI

MALAYSIA

HERIOT WATT UNIVERSITY

- 29,000 students from 170 countries
- 33% of students on-campus in Scotland from outside UK
- 116,000 alumni in over 190 countries
- 92 university and college partners in 35 countries
- 28,000 exams in 400 locations worldwide annually



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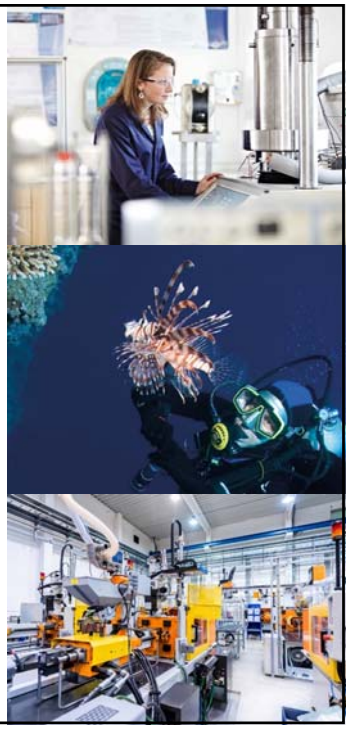
School of Engineering and Physical Sciences
Chemistry, Chemical Engineering,
Electrical/Electronic and Computer Engineering,
Mechanical Engineering, Physics, STEM teacher training



Programme equivalence

- Where possible the programmes that we offer are the same where ever they are delivered.
- Local variations are built in but they do not impinge on the overall programme learning outcomes.
- Local accreditation requirements are accommodated in the programmes.
- Exams the same across campuses (there are some time zone variants)

Electrical and Electronic Engineering Years 1 to 3

- Year 1 Identical in Edinburgh and Dubai (no year 1 in Malaysia)
- Year 2 Identical in Edinburgh, Dubai and Malaysia
- Year 3 Identical in Edinburgh, Dubai and Malaysia

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Year 1

Mand/ Opt	Stage	Sem	Course Code	Title	1ED	1DU	1MP
M	1	S1	B27MW	Mechanics, Fields and Forces	X	X	X
M	1	S1	B37EE	Introduction to E and EE	X	X	X
M	1	S1	B37VA	Prax. Electr. Design	X	X	X
M	1	S1	F17XA	Maths Engineers & Scientists 1	X	X	X
M	1	S2	B27FF	Waves and Matter	X	X	X
M	1	S2	B37VB	Praxis Programming	X	X	X
M	1	S2	B57AU	Intro to Mech Engineering	X	X	X
M	1	S2	F17XB	Maths Engineers & Scientists 2	X	X	X

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Year 2

Mand/ Opt	Stage	Sem	Course Code	Title	1ED	1DU	1MP
M	2	S1	B38DB	Dig. Design and Prog.	X	X	X
M	2	S1	B38EB	Circuits and Analysis	X	X	X
M	2	S1	B49CB	Business Aware, Safety & Sust	X	X	X
M	2	S1	F18XC	Maths Engineers & Scientists 3	X	X	X
M	2	S2	B38EM	Intro Electricity & Magnetism	X	X	X
M	2	S2	B38DF	Computer Arch & Embed Systsms	X	X	X
M	2	S2	B38EI	Elec. Pow. & Machines	X	X	X
M	2	S2	F18XD	Maths Engineers & Scientists 4	X	X	X

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Year 3

Mand/ Opt	Stage	Sem	Course Code	Title	1ED	1DU	1MP
M		3S1	B39AX	Engineering maths and stats	X	X	X
M		3S1	B39MB	Phys. Elect. And Semicon.	X	X	X
M		3S1	B39VS	System Project	X	X	X
M		3S2	B39EE	Analogue Electronics	X	X	X
M		3S2	B39MA	Electromagnetism	X	X	X
M		3S2	B39SB	Time Frequency & Signal Analys	X	X	X
M		3S2	B39ES	Elect. Energy Systems	X	X	X

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Year 4

Mand/ Opt	Stage	Sem	Course Code	Title	1ED	1DU	1MP
O		4S1	B30EI	Advanced Analogue Electronics	X	X	X
O		4S1	B30EJ	Linear Control	X	X	X
M		4S1	B30UB	4th Yr Project 1	X	X	X
O		4S1	B31DD	Embedded Systems	X		
O		4S1	B31SC	Dig. Sig. Processing	X	X	X
O		4S1	B30MT	Micro Techniques	X	X	
O		4S2	B30EK	Sust Energy and PS	X	X	X
M		4S2	B30UC	4th Yr Project II	X	X	X
O		4S2	B31HD	High Frequency Circuit Design	X		
O		4S2	B30SQ	Comms Devices and Systems	X		X
O		4S2	B31SE	Image Processing	X		
O		4S2	B31DE	Adv. Dig. Elect.	X		
O		4S2	B30ES	Industrial Power Systems		X	

Overarching principals

- The programmes are equivalent across all campuses
- Transfer between campuses is straightforward
- Exams are the same across all campuses
- Coursework covers the same learning outcomes, but may be contextualized at different campuses
- Not all specializations are necessarily be offered on all campuses
- All staff from all campuses are members of the teaching group

Quality control

- All campuses have the same exam boards (inter-campus communications has been an issue in the past)
- There is an additional school-wide external examiner who looks across all subjects and campuses.
- There are module responsible staff who check that the different marking done on the different campuses are equivalent. These may be based on any campus.
- The subject external examiner sees all of the exam papers for comment.

Benefits

- Several cohorts doing the same exams so it is easier to spot when an exam is out of line or there have been campus specific issues.
- Several members of staff able to input into module evolution.
- Can generate additional income after start-up period.

Drawbacks

- Co-ordinating different campuses can be tricky.
- Running boards of studies across campuses can be challenging.
- Initial start-up has large administrative burden.
- Different accreditation requirements in each location.
- Teaching materials need to be agreed in advance, sometimes this delays updates being introduced.
- Prizes for different campuses can cause friction.

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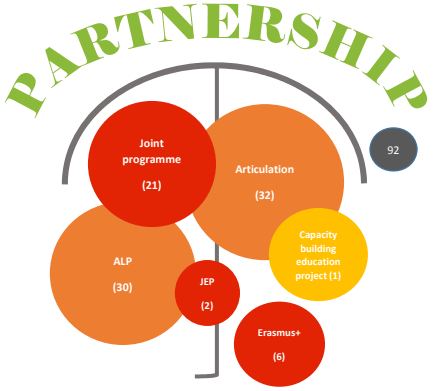
Collaborative Partnerships

- We work together to build strategic partnerships, create broad academic coalitions and drive high quality, sustainable recruitment
- We are developing and extending partnerships for all campuses in both research and teaching
- 2018: 5,000 students joined HWU through international collaborative partnerships



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Scottish Confucius Institute for Business and Communication

苏格兰商务与交流孔子学院

Collaboration with China

- 29 active university and college partners in 14 provinces
- Collaborative Agreements
  - Tianjin University of Science and Technology – joint education programme in Brewing and Distilling approved by MOE
  - Xidian University – joint education programme in Telecommunication Engineering approved by MoE
- Articulation and Study Abroad partners

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Conclusions

- International engagement requires significant start-up effort
- Initial start-up puts a burden on the main campus staff
- Payback is quite slow
- Offers staff and students a broader outlook
- Helps develop international research relationships
- Helps with recruitment to UK campus

A Case Study: QMUL-BUPT Joint Programme

Prof Yue Chen

Director of Education

Queen Mary University of London

Biography

Yue Chen is currently a Professor of Telecommunications Engineering at the School of Electronic Engineering and Computer Science (EECS), Queen Mary University of London (QMUL). She is the EECS Director of Education (DoE), responsible for teaching and learning strategies to ensure excellence in student experience and staff development. Prior to the DoE role, Prof Chen has been the QM Director of QMUL-BUPT Joint Programme, a dual award transnational education (TNE) programme for 6 years. She has extensive experience on establishing and managing collaborative TNE programmes and has also served as the external examiner for UK-China TNE programmes, member of the IET China Steering Group, the IET Qualification Board and Quality Review/Programme Validation Advisory board at several universities in the UK.

International Delivery of UK Engineering Education

A case study: QMUL-BUPT Joint Programme

Prof Yue Chen

Queen Mary University of London

Outline

- Dual award TNE programmes – opportunities and challenges
- A case study of the QMUL-BUPT Joint Programme
  - History
  - Facts and figures
  - Programme structure
  - Governance and management
  - Quality assurance
  - Flying faculty delivery model
  - Sustainability

International dual degree programme

Dual award or double award --- QAA

The granting of separate awards (and certificates) for the same programme by two degree-awarding bodies who have jointly delivered the programme of study leading to them.

Dual award – opportunities and challenges

- two degrees
- a rich learning environment
- enhance further study and employment opportunities in a global market
- promote research collaborations
- enhance international mobility
- shared delivery load
- …….

- effective quality assurance over two different educational systems
- cope with different teaching and learning styles
- complexity in programme design
- effective communication and joint decision making
- ……..

Queen Mary University of London

Queen Mary University of London

北京郵電大學

Beijing University of Posts and Telecommunications

- A Research-led university in the Russell Group
- REF 2014 - ranked 9th amongst multi-faculty universities for research quality in the UK
- Top 20 world's most international universities (THE)
- Top 10 for student: staff ratio, employability and graduate starting salaries in the UK

- A Key National University directly administered by the Chinese Ministry of Education
- Ranked 1st on "Information and Communication Engineering" subject in China
- Two State Key Labs leading the research in network technology, information and optical communications

Queen Mary University of London

www.qmul.ac.uk

QMUL-BUPT Joint Programme

The 2004 cohort of graduates

- First UK-China dual award joint programme approved by the Chinese MoE and launched in 2004
- First degree programmes accredited by the Institution of Engineering Technology (IET) in mainland China
- Won "Right Partner" category in British Business Awards in 2009 and "New Horizons" category in Cathay Pacific Business Awards in 2011
- Highly commended by UK QAA (audit in 2012) and Chinese MoE (audit in 2013)
- over 2700 students enrolled
- 10 cohorts (over 5300) graduates

2004

2018

The 2014 cohort of graduates

Programme structure

- Three degree programmes
  - ✓ Telecommunications Engineering with Management
  - ✓ e-Commerce Engineering with Law
  - ✓ Internet of Things Engineering

- Dual award – BUPT and UoL/QM degree
- 4 year duration
- Students see themselves belonging to both universities
- Teaching is split 50/50 between BUPT and QM
- All designed to meet the general and specific learning outcomes in UK-SPEC

Queen Mary University of London www.qmul.ac.uk

Graduate employment & student achievements

- 10 cohorts (over 5300) graduated:
  ~100% employment or postgraduate study in each
- On average, around 80% going on to postgraduate education (~ 65% outside China)
- remaining 20% go straight into employment at leading companies such as Alibaba, Huawei, IBM, China Mobile, China Unicom, Cisco and 3Com.
- more than 70 graduates direct to PhD with Chinese Government support
- ~ 200 EI and ISTP indexed papers published
- ~ 250 undergraduate innovative projects conducted
- ~ 20 patents and copyrights have been registered

