UKIERI
UK-India Education
and Research Initiative

ANNUAL **REPORT**

2018-2019

Contents

Foreword

UK-India Education and Research Initiative (UKIERI), is at the heart of enhancing educational links between the UK and India, strengthening the research, leadership, education and skill sector relations between the two countries.

This is the 13th year of UKIERI, which was launched in 2006 to bring about a step change in education collaboration between the two countries. It has been a game-changer, recognised by the Government of India as a programme promoting institutional and individual excellence in educational practices in the higher education sector.

UKIERI Phase 3 (2016-2021) focuses on three areas: capacity building and leadership development; research innovation and partnerships; and skill development in higher education.

In 2018-19, we have seen 11 new higher education partnerships in cyber-physical security and waste management and seven skills partnerships. Conducted with the All India Council for Technical Education (AICTE) as a partner, the UKIERI-AICTE Technical Leadership Development Programme has provided opportunity to over 200 senior educators from Engineering and Polytechnic institutions from 24 states of India. Institutional grants have been awarded to 61 selected proposals from UK higher education institutions under the Scheme for Promotion of Academic and Research Collaboration (SPARC) of the Ministry of Human Resource Development (MHRD), Government of India.

The most exciting, of course, is what we are looking forward to achieving through the rest of Phase 3 — enhancing leadership capacity of education administrators from central and state-level Higher Education Institutions (HEIs) in India, providing student mobility opportunities for up to 200 UK students to India and contributing to the internationalisation of Indian HEIs in line with the objectives of the Study in India programme of the Government of India.

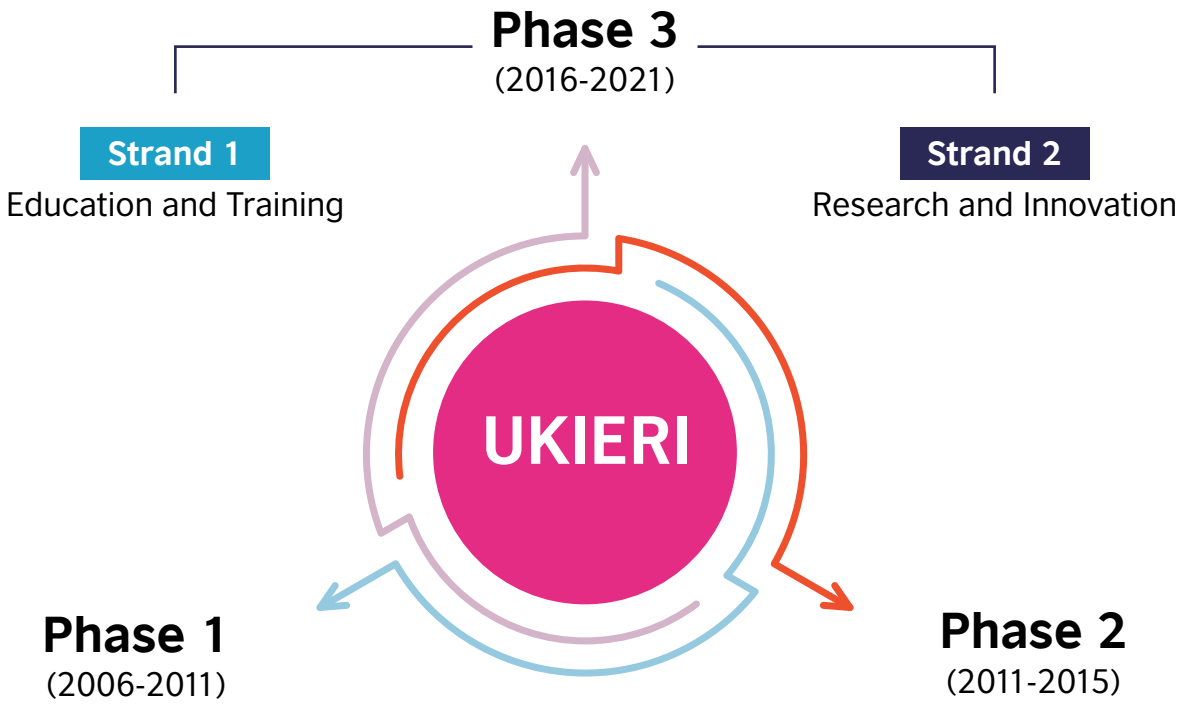
We hope the upcoming UKIERI Policy Dialogues on themes such as internationalisation of higher education in India, graduate employability and enhancing the quality of teaching and learning in Indian HEIs, will contribute to the rich dialogue that already exists between the higher education sectors of both countries. We also look forward to exciting new work along with the Department of Science and Technology (DST), Government of India, under the UKIERI-DST partnerships under relevant areas including but not limited to cyber security, artificial intelligence, water management, alternative energy, alternative healthcare, waste management and, pharmaceutical formulation development. Each of these areas is crucial not only to UK and India but to the world.

