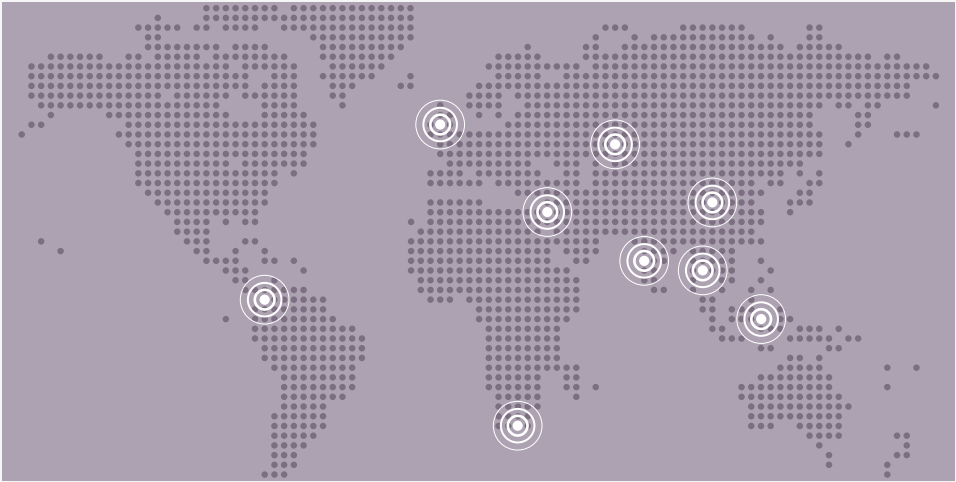# Royal Academy of Engineering

Industry-Academia Partnership Programme

Improving teaching, research and innovation outcomes by creating strong industry-academia links between the UK and selected countries

Working in collaboration with

14

delivery partners in

8

Newton Fund partner countries, the Academy's Industry-Academia Partnership Programme has funded

140

projects that have supported

133

partner country universities to collaborate with

61

UK universities and

199

industrial partners.

These projects cover a variety of sectors in industry:

Mechanical and manufacturing

23

Civil, structural and concrete water

26

Energy and environment

57

Biotech and biomedical

23

Materials and metallurgy

24

Education and innovation capacity

40

Control, electrical and ICT

38

*Some projects fall under more than one category

Promoting partnership

As a Newton Fund delivery partner, the Royal Academy of Engineering works together with leading international institutes to implement the Industry-Academia Partnership Programme. This scheme builds strong bilateral industry-academic links that build capabilities within international universities and improve their engineering teaching, research and innovation outcomes.

The Academy understands that deep, long-term strategic links between industry and universities can foster use-inspired research and breakthroughs in engineering innovation. The programme achieves this by strengthening industry links, especially with SMEs, and leveraging links with UK expertise. This allows international universities to contribute to disruptive technological innovation and creates deep ties between innovation stakeholders in both countries.

The Academy also works with its implementation partners to develop case studies of excellence in bilateral innovation collaboration, produce models replicable by others, and generate lessons that can help inform bilateral and national-level research and innovation policy.

Activity aims

The scheme promotes inter-sector collaborations by funding travel, subsistence and salary support costs relating to international visits and exchanges. The value and types of activities supported vary between partner countries. All projects are designed to support one or more of the following outcomes:

Enhance industry input into engineering curricula and teaching in partner country universities to improve the quality and uptake of practical engineering skills, help develop a talent pipeline and encourage entrepreneurship in emerging and/or currently skill-scarce industries.

Develop new partnerships and strengthen bilateral collaboration in engineering research and knowledge-sharing between industry and academia counterparts to develop new capabilities within partner country universities.

Formation of deep, strategic bilateral partnerships between industry and academia around application-inspired engineering research and innovation that aims to solve economic and social development challenges faced by partner countries or globally.

Improve business-university interface to help systemically foster deeper engagement among actors in the innovation eco-systems of both countries and create different models of business-university engagement for wider sharing and adoption.