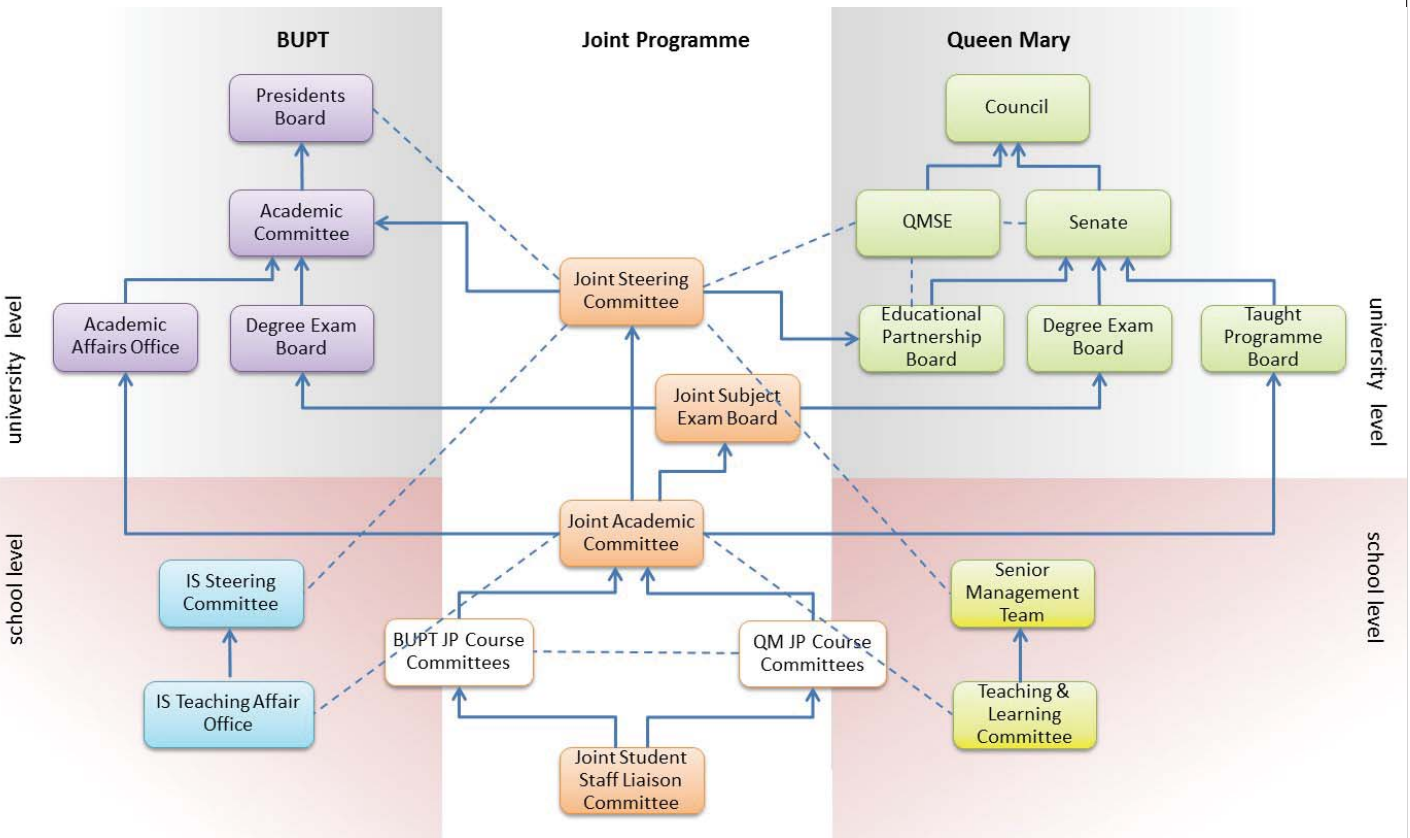
The principle of QMUL-BUPT Joint Programme

QMUL-BUPT Joint Programme is the first and largest TNE prog at QM

A jointly designed TNE Programme based on equal partnership to

- bring out the **best** of Chinese and UK education systems
- combine the **strength** of the two world-class universities

Governance and management



Quality Assurance

- The Joint Programme adheres to both QM and BUPT Quality Frameworks
- Taught modules are assigned to two internal examiners
- Subject Examination Boards, with external examiners appointed and approved by both universities
- Student-Staff Liaison Committees (twice per semester for each cohort)
- Module evaluation questionnaires (once per semester)
- Student online survey (annual)
- Course Committees & Academic Committee (twice per semester)
- Annual Programme Review and Taught Programme Action Plan (Annual)
- Periodic Review: 5 year cycle at QM, 2 year cycle at BUPT

Flying faculty delivery model

- QM staff teach in 1-week blocks for each module
- 10 hours lectures per block (per group)
- 4 blocks per semester
- This allows QM staff to teach in London and in Beijing
- BUPT lectures spread over the semester

EBU5302	01-Nov	02-Nov	03-Nov	04-Nov	05-Nov
08:00-10:00	Group A			Group A	
10:00-12:00		Group B	Group A		Group A
13:30-15:30	Group B				
15:30-17:30			Group B		Group B
18:30-20:30		Group A		Group B	

Sustainable dual degree programmes

- Genuine partnerships
- Assured quality
- Academic and financial sustainability
- Continuing attention to student experience

1+1 > 2 !

Queen Mary
University of London

Funding Opportunities in GCRF and the Newton Fund

Prof Jacqui Williams

Head of Partnerships and Programmes

UK Research and Innovation

Biography

Jacqui is currently the Head of Partnerships and Programmes in UK Research and Innovation's (UKRI) International Development Team. Her team works to provide strategic leadership and coordinate activities across the UKRI Councils. Jacqui works across the Global Challenges Research Fund and the Newton Fund. Jacqui is responsible for the team's regional working approach, and leads on activities within the Africa region. Jacqui joined the team from the Engineering and Physical Sciences Research Council where she had worked as leader of their Energy Programme. Previously Jacqui was senior manager within the energy team, managing the research and training portfolio in many areas such as energy storage and carbon capture and storage, and worked on many international joint calls and activities. Previous research themes that Jacqui has managed include construction engineering and manufacturing. Prior to joining the Councils she studied agricultural engineering and researched the impacts of wind erosion controls.

UK Research and Innovation

UK Research and Innovation

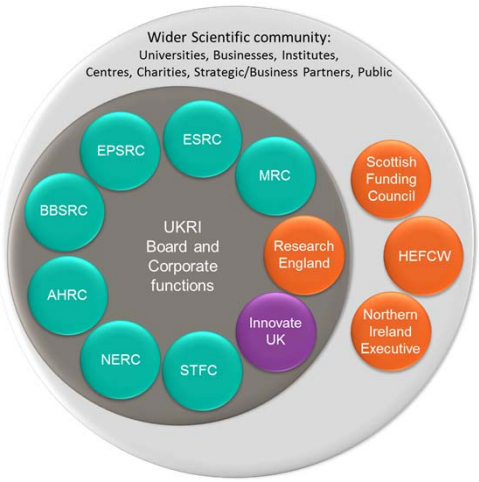
Funding opportunities in GCRF and the Newton Fund

Jacqui Williams, Head of Partnerships and Programmes, International Development Team

What is UK Research and Innovation?

UK Research and Innovation, launched in April 2018, is the new funding organisation for research and innovation in the UK.

It brings together the seven UK research councils, Innovate UK and a new organisation, Research England, working closely with its partner organisations in the devolved administrations.



The Numbers

- **More than £6.5 billion** in combined budget per year
- **3,900** research and business grants issued every year
- **2,400** business-led collaborative projects and **over 200** Knowledge Transfer Partnerships
- **151** universities receiving research funding
- **38** institutes, laboratories, units, campuses and innovation catapults

UK Research and Innovation

UK Research and Innovation

UK Funding for Research for Development

- ❑Department for International Development (DfID) (£1.5bn)
- ❑Newton Fund (£735m UK contribution; partner countries providing matched resources within the fund)
- ❑The Global Challenges Research Fund GCRF (£1.5bn)
- ❑Ross Fund (£1bn focused on health)
- ❑Fleming Fund (£195 million focused on antimicrobial resistance)

Background to GCRF

Cutting edge research which addresses the problems faced by developing countries

- Address global challenges through disciplinary and interdisciplinary research
- Strengthening capability for research and innovation, within developing countries and the UK
- Agile response to emergencies and opportunities

Key numbers

- £1.5Bn over five years
- 17 delivery partners

Over 700 current projects

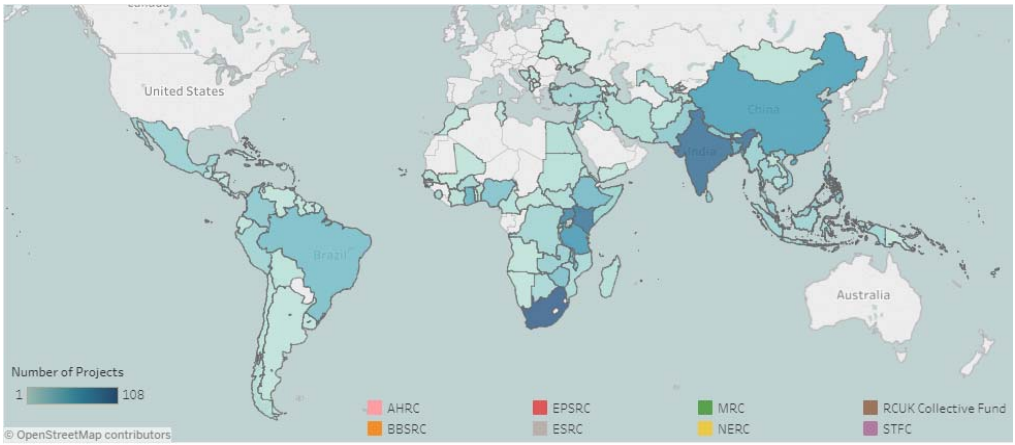
- Address diversity of challenge
- 80 DAC project partner countries
- Disciplinary and interdisciplinary approaches
- 37 cross-disciplinary *Growing Capability* awards (£225M)
- 12 Interdisciplinary Research Hubs to address intractable challenges (£210M)

Strategic Foci

GCRF: Key Criteria

- ✓ **Research Excellence**
  new approaches not constrained by traditional methodologies or disciplinary silos
- ✓ **Official Development Assistance (ODA) compliance**
  OECD guidelines
- ✓ **Equitable Partnerships and Building Capacity**
  strong and enduring partnerships between UK and developing-country researchers to enhance the research and innovation capacity of both
- ✓ **Impact: Problem and Solution Focused**
  substantial impact on improved social welfare, economic development, and environmental sustainability

UKRI GCRF Funded Projects: Countries of Focus



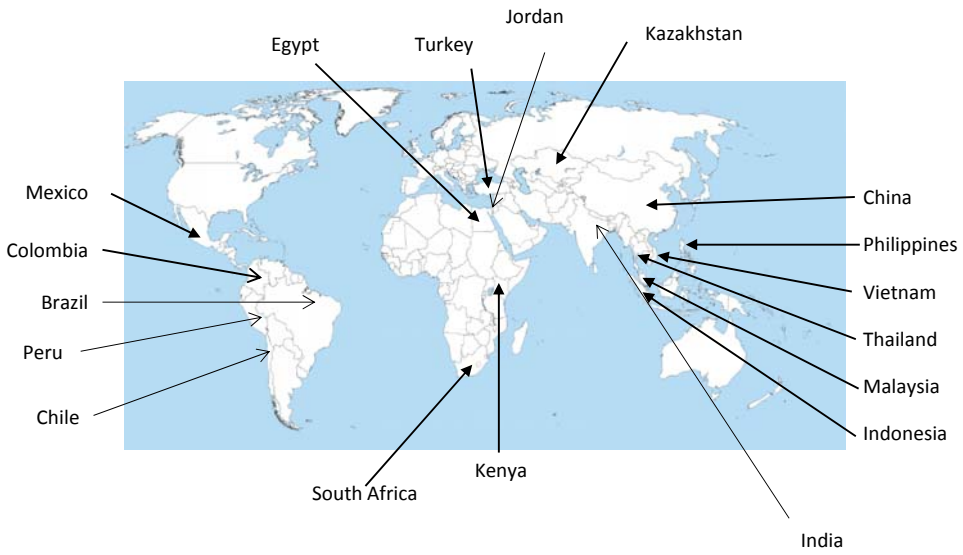
www.rcuk.ac.uk/funding/gcrf/gcrfawardedprojects/

Newton Fund: An Overview

- Launched in April 2014 as part of UK's Official Development Assistance (ODA) commitment
- Builds research and innovation partnerships with partner countries to:
  - support their economic development and social welfare
  - develop their research and innovation capacity for long-term sustainable growth
- Total budgeted UK Government investment of £735 million up to 2021
- All activities are match-funded so equal partnership
- Currently working with 18 partner countries
- Delivered by 15 UK delivery partners (UKRI is 9 of these)
- More than 700 programmes funded so far

Newton Fund

Newton Fund Partner Countries



UKRI activities under the Newton Fund

The Research Councils are collectively responsible for delivering over half of the budget (£380m) of the Newton Fund. Activities include:

- Research
  - Scoping: shorter term funding for exploratory research – understanding and preparing the landscape to focus for future research at scale
  - Full scale research programmes: Longer term larger scale addressing key development challenges, sometimes regional
  - Joint Centres / Networks: Linking institutions in partner countries to increase their competitiveness for future opportunity
- People: Capacity building and skills development e.g. International PhD Partnering, staff exchanges with other research funding agencies, STEM
- Translation: Innovate UK lead many activities. Also RC programmes.

Newton Fund

UK Research and Innovation

Future opportunities through GCRF

We have just announced the **UKRI GCRF Collective Programme** – a series of 2 or 3 calls in each challenge theme below to be issued in 2019 designed to enhance their overall impact.

Cities and Sustainable infrastructure

Global Health

Education

Food Systems

Security, Conflict and Displacement

Resilience to environmental shocks and change

Cross-cutting: Coherence Grants and Gender Network plus.

UK Research and Innovation

Discussion points

- Major funds impacting on the research base.
- Multiple calls from different delivery partners, often to tight deadlines and requiring (multiple) partners from developing countries
- Move to more DAC-country led partnerships, focus on equitable partnerships and co-creation of projects.
- New systems and processes:
  - Understanding ODA and ensuring compliance
  - Funding assurance processes and due diligence
  - Safeguarding
- Gender equality

UK Research and Innovation

Find out more

Do visit our website and see our interactive world map of GCRF funded projects. Find more information about the hubs, Challenge Leaders and calls for proposals and any planned events.

- www.ukri.org/research/global-challenges-research-fund
- **https://www.ukri.org/research/international/newton-fund**

Also visit the newtonfund.ac.uk and websites of the individual Councils within UKRI, and the other delivery partners such as the Royal Academy of Engineering, the Royal Society and the British Council.

Engineering a Better World: The Royal Academy of Supporting Global Partnerships

Shaarad Sharma, FRSA

Senior Manager

Royal Academy of Engineering

Biography

Shaarad Sharma is a Senior Manager with the Royal Academy of Engineering, responsible for delivering Newton Fund activities which aims to create science, innovation and R&D linkages between the UK and 18 emerging countries. He is also leading a strategic partnership with the Lloyd's Register Foundation, developing and implementing global programmes which develop and spread best practices to embed safety and sustainability in the domains of end of engineered life; complex systems; and engineering education. Prior to joining the RAEng, Shaarad led consulting assignments to governments in South Asia and Sub Saharan Africa, including as advisor to the Kazakh Government on the development of its High-Tech SME sector. He holds a Master of Public Administration from Columbia University, USA, a Master of Public Policy from Hertie School of Governance, Berlin and a BSc in Economics and International Development from University of Bath, U.K. Shaarad is also elected Fellow of the Royal Society of Arts, Commerce and Manufacturing as well as a Policy Fellow of the University of Cambridge's Centre for Science and Policy.

Our Vision

ROYAL ACADEMY OF ENGINEERING

PUTTING ENGINEERING AT THE HEART OF SOCIETY

ROYAL ACADEMY OF ENGINEERING

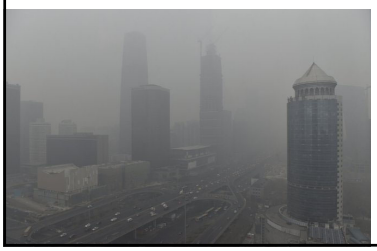
What we do

- **Supporting the global outlook of the UK Engineering Profession and the mobility of talent to underpin it.**
- **Supporting engineering entrepreneurs to develop scalable solutions to development challenges.**
- **Championing the contribution engineering can make to SDGs.**
- **Building international partnerships to support engineering innovation, skills and professionalisation.**

ROYAL ACADEMY OF ENGINEERING

Supporting the global outlook of the UK Engineering Profession and the mobility of talent to underpin it.

- Supported through BEIS and Home Office, industry partners and charitable foundations
  - Tier 1 Exceptional Talent Visa
  - Distinguished Visiting Fellowship programme
  - Missions and events



ROYAL ACADEMY OF ENGINEERING

Research and Innovation Talent visa

The Research and Innovation Talent Visa empowers the world's brightest and best individuals in the fields of engineering, natural sciences, medical sciences, social sciences and humanities and the arts to live and work in the UK.

The scheme is part of our mission to make the UK the leading nation for engineering innovation and businesses.

Ming Kong, founder of Tangio

"I am the proud holder of a Tier 1 Exceptional Promise visa. Access to the brightest and best global talent, regardless of nationality, can help start-ups to grow and prosper."

ROYAL ACADEMY OF ENGINEERING

International Programmes

30 countries

£9.5m annual budget

9 programmes

- Funded primarily through UK government's Newton Fund and Global Challenges Research Fund
- Funding also from industry and foundations
- Programmes of activity modelled around successful programmes in the UK

Newton Fund

GCRF

ROYAL ACADEMY OF ENGINEERING

Shaping Policy

Breaking siloed approaches to tackling and managing complex, interdependent and cascading societal challenges.

ROYAL ACADEMY OF ENGINEERING

Supporting entrepreneurs

ROYAL ACADEMY OF ENGINEERING

LEADERS IN INNOVATION FELLOWSHIPS

- Supported **780 Entrepreneurs** with training, mentoring and networking
- Across **23 Countries**
- Scalable businesses addressing development challenges
- Above **$70 million investment** generated with over 600 high value jobs created

ROYAL ACADEMY OF ENGINEERING

Supporting entrepreneurs

Barbarita Lara (Chile)
Founder - S! E
Mobile Emergency Information System

Arthur Zang (Cameroon)
Founder - Cardiopad
Remote Cardio Diagnostic Kit

Newton Fund

GCRF
Global Challenges Research Fund

ROYAL ACADEMY OF ENGINEERING

Championing the contribution engineering can make to SDGs



- Kicked off with 2016 global conference for +400 engineering leaders and international development stakeholders to discuss how **engineering is critical to achieving the United Nations Sustainable Development Goals**
- **Because Engineering**

SUSTAINABLE DEVELOPMENT GOALS

ROYAL ACADEMY OF ENGINEERING

Because Engineering

https://www.youtube.com/watch?v=zkjmJ5MyQoE

http://www.raeng.org.uk/policy/international-policy-and-development/gcrf-international-development/engineering-a-better-world-caets-2016/videos/because-engineering

ROYAL ACADEMY OF ENGINEERING | NATIONAL ACADEMY OF ENGINEERING | 中国工程院 CHINESE ACADEMY OF ENGINEERING

The Global Grand Challenges Summit

- www.ggcs2019.com
- QE2 Hall, South Bank; September 16-19, 2019
- Aims of inspiring the next generation of engineers, policymakers, and the public to address critically important engineering challenges and opportunities facing humanity
- Key themes included Healthcare, re-engineering the brain, urbanisation and artificial intelligence

ROYAL ACADEMY OF ENGINEERING

Frontiers of Engineering for Development

- Series of interdisciplinary, international symposia and follow-up seed funding
- Two symposia per year, one in the UK and one international
- Nine seed fund awards available to groups of two or more symposium participants to help kick-start a new collaborative project inspired by the event

Participants from the agriculture and data event in Pretoria, December 2017

Last Event:

Engineers as Healthcare Practitioners
31 Oct – 3 Nov 2018, Vietnam

Expressions of interest and nominations welcome: www.raeng.org.uk/FoE

Frontiers of Development

- Run by RAEng on behalf of the all four National Academies
- Completely interdisciplinary
- Two per year, both international
- Feb 2018- Kigali, Rwanda- Inclusive Prosperity and Wellbeing in the Context of Mass Displacement
- Networking Grants

Photo from the participant countdown session in Kigali

Last Event:

Inclusivity and Wellbeing: Coastal Communities in a 3°C World

15-18 July 2018, Rio de Janiero, Brazil

Building international partnerships to support engineering innovation, skills and professionalisation

- Supported through UK Government's Global Challenges Research Fund and Newton Fund, industry partners and charitable foundations
  - Industry Academic Partnership Programme
  - Higher Education Partnership – Sub Saharan Africa
  - Africa Catalyst
  - Lloyd's Register Foundation partnership

Industry-Academia Partnerships Programme

Structured partnerships between higher education institutions (HEIs) and locally based industry to enhance the quality of engineering education and build technology transfer links.

What they do

- **Ensure graduates engineering skills meet industry needs** by enhancing teaching curricula and methods within HEIs through practice-led learning.
- **Improve innovation capacity** among engineering graduates through innovation-focused learning and technology entrepreneurship.
- **Enhance research linkages** between industry and academia partners within country and counterparts in the UK.
- **Promote knowledge sharing** between HEIs and industry, to inform engineering research and enhance its practical impact.