Industry-academia partnership
Colombia

PROJECT

Developing an intelligence system to improve the sustainability of oil palm crops through the construction of forecasting maps that integrate adaptive vegetation indices from multispectral aerial views.

This collaboration between Universidad EIA (Colombia), a large local food production company, and De Montford University (UK) aims to support sustainable practices by using computational intelligence to monitor the health of crops. By working closely with industry, new techniques will be developed to analyse high-resolution images of crops gathered by low-altitude drones. This will lead to faster, more reliable diagnosis of crop disease and more targeted, sustainable use of chemicals and fertilisers.

"We do not always have access to the equipment and expertise needed to properly develop research and development activity that helps with improving production processes. In recent years we have built strategic alliances with academia to achieve real progress in this area. Our current project through the Industry-Academia Partnership Programme has helped to strengthen our collaborative networks and also created opportunities for us to host visiting students and researchers so they can learn about our research."

Iván Erick Ochoa Cadavid, Deputy Director of Research and Development – Department of Improvement and Seeds, Unipalma S.A., Colombia

Global partnerships

JORDAN
Partner: Higher Council for
Science and Technology
6 Awards
5 Jordanian universities
8 Jordanian industry partners
6 UK universities

COLOMBIA
Partner: Promigas, Ecopetrol
and Ruta N
27 Awards
21 Colombian universities
24 Colombian industry partners
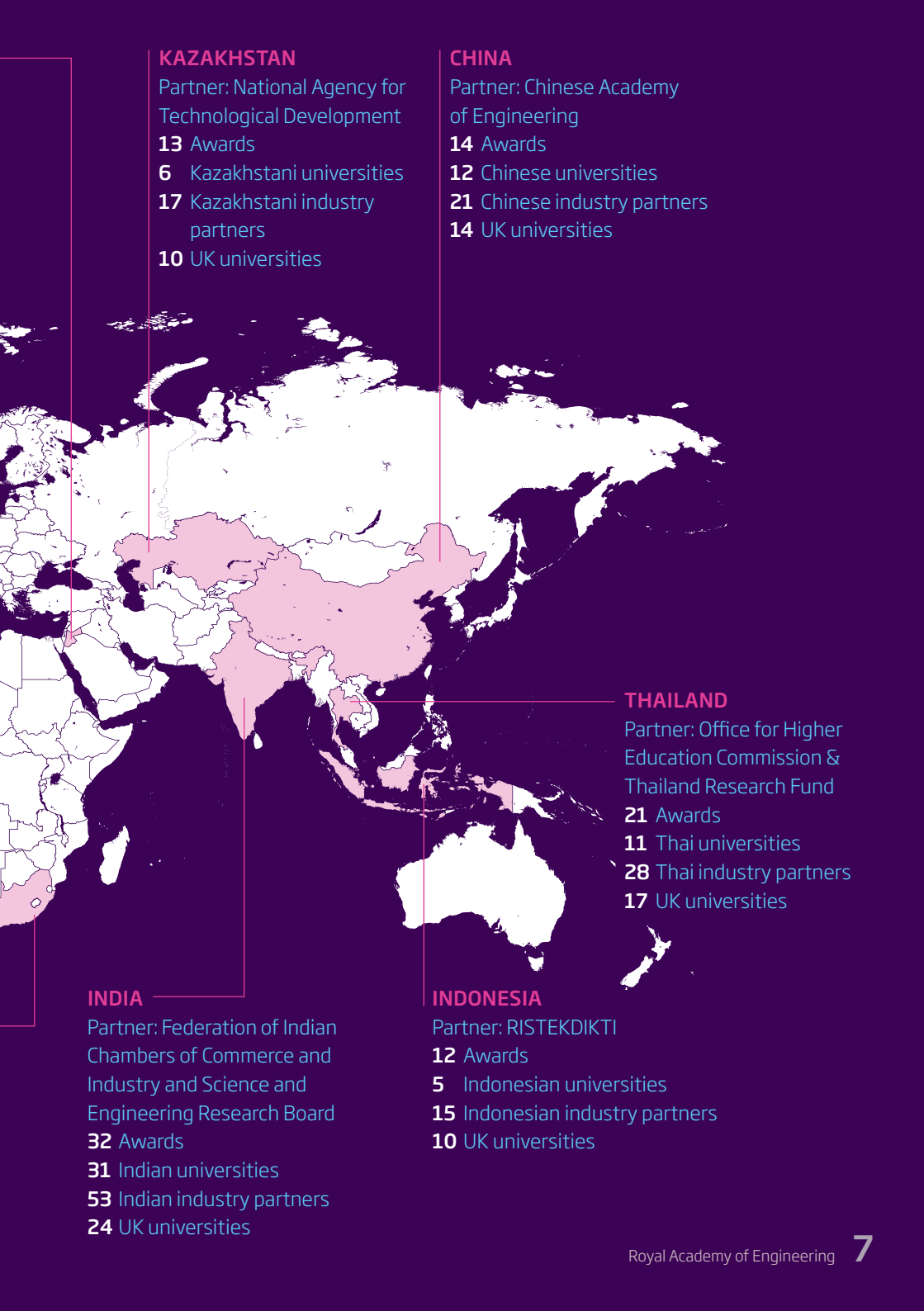**14** UK universities