Key features

- Lead applicant must be **Partner Country university** partnering with an industry organisation and a UK institution. The industry partner may also be considered as the UK institution if it is headquartered in the UK.
- Gives funding of **£50,000 over two years per project** to support salary, travel and accommodation costs for collaborative projects, activities and workshops
- Funding must have a **'matched' contribution** from industry, Academic or Government partners to be demonstrated.

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ROYAL ACADEMY OF ENGINEERING

Project examples

The Academy supports **120 Universities directly and an additional 72 Universities indirectly in 23 countries** to connect with Industry and UK partners to improve the quality of their teaching, research and innovation output.

Projects include:

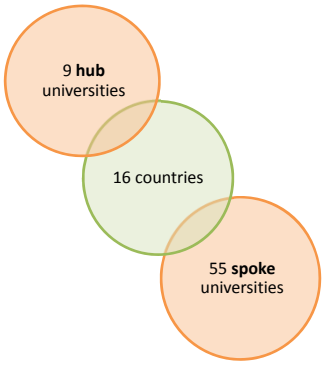
- Developing capability in **Rail Engineering in China, Colombia, Indonesia and Thailand**
- Building capability and creating a skilled workforce in **advanced manufacturing in China, India and South Africa**
- Working with universities across Sub Saharan Africa and facilitating their linkage with local industry to prepare employable and entrepreneurial graduates

ROYAL ACADEMY OF ENGINEERING

Higher Education Partnerships in sub-Saharan Africa

GCRF

- Bilateral exchanges between academics and industrialists at 'hub' universities.
- Workshops to disseminate learning throughout 'spoke' universities.
- UK partners engaged to strengthen global partnerships and knowledge sharing.



AngloAmerican GROUP FOUNDATION

GCRF Africa Catalyst

- Launched in September 2016
- To better connect professional engineering institutions to the engineering research, policy and business communities
- To support the PEIs in taking a leadership role and ensuring appropriate accreditation, professionalism and opportunities for engineers
- IAgrE secretariat UK partner for Pan African Society for Agricultural Engineering (and attended FOE in Pretoria)

"Fewer than half of Africa's countries have PEIs" WFEO 2014

"SA is the only African country with an internationally recognised accreditation system" IEA 2014

"2.5 million engineers and technicians are required in sub-Saharan Africa" UNESCO 2010

Lloyd's Register Foundation

3 emerging programmes to fund global, impact-driven & needs-led collaborations in three areas:

- Complex Industrial and Engineered Systems
- End of Engineered Life & Decommissioning
- Engineering Skills where they are most needed

Lloyd's Register Foundation

More news to come in Spring 2019

A Solar Energy Partnership, a GCRF Case Study

Dr Ian Mabbett

COO of GCRF SUNRISE Project

Swansea University

Biography

Dr Ian Mabbett the COO of SUNRISE, a global challenges research fund project led by Swansea University, that will develop printed photovoltaic cells and new manufacturing processes, which can be used to construct solar energy products in India. These will then be integrated into buildings in five villages, allowing them to harness solar power to provide their own energy and run off grid. The villages will benefit from Swansea University expertise in creating buildings that work as power stations, generating, storing and releasing their own power. SUNRISE is a Swansea-led consortium of 12 UK and Indian universities, including Oxford, Cambridge, Brunel, and Imperial College London.

He joined the College of Science in 2016 at an exciting time as we worked to reintroduce Chemistry back into our undergraduate portfolio.

He had a particular interest in making this a success, having graduated with an MChem from Swansea prior to the closure of undergraduate teaching. My MChem included a year in industry at 3M where I developed a love of industrial coatings. After graduation I carried out an EngD in the corrosion and coatings group in the Materials Research Centre in the College of Engineering, sponsored by Corus and BASF, working with the coil coating industry on ultrafast curing of high performance coatings.

From there he went on to lead energy storage research at the Swansea led SPECIFIC Innovation and Knowledge Centre and then he went on to manage the Materials and Manufacturing Academy. More recently, in addition to working in the field of functional coatings, he has been working on Bill and Melinda Gates Foundation funded research projects, collaborating globally with other grantees, to develop transformative technologies in the fields of water and sanitation for developing nations.

These roles have enabled him to develop partnerships, collaborations and research expertise in a number of fields that have real world applications and demonstrable impact for industrial partners.

He is a member of the Royal Society of Chemistry (RSC), hold CChem and CSci registrations and sit on the professional standards board for the RSC. He is also Fellow of the Institute of Materials, Minerals and Mining (FIMMM from IOM3), holding CEng status and sit on the membership committee, assessing applications for professional registration in the form of chartership.

He is interested in innovation and engagement, scale up of technology and getting it to people with real world problems to solve. He engages in consultancy and He is working on a number of projects with AgorIP around commercialisation of the outputs of scientific research and developing spin-outs to get solutions to market. He also collaborates with colleagues across the colleges in the University in many interesting interdisciplinary projects.

Public engagement and science communication are also activities of huge importance and relevance and as such he is a registered STEM ambassador, an active member of Swansea University's public engagement forum, have run large outreach projects, featured at Cheltenham Science festival, written for a popular science magazine and he is a trustee of the EESW/STEM Cymru.

He has been a frequent speaker at teaching conferences and look to develop modern, research driven and practice led teaching methodologies in his areas of expertise. He has a Post Graduate Certificate in Teaching at Higher Education and am a Fellow of the Higher Education Academy (FHEA).

specific®

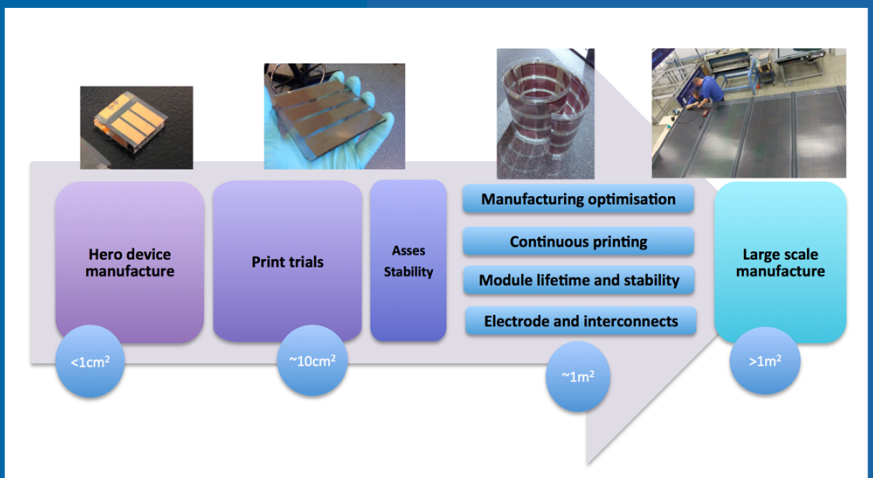
Prifysgol Abertawe
Swansea University

Buildings as Powerstations: solar powered future architecture

specific®

Prifysgol Abertawe
Swansea University

PV Roadmap



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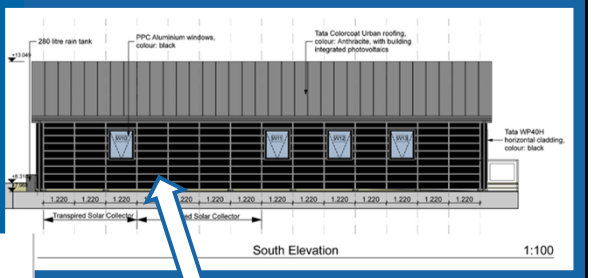
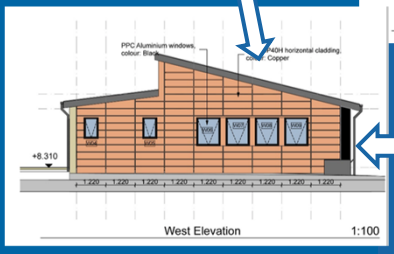
Prifysgol Abertawe
Swansea University

Buildings as Power Stations – concepts to reality

16.2 kWp integrated roof panels (CIGS)





Transpired solar collector (thermal harvesting)

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Swansea University

Buildings as Power Stations – concepts to reality

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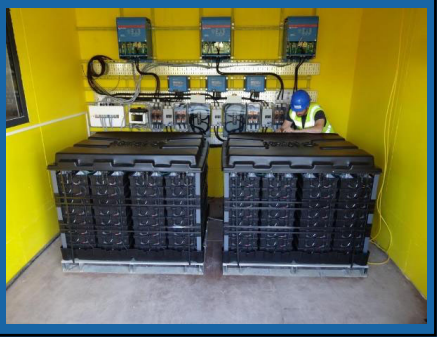
Swansea University

Buildings as Power Stations – concepts to reality

AQUION ENERGY

Saltwater batteries



First year

- **Use: 7219kWh**
- **Generation: 13480kWh**
- **Excess 26,380 Leaf Miles**

specific®

Prifysgol Abertawe
Swansea University

Buildings as Power Stations – concepts to reality

specific®

Prifysgol Abertawe
Swansea University

Buildings as Power Stations – concepts to reality

SUNRISE
Solar power for all

Prifysgol Abertawe
Swansea University

SUNRISE Active Classroom?

UK Swansea
Insolation: 950kWh m^{-2} y^{-1}

13,480 kwh

- 56,616 EV miles
- 337,000 kettles
- >13 tonnes CO_2 saved

India Pune
Insolation: 2200kWh m^{-2} y^{-1}

31,217 kwh

- 131,111 EV miles
- 780,425 kettles
- >31 tonnes CO_2 saved

GCRF UK Research and Innovation

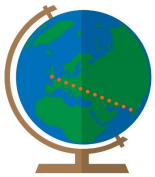
SUNRISE Solar power for all

Prifysgol Abertawe Swansea University

"Solar technology is evolving, costs are coming down. . .The dream of universal access to clean energy is becoming more real. This will be the foundation of the new economy of the new century." – Prime Minister Modi

International Network

Interdisciplinary partnerships across UK and India, with a global network of industrial support

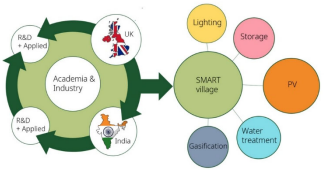


Led by Swansea University in partnership with:

- IISER Pune
- NPL New Delhi
- IISc Bangalore
- JNCASR Bangalore
- IIT Delhi
- IICT Hyderabad
- IIT Kanpur
- IIT Bombay
- University of Oxford
- University of Cambridge
- Imperial College London
- Brunel University London
- London South Bank University

Growing Capabilities

Developing and delivering solar power technology through innovation and collaboration with India



Delivery and Legacy

- Development of low-cost PV, potentially manufactured locally
- Demonstrators at a minimum of five rural Indian villages incorporating PV, storage, lighting, water treatment, and gasification
- Co-created industrial engineering doctorate programme linking Indian research with industry
- Long term UK/India solar energy collaboration and trade opportunities

Providing Sustainable Energy

Contributing to several GCRF challenge areas but with a focus on 'affordable, reliable, sustainable energy'

info@sunrisenetwork.org

www.sunrisenetwork.org

@SUNRISEnet1

Update on the KEF and other related developments

Alice Frost

Director of Knowledge Exchange

Research England

Biography

Alice Frost is responsible for knowledge exchange policy and funding at Research England, having previously had this responsibility at the Higher Education Funding Council for England (HEFCE).

After studying politics at Oxford University at undergraduate and postgraduate levels, Alice began her career in national policy. She was an adviser at The Leverhulme Trust and Universities UK, working on research policy and funding. She also worked as a researcher with the House of Commons Select Committee covering education and research, before joining the Advisory Board for the Research Councils (ABRC). At ABRC her responsibilities included liaison between the research councils and the then universities funding body and research into science and innovation policy.

At HEFCE, Alice had a wide-ranging set of policy roles, heading, at different times, policy, funding and quality assessment for research, learning and teaching and knowledge exchange.

On secondment from HEFCE, she experienced research strategy in a university and led a local/regional university collaboration.

Over many years, Alice has advised countries across Europe and Asia on following the UK model of a third stream of funding for knowledge exchange. Recently, she has specialized in commercialization policy.

Research England

Update on the KEF and other related developments

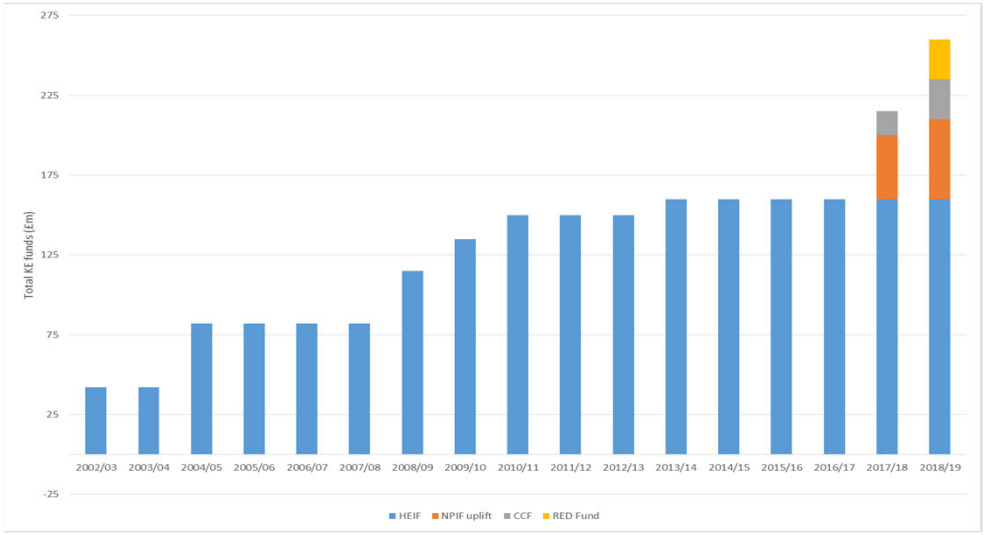
Alice Frost
Director of Knowledge Exchange
PHEE Annual Conference , London
16 January 2019

Agenda

- KEF Context
- Why KEF is important
- Next steps and our approach

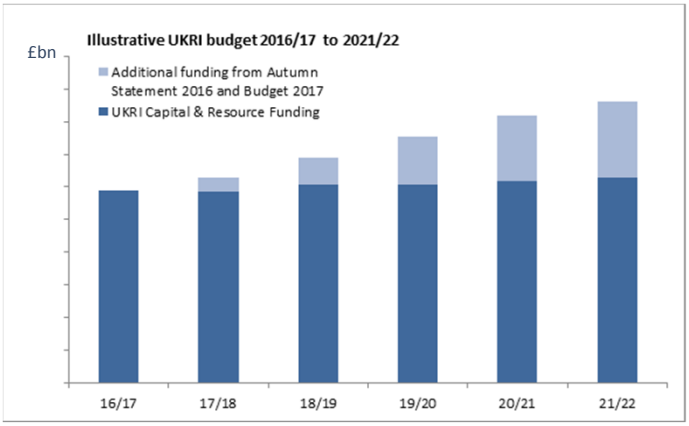
- Context

Growth in HEIF, KE etc funding



Research England

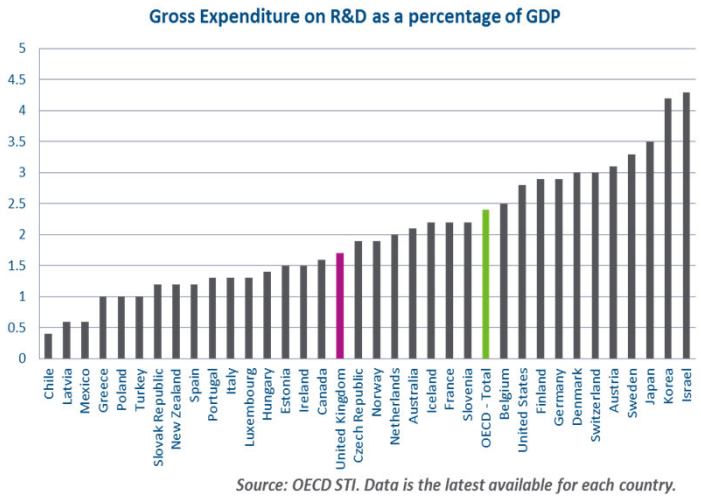
Context: rising funding in UKRI



Plans for HEIF 2018 – emerging findings

- 77 HEIs with new IS posts, 16 specifically on IS/ISCF, 11 TT, 10 SMEs etc
- 88 HEIs with additional IS project spend
- 71 HEIs reference Innovate UK links – ISCF, KTPs, Catapults, Investment Accelerator etc
- 79 HEIs reference local links – SIAs, Growth deals, SIPF
- Increased commercialisation including IP exploitation; many HEIs new to this
- Industry 4.0 – novel technologies, cross cutting technologies

Context: the 2.4% target



Source: OECD STI. Data is the latest available for each country.

The Government has committed to reaching 2.4% of GDP investment in R&D by 2027, and to reaching 3% in the longer term.

As a first step it will invest an additional £2.3bn over what was previously planned in 2021/22.

UKRI will work with the Government to develop a roadmap for meeting this target to be published in 2018.

- Why the KEF matters

Why the KEF matters (1)

- Benchmarking university performance to deliver the Industrial Strategy (and wider KE)
- Clusters: Objective tools to discuss sector diversity
- Perspectives: Engaging users

Why the KEF matters (2)

- Driver for new metrics – identify new forms of success
- Influence research and innovation data landscape
- Reliable, comparative information: efficiency and effectiveness
- Improvement: how to focus more resources – where to innovate, collaborate or invest

•Our approach and next steps

https://www.youtube.com/watch?v=Icq_B7DeLwY

Next steps

- November 2018: published:
  - responses to call for evidence
  - working paper on clustering
  - and UKRI data
- January 2019: published:
  - Proposals that formed advice of the RE Chair, and Ministerial response
  - Consultation
  - Call for pilot HEIs
  - Youtube visualisations

Our approach

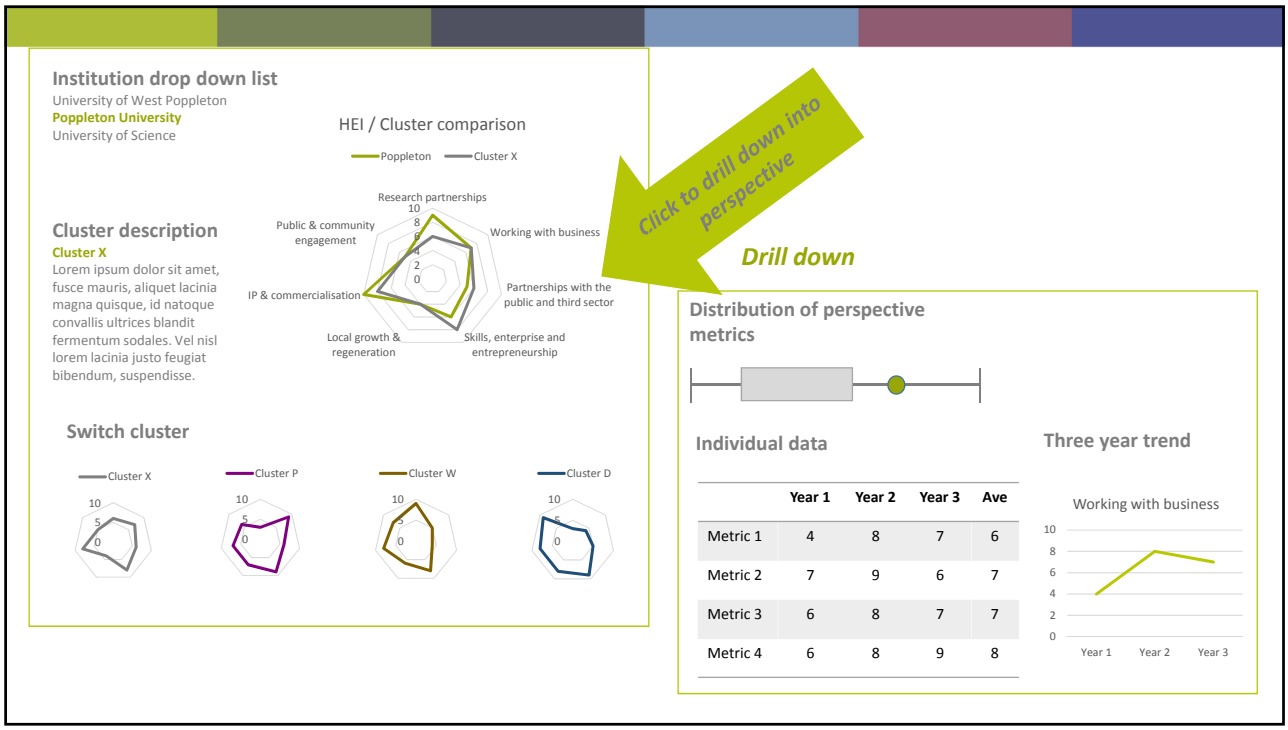
- Annual, institutional level data: specific proposals on initial sets of metrics
- Placeholders – narrative templates - for data gaps
  - HEBCI review
- Presentation formats for HEIs - and for users
  - Structure: clusters and perspectives
  - Comparisons to the cluster average per perspective
  - Per HEI
- Test cost-benefit of new “voice of user” measures, or alternatives

Initial set of KEF metrics (1)