SOUTH AFRICA
Partner: Department for
Higher Education and Training
15 Awards
14 South Africa universities
25 South African industry
      partners
15 UK universities

KAZAKHSTAN
Partner: National Agency for
Technological Development
13 Awards
6 Kazakhstani universities
17 Kazakhstani industry
partners
10 UK universities

CHINA
Partner: Chinese Academy
of Engineering
14 Awards
12 Chinese universities
21 Chinese industry partners
14 UK universities

THAILAND
Partner: Office for Higher
Education Commission &
Thailand Research Fund
21 Awards
11 Thai universities
28 Thai industry partners
17 UK universities

INDIA
Partner: Federation of Indian
Chambers of Commerce and
Industry and Science and
Engineering Research Board
32 Awards
31 Indian universities
53 Indian industry partners
24 UK universities

INDONESIA
Partner: RISTEKDIKTI
12 Awards
5 Indonesian universities
15 Indonesian industry partners
10 UK universities

INDIA

From big data engineering to developing technologies for cleaner water, the UK-India Industry-Academia Partnership Programme has supported over 30 projects.

In 2016, an award was made to develop a *center of excellence in research and training for developing low-cost medical diagnostic devices*, bringing together partners from the Indian Institute of Technology (IIT) Kharagpur, the University of Southampton and Achira Labs, India.

Improving point-of-care diagnostics is essential for integrated healthcare. Current diagnostic tools are limited in meeting the specific needs of developing areas and can be inaccessible to rural populations. This project aimed to develop alternative, affordable diagnostic tools and protocols for rapid, on-the-spot diagnostics.

"Engaging with academia helps to bring cutting-edge research that has been completed to a proof-of-concept level into industrial practice. It's not always possible for companies to engage in risky research projects, so we rely on our academic collaborators for this. Our continuous interface with leading academic institutes also helps us to recruit the best candidates."

Dr Dhananjaya Dendukuri,
CEO and Co-Founder, Achira Labs

In collaboration with the startup Achira Labs, academic researchers in the UK and India created new devices and prototypes for diagnostics that use a single drop of blood. Their work has led to a spin-out company and supported the training of nearly 20 undergraduate and postgraduate students.

The collaborators are developing teaching materials, including a laboratory video, to demonstrate theoretical concepts to inspire and engage students at other universities. There are also plans for additional industry partnerships. "We are working closely with small-scale startups and local hospitals to validate our device, perform field trials and prepare for commercialisation," explains lead award holder, Professor Suman Chakraborty, IIT Kharagpur.