- Research partnerships
  - Contribution to collaborative research (cash and in-kind) as proportion of public funding (HE-BCI table 1a)
  - Co-authorship with non-academic partners as a proportion of total outputs (data provider TBD)
- Working with business
  - Innovate UK income (KTP and grant) as proportion of research income (Innovate UK)
  - Contract research income with businesses per academic FTE (HE-BCI table 1b)
  - Consultancy income with businesses per academic FTE (HE-BCI table 2)
- Working with the public and third sector
  - HE-BCI contract research income with the public and third sector per academic FTE (HE-BCI table 1b)
  - HE-BCI Consultancy income with the public and third sector per academic FTE (HE-BCI table 2)
- Skills, enterprise and entrepreneurship
  - HE-BCI CPD/CE income per academic FTE (HE-BCI table 2)
  - HE-BCI CPD/CE learner days delivered per academic FTE (HE-BCI table 2)
  - HE-BCI Graduate start-ups rate by undergraduate FTE (HE-BCI table 4)

Initial set of KEF metrics (2)

- Local growth and regeneration
  - Regeneration and development income from all sources per academic FTE (HE-BCI table 3)
  - ***Additional narrative/contextual information***
- IP and commercialization
  - Research resource (income) per spin-out (HE-BCI table 4)
  - Average external investment per formal spin-out (HE-BCI table 4)
  - Licensing and other IP income as proportion of research income (HE-BCI table 4)
- Public and community engagement
  - Time per academic staff FTE committed to public and community engagement (paid and free) across:
  - Events
  - Performances
  - Museums and galleries
  - (HE-BCI table 5)
  - ***Additional narrative/contextual information***



Implementation steps

- Development phase:
  - Results of consultation
  - Spring HEI pilots – test novel elements esp clusters and placeholders
  - On-going:
    - HESA HEBCI review
    - Voice of users work
- Pilot outcomes, evaluation and decision
- Consideration and consultation on any funding link
- Full KEF
- Long-term development

RE KE team

- Alice Frost – Alice.Frost@re.ukri.org, particularly UKRI strategy including commercialisation, KE policy oversight
- Rachel Tyrrell – Rachel.Tyrrell@re.ukri.org, - also UKRI Strength in Places Fund Director
- Hamish McAlpine – Hamish.mcalpine@re.ukri.org, particularly HEBCI, HEIF formula and KEF metrics
- Jo Allatt – Jo.allatt@re.ukri.org, particularly CCF, KE Concordat
- Sacha Ayres – Sacha.Ayres@re.ukri.org, particularly Plans for HEIF monitoring, social enterprise

Alice Frost
Director of Knowledge Exchange

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Alice.Frost@re.ukri.org
@ResEngland
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Research England

Recent Developments at Innovate UK

Simon Masters

Head of High Value Manufacturing

Innovate UK

Biography

Simon Masters joined Innovate UK in January 2014. He is responsible for technical aspects relating to the Aerospace Technology Institute programme and running the Innovate UK Highly Innovative Technology Enablers in Aerospace (HITEA) programme. Before joining Innovate UK, he held various key positions in the civil and military aerospace sectors.

Innovate UK Update

Innovate UK

Simon Masters
Head Of High Value Manufacturing
@SJMasters01

Innovate UK is part of
UK Research and Innovation

UK Research and Innovation: vision, mission and values

UK Research and Innovation

A research and innovation system that is fit for the future and able to respond to environmental, social and economic change on a global scale, tackling several challenges and opportunities:

- developing new ideas and technologies to address the complex challenges facing all societies around the world
- helping the UK to make the most of its world-class research and supporting its businesses to stay at the cutting edge
- engaging the public in discussion about research and innovation

Ensuring the UK maintains its world leading position in research and innovation

UK Research and Innovation

Benefiting everyone through knowledge, talent and ideas.

UK Research and Innovation brings together the 7 Research Councils, Innovate UK and Research England.

As part of UK Research and Innovation, Innovate UK drives productivity and economic growth by supporting businesses to develop and realise the potential of new ideas including those from the UK's world-class research base.

Innovate UK

Innovate UK drives productivity and economic growth by supporting businesses to develop new ideas.

We connect businesses to the people that can help them, and fund businesses and research collaborations in all economic sectors, value chains and UK regions to accelerate innovation.

Innovate UK

Investment of
£2.2bn
Since 2007

Industry match funding taking the total value of projects above
£3.75bn

Up to
£16bn
in added value to the economy

Up to
£7.30
For every **£1** we've invested

We've funded around
11,000
projects

8,000
Unique organisations involved

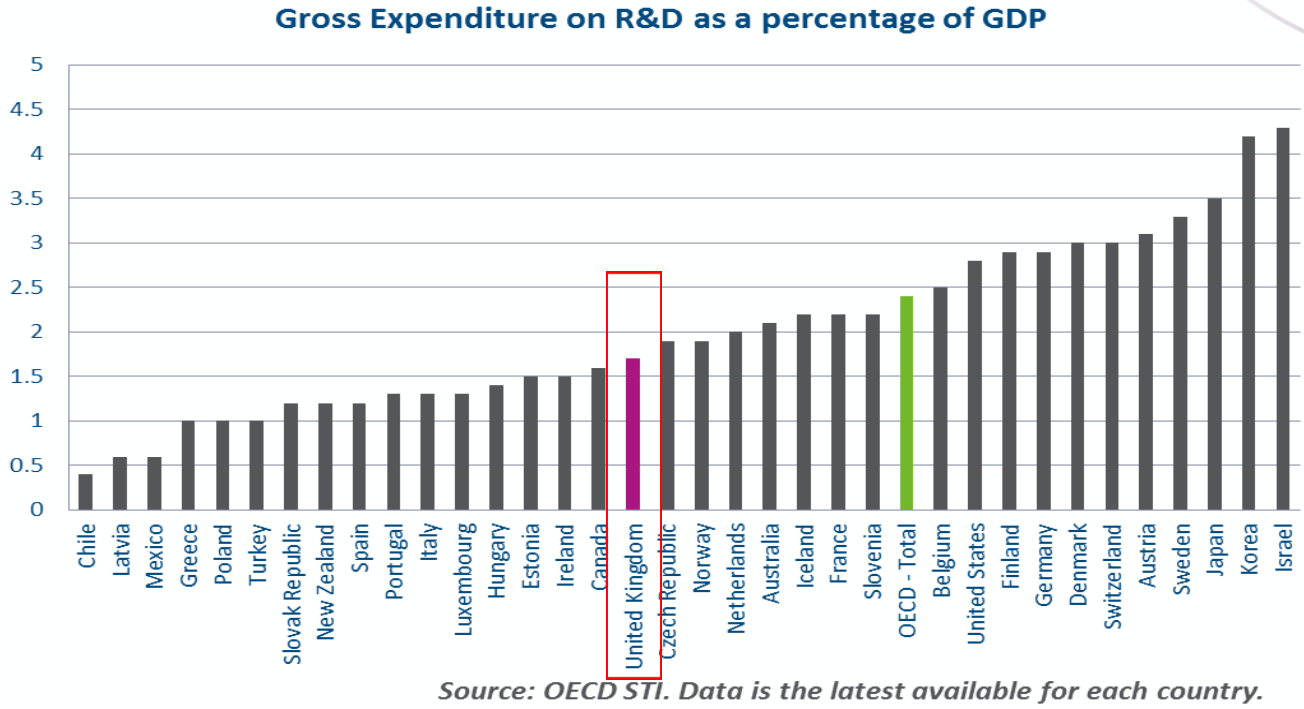
8 jobs
For each organisation involved

70,000
Jobs created in total

The UK's innovation agency

- we sit at the heart of delivering government's Industrial Strategy and target of UK R&D expenditure reaching 2.4% of GDP
- we act as a transformative agent for change in the UK economy by accelerating productivity and driving disruptive innovation
- we support innovation, from spin-outs and start-ups to companies with the ambition to scale and grow in the UK and through global markets
- we help companies of all sizes in all sectors access the research, partners, investors and markets they need to innovate and grow

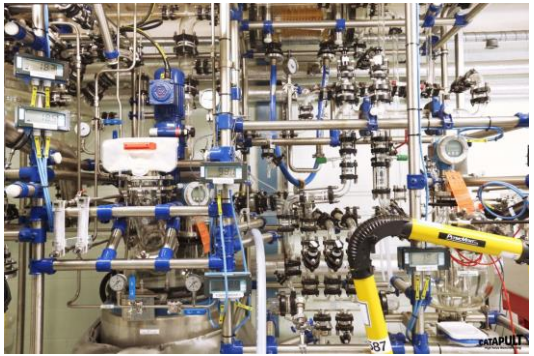
Working towards 2.4%

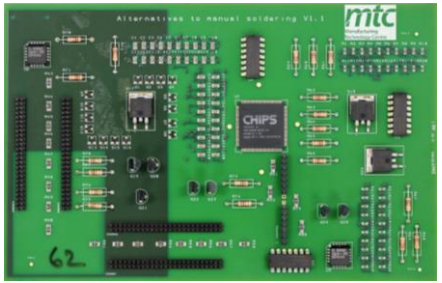


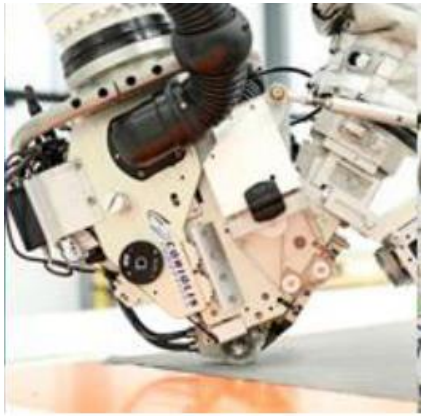
Source: OECD STI. Data is the latest available for each country.

High Value Manufacturing

Innovate UK



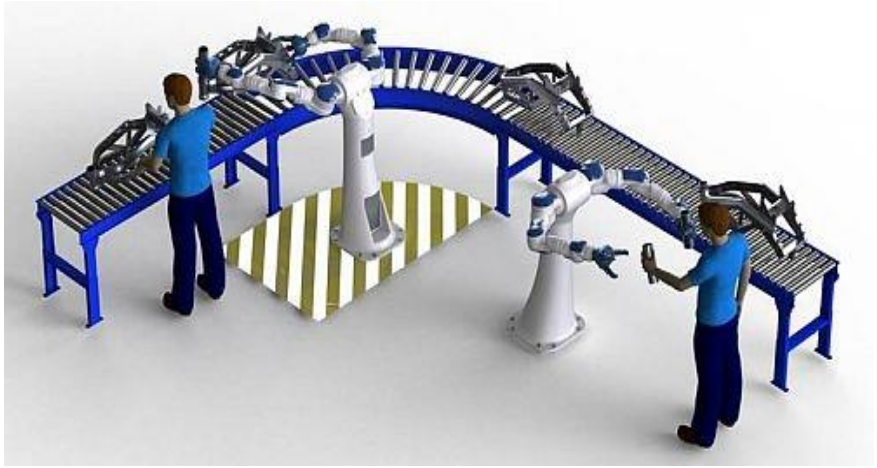




Innovate UK

Shaping the Future of Manufacturing

Helping manufacturers to innovate and innovators to manufacture



Made Smarter

A focus on digital technologies used throughout the Industrial Value Chain to increase Productivity, Growth & Jobs

White Paper set out that Government would work with Industry to examine how we can use existing programme and policy, including the High Value Manufacturing Catapult, to deliver the ambition of Made Smarter

- **Made Smarter Commission:** Government Industry partnership to provide the vision and leadership for the future of Manufacturing in the UK
- **Industrial Strategy Challenge Fund-wave 3**: Digital Manufacturing Challenge to increase manufacturing productivity
- **North West Pilot-** test out the Made Smarter eco-system

5 foundations of The Industrial Strategy

INDUSTRIAL STRATEGY

The Industrial Strategy is boosting boost productivity and earning power across the country by focusing on the 5 foundations of productivity, which support a vision for a transformed economy.

Ideas

The world's most innovative economy

People

Good jobs and greater earning power for all

Infrastructure

A major upgrade to UK's infrastructure

Business Environment

The best place to start and grow a business

Places

Prosperous communities across the UK

UK Research and Innovation

Industrial Strategy Challenge Fund:
Grand Challenges

INDUSTRIAL STRATEGY

AI and Data Economy

Putting the UK at the forefront of the artificial intelligence and data revolution

Healthy ageing

Harnessing the power of innovation to help meet the needs of an ageing society

Clean growth

Maximising the advantages for UK industry from the global shift to clean growth

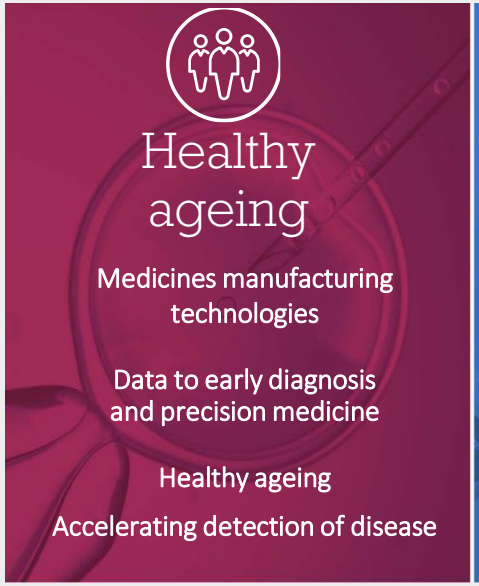
Future of mobility

Becoming a world leader in shaping the future of mobility

UK Research and Innovation

ISCF challenges

INDUSTRIAL STRATEGY



Healthy ageing

Medicines manufacturing technologies

Data to early diagnosis and precision medicine

Healthy ageing

Accelerating detection of disease

AI and Data Economy

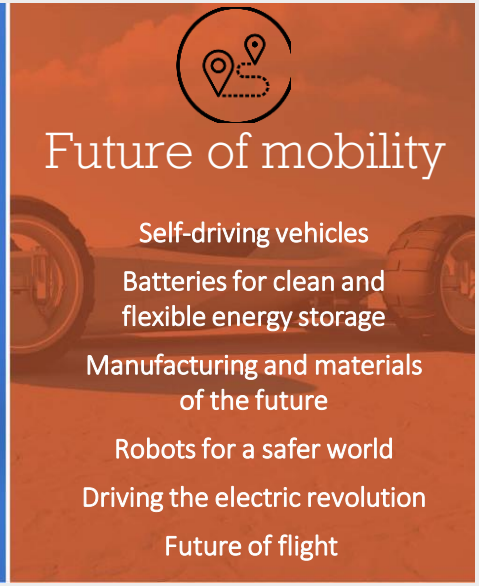
Satellites and space technology

Audience of the future

Quantum technology

Next generation services

Made smarter



Future of mobility

Self-driving vehicles

Batteries for clean and flexible energy storage

Manufacturing and materials of the future

Robots for a safer world

Driving the electric revolution

Future of flight

Clean growth

Energy revolution

Transforming construction

Transforming food production

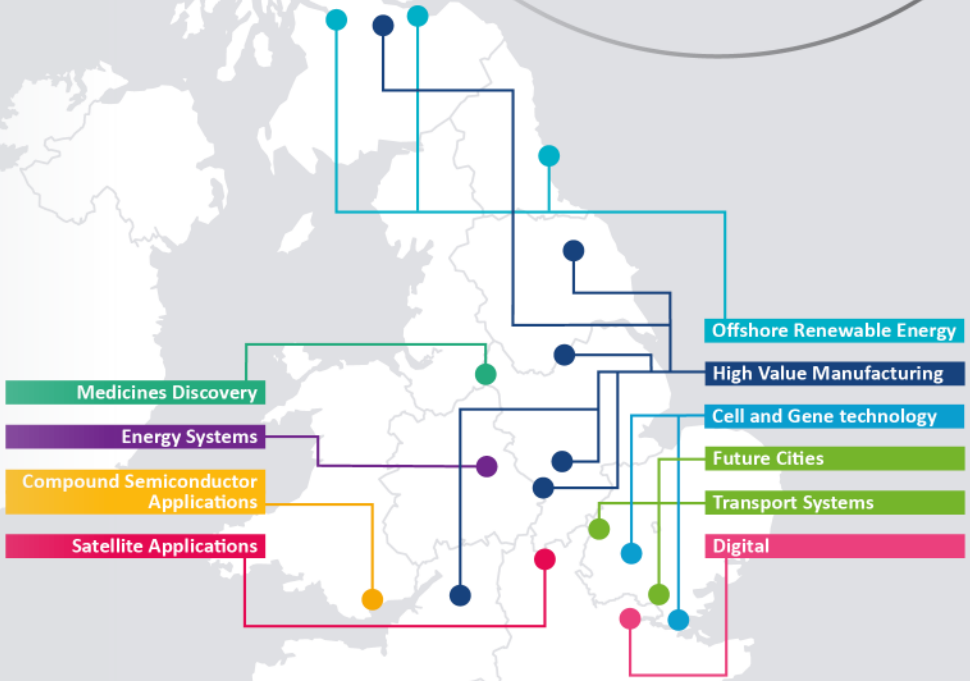
Smart sustainable plastic packaging

UK Research and Innovation

Catapult centres

Fostering innovation to drive economic growth

- established and overseen by Innovate UK
- part of a network of technology and innovation centres
- bridge the gap between businesses, academia, research and government
- transforming the UK's ability to create new products and services
- ensure global opportunities for the UK and sustained economic growth for the future



Catapult network

- Leverage capabilities to work on the big system challenges that no-one else can tackle
- Sharing best practice
- Collective cross-Catapult understanding of the needs of industry
- Stronger, consistent voice with stakeholders including other Government Departments
- Deliver cross disciplinary case studies for UK Research and Innovation

Innovation loans

For businesses on the edge of greatness

We are running a pilot programme of loan competitions to the end of 2019. The programme is aiming to ensure that businesses can access funding at all stages of innovation.

Up to **£50 million** available for business innovation projects near to market

Offered through competitions to UK SMEs that want to scale up by developing new services

Can be used for late-stage R&D projects not yet at the point of commercialization

Delivered by Innovate UK Loans Ltd, a wholly-owned subsidiary of Innovate UK

Delivering Innovation Loans

Innovate UK

Infrastructure Systems 'first of a kind projects':

11 loans, £7m committed

Manufacturing & Materials 'readiness projects'

5 loans, £4m committed

12 loan offers, £8m conditional commitment

Open competition 1

17 loan offers, £12m conditional commitment

Open competition 2

32 applications progressed to detailed credit evaluation, £22m sought

Open competition 3

Closing date 21st November

Evaluation underway to support bid for extension and full scale programme

Delivering Innovation Loans - Manufacturing

News story

Innovation loans will help UK businesses improve manufacturing

£12 million innovation loans offered to 17 businesses, which will use the funding to undertake innovative manufacturing and materials R&D projects.

Published 5 November 2018
From: Innovate UK and UK Research and Innovation

Innovation loans are designed to help the UK's most innovative businesses to scale.

Successful companies

Successful applicants to the second round of loans funding include:

- Callaly: a new feminine care product designed in London and manufactured entirely in the UK
- KwickScreen: portable printed room partitions, based and manufactured in London
- The Electrospinning Company: clinical-grade biomaterials
- Valuechain: manufacturing supply chain software. ValueChain has offices worldwide in China and India, as well as across the UK
- Ashwoods Electric Motors: smaller, lighter and more efficient permanent magnet electric motors

Open funding

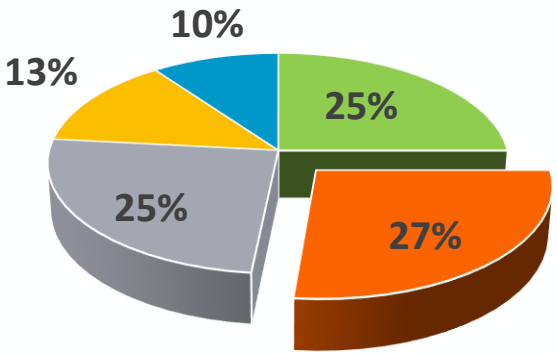
For businesses in any sector

- open funding enables businesses to apply for grant funding regardless of technical or industrial area of focus
- funding is offered to businesses that submit the best proposals in a competitive application process
- 5 open competitions run in 2018/19, each offering £20 million funding

Paul Holt, Founder, Photocentric

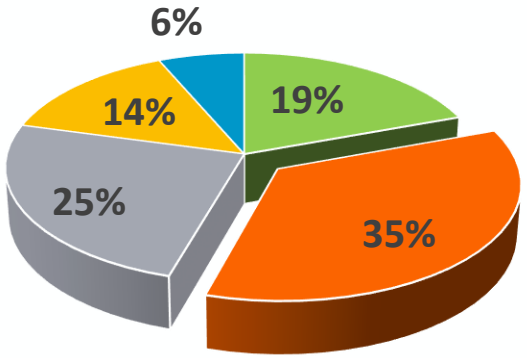
Open Funding

Open Rd 1 No. Projects Split



Sector	% Grant obtained
Ageing Society, Health & Nutrition	24%
Manufacturing & Mobility	33%
AI & Data Economy	21%
Clean Growth & Infrastructure	11%
Commercialisation & Open	10%

Open Rd 2 No. Projects Split



Sector	% Grant obtained
Ageing Society, Health & Nutrition	15%
Manufacturing & Mobility	43%
AI & Data Economy	24%
Clean Growth & Infrastructure	12%
Commercialisation & Open	6%

Knowledge Transfer Partnerships (KTP)

- KTPs help UK businesses innovate and grow by linking them with an academic or research organisation and a graduate
- a KTP enables a business to bring in new skills academic thinking
- the academic or research organisation partner will help to recruit a suitable graduate
- schemes last between 12 and 36 months

Signal Media Founders (L&R) with Professor Udo Kruschuitz, KTP associate (C)

Success stories:

Savings for the Ministry of Defence by **Qioptiq**

- KTP with Cardiff Business School and KTP associate Thanos Goltos reduced costs through leaner supply chain
- opened new £3.7 million warehouse in North Wales to support £83 million contract with MoD
- 6-year contract will save MoD £47 million and ensure night-vision equipment available to UK forces worldwide

"It's been a tough, enjoyable journey, and the results have been well worth the effort."