SOUTH AFRICA

From developing advanced optical fibre sensor networks to building teaching capacity for power systems studies, the UK-South Africa Industry-Academia Partnership Programme has supported 15 projects to date.

In 2018, an award was made to support a project dedicated to *transforming teaching and learning in engineering through the application of virtual reality (VR)*. This collaboration brings together the University of Johannesburg, Manchester Metropolitan University and The Virtual Space, a South African VR company that manufactures cardboard VR headsets and VR education kits for use in the classroom.

Their project tackles the widening gap between traditional teaching methods and philosophies and teaching methods driven by emerging technologies. The aim is to develop a roadmap and VR platform for teaching engineering courses.

"Our company mission is to 'Educate Africa through VR' - this is supported by engaging with academia to develop products and solutions. The connection with academia is influencing the direction of our VR and machine learning software development."

Richard McAdam, Founder, The Virtual Space

"This type of research requires industry input because most VR use in institutions is entirely driven by industry," explains Dr Timothy Laseinde, lead award holder at the University of Johannesburg. "We hope that new teaching methods will evolve through the project resulting in changes to curricula in terms of practical laboratory processes."

Two master's students are engaged in the project and Dr Laseinde has leveraged additional funding from his university for equipment. There are plans to disseminate project outcomes in the future through a bespoke public engagement forum and greater industry involvement.

CHINA

From smart contact lenses for the early detection of glaucoma to understanding knowledge network in industry-academia collaborations, the UK-China Industry-Academia Partnership Programme has supported 14 projects to date.

"So far, the collaboration has helped our industry collaborators to improve their ability for theoretical analysis. At the same time our universities have been able to study and solve specific engineering problems in industry."

Professor Yingai Jin, Jilin University

PROJECT HIGHLIGHTS

11 Undergraduate students trained

3 Postgraduate researchers trained

7 Publications

2 Patents granted for utility models

2 Software copyrights registered

The project *improving the combustion mode and security running control strategy to decrease pollution in northeast China* is a collaboration between Jilin University, the University of Nottingham and three Chinese energy companies. It aims to reduce air pollution by analysing power plant boiler combustion and air distribution and using this data to develop more energy-efficient processes. The collaboration has also supported student learning through supported workshops, seminars and mentoring between university and industrial collaborators.

Collaborators from academia and industry visit a power plant in North East China.

Royal Academy of Engineering

As the UK's national academy for engineering and technology, we bring together the most successful and talented engineers from academia and business – our Fellows – to advance and promote excellence in engineering for the benefit of society.

We harness their experience and expertise to provide independent advice to government, to deliver programmes that help exceptional engineering researchers and innovators realise their potential, to engage the public with engineering and to provide leadership for the profession.

We have three strategic priorities:

- Make the UK the leading nation for engineering innovation and businesses
- Address the engineering skills and diversity challenge
- Position engineering at the heart of society

We bring together engineers, policymakers, entrepreneurs, business leaders, academics, educators and the public in pursuit of these goals.

Engineering is a global profession, so we work with partners across the world to advance engineering's contribution to society on an international, as well as a national scale.

For more information

W www.raeng.org.uk

@RAEngNews

Newton Fund

The Newton Fund is now a £735 million fund that, through science and innovation partnerships, promotes the economic development and social welfare of partnering countries. It aims to strengthen science and innovation capacity and unlock further funding through which the UK and partner countries will build strong, sustainable and systemic relationships. It is delivered through fifteen UK delivery partners in collaboration with the partner countries.

Activities are in three broad activities:

People: increasing capacity for science and innovation in partner countries.

Research: research collaborations on development topics.

Translation: creating collaborative solutions to development challenges and strengthening innovation systems.

For more information

W www.newtonfund.ac.uk

@NewtonFund

ROYAL
ACADEMY OF
ENGINEERING