Thanos Goltos, KTP associate

Knowledge Transfer Network (KTN)

Find markets.
Find solutions.
Find funding.

KTN is a network partner of Innovate UK. It helps businesses get the best out of creativity, ideas and the latest discoveries to strengthen the UK economy and improve people's lives.

KTN links new ideas and opportunities from all sectors with expertise, markets and finance through a network of businesses, universities, funders and investors.

KTN supported clean-tech company FeTu

Diversity and inclusion

At Innovate UK we are committed to encouraging diversity and inclusion in business innovation.

We want to find the best and most talented innovators from a diverse range of backgrounds, and provide them with the resources, advice and self-belief to succeed.

Our approach shines a spotlight where there is currently under representation in business innovation. We support and empower people to innovate, grow businesses, and in turn the UK economy, through:

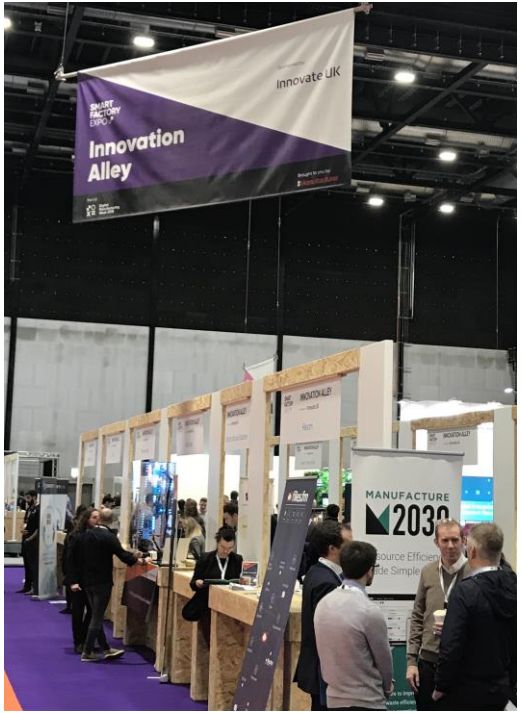
- our Women in Innovation competition and campaign
- Ideas Mean Business – supporting the UK's brightest young innovators

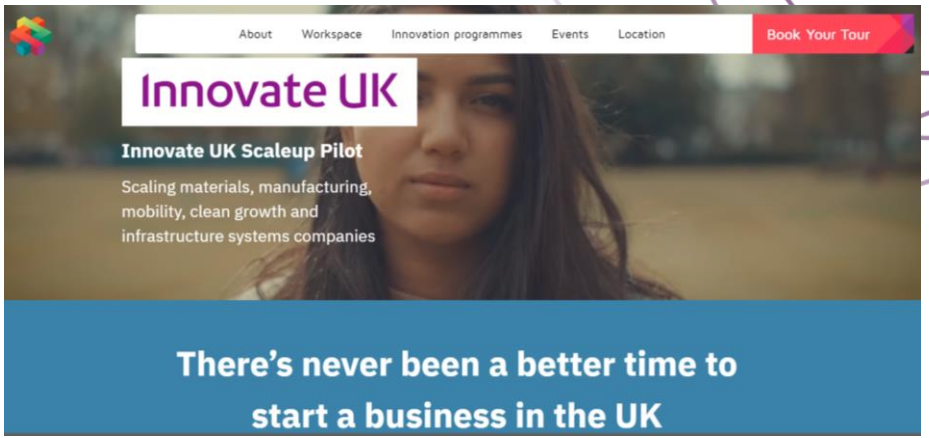
Investment accelerator

The Industrial Strategy identified our investment accelerator model as a new approach to finance innovation, highlighting the potential for it to scale up.

We are running 2 investment accelerator programmes in 2018/2019. A full evaluation of the model has been commissioned to examine the impact of the pilot and the results will be published in 2018/19.

Scale Up Activities



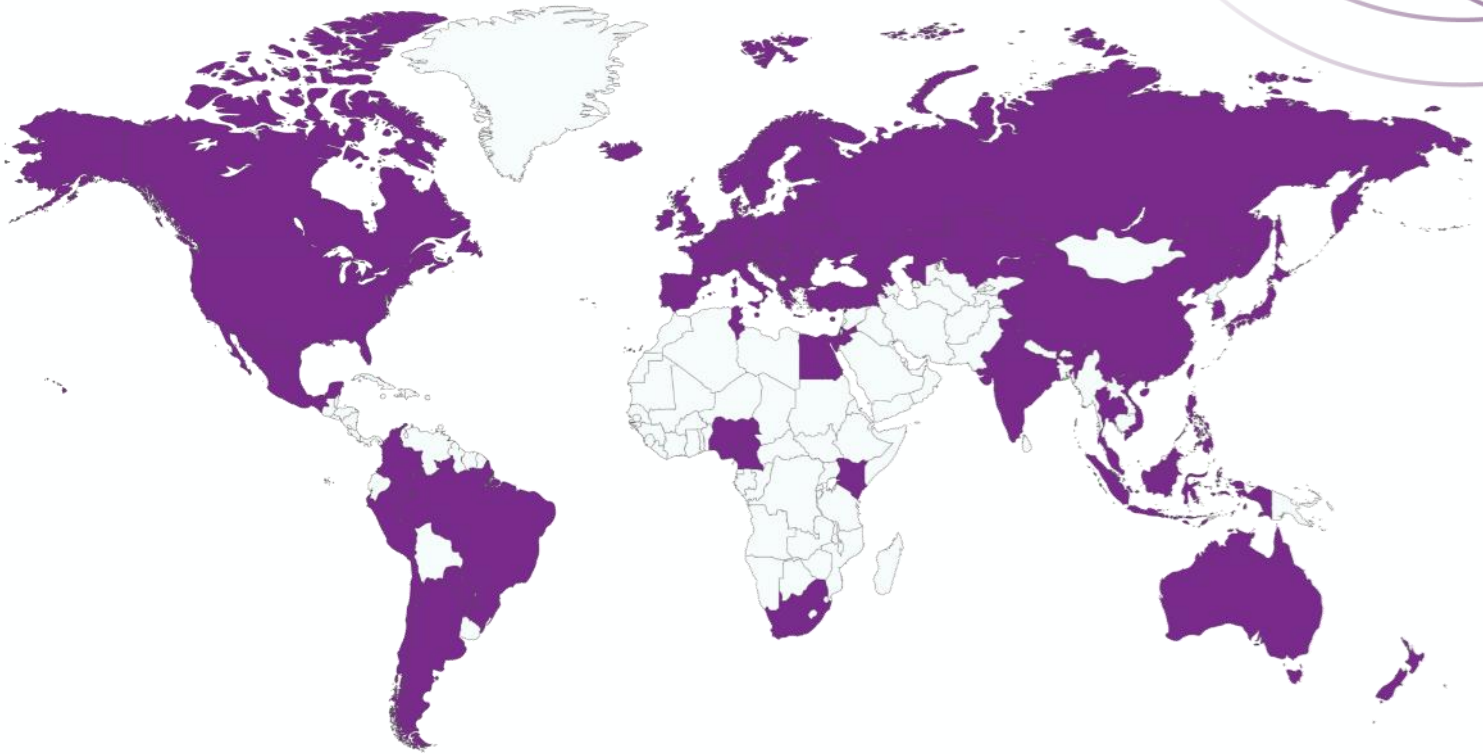


Global programmes

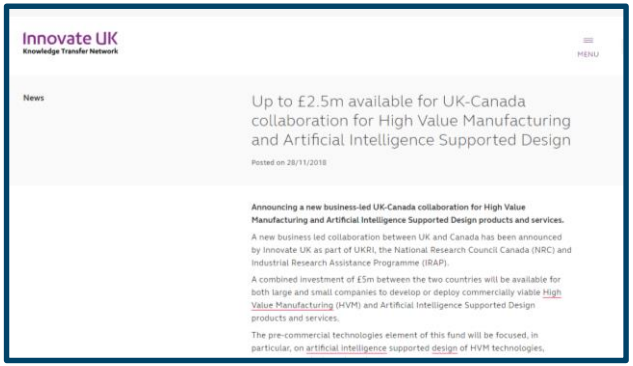
To grow and scale up successfully, UK companies need to access knowledge and develop new partnerships globally. We are expanding our support available to businesses through:

- UKRI international fund, worth approximately £110 million over 3 years
- funding 8 global expert missions in priority countries and 12 global business accelerators, which will help over 180 UK businesses explore global opportunities
- continuing to deliver our Newton Fund programmes with £18 million investment in 2018-19, and £10 million in 2019-20
- continuing to promote engagement in Horizon 2020 through National Contact Points, Enterprise Europe network, the Knowledge Transfer Network and Innovate UK's Brussels Office

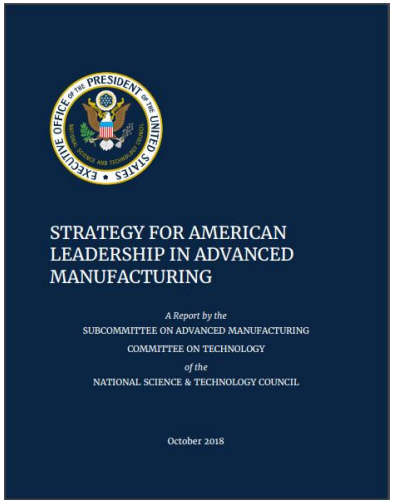
Globally – Innovate UK works with 75 countries



International Activities - Manufacturing



Expert mission focussed on Composites held in October



Supporting UK innovative businesses today in developing the industries of tomorrow

Innovate UK is part of
UK Research and Innovation

Update on Subject Level TEF

Professor Nick Lieven FRAeS

University of Bristol

Biography

Prof Lieven's area of research is in the area of structural dynamics of aircraft. In particular, his area of interest relates to extreme dynamic performance and aeroelasticity. He applies both experimental and analytical methods to help inform the understanding of the remaining life of aircraft. Nick was awarded his first degree in Acoustics and Vibration from the Institute of Sound and Vibration Research in Southampton and then went to Imperial College London and gained a PhD in Mechanical Engineering supported by Rolls-Royce. He stayed at Imperial College as a lecturer before joining Airbus on a Royal Academy of Engineering Industrial Fellowship, then taking up a lectureship at Bristol University. He was made a professor and Head of Aerospace Engineering and became Dean of Engineering in 2007 and then Pro Vice-Chancellor for Education in 2011, he became senior Pro Vice-Chancellor in 2015, returning to Engineering Faculty in 2017. He was the founding director of the Agusta Westland University Technology Centre in Rotorcraft Vibration.

Edited By: **Professor Izzet Kale**
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January 2019

Academic Partners

The Institution of Engineering and Technology