The British Council along with the Association of Colleges and Universities UK International are proud to be supporting delivery of this programme and I would like to thank the funding partners in India and the UK for their continued support through significant contributions to this unique programme.

Barbara Wickham OBE
Director
British Council, India

INTRODUCTION TO UKIERI PHASE 3 (2016-2021)

Programme Overview



Funding Partners of UKIERI Phase 3

INDIA

Ministry of Human Resource Development (MHRD)

Department of Science and Technology (DST)

University Grants Commission (UGC)

All India Council for Technical Education (AICTE)

Ministry of Skill Development and Entrepreneurship (MSDE)

UK

Department for Business, Energy and Industrial Strategy (DBEIS)

Department for Education (DFE)

Government of Northern Ireland (NI)

The Scottish Government

Foreign and Commonwealth Office (FCO)

STRAND 1: EDUCATION AND TRAINING

PROGRAMME PROGRESS | SUMMARY | HIGHLIGHTS

Key Objectives

- Develop and implement academic leadership and education management programmes for Higher Education Institutes (HEI).
- Conduct faculty development programmes for staff and department heads in colleges, universities and skill training institutions.

Activities

1. UKIERI-AICTE Technical Education Leadership Development Programme

The programme aims to provide leadership training to 600 academic leaders from the All India Council for Technical Education (AICTE) recognised technical HEIs. The training is spread across three workshops of four days each with six cohorts of 100 participants each. Dudley College of Technology, UK is the delivery partner for the programme.

Expected Outcomes

Development of skills for educational leaders in higher technical education in Indian HEIs.

Sustaining existing and new collaborations between the UK and India in the higher technical education landscape in India.

Key Updates

In 2018-19 over 200 education leaders representing over 197 institutions from 27 Indian states completed the programme with CMI level 5 certification and made systemic changes in their institutions. In fact, 86% of the participants rated the content of the Professional Leadership Development course as either excellent or good.

As part of the training the participants were to drive change management projects in their respective institutions around the following themes:

- special education needs, enhanced participation of women and girls
- introduction of innovative teaching methods
- increasing employability of students
- enhanced use of ICT
- increased involvement of staff in decision making and better staff performance leading to better learner outcomes

To provide further exposure, the 10 best performing participants from the first cohort undertook a study tour to the UK. This involved visiting Dudley College and industries relevant to participants' change-making projects.

Following the success of the programme and the institutional change it has initiated, the programme was expanded to another 100 potential leaders at the recommendation of AICTE.

> *"I take the opportunity to extend my thanks and gratitude for igniting the culture of academic excellence amongst all the participants during the four workshops of UKIERI-AICTE. These workshops have worked as a catalyst to implement positive changes in our sphere of work. The academic fraternity has a great challenge of creating inquisitiveness amongst the students, instead of focusing on providing stereotypical answers. We hope that we would keep igniting that quest for learning among our students!"*
>
> ***Dr. Urvashi Makkar, Director General & Professional Marketing, Shri Guru Ram Rai Institute of Management, Uttarakhand (Participant in the UKIERI-AICTE Technical Education Leadership Development Programme)***

2. UKIERI-SPARC Support Programme

Launched in 2018 by the Ministry of Human Resource Development (MHRD), the Scheme for Promotion of Academic and Research Collaboration (SPARC) aims to improve the research ecosystem at Indian HEIs by facilitating academic and research collaborations between Indian institutions and the best institutions globally. It provides funding to support joint research projects between Indian researchers and their international counterparts for up to two years.

SPARC aligns with UKIERI's objective to develop and strengthen academic partnerships between India and the UK.

The programme funds SPARC joint research proposals on key thematic areas in science, including fundamental research, emergent areas of impact, convergence, action-oriented research, and innovation driven works.

Expected Outcomes

Develop India-UK academic collaborations in research areas of mutual interest.

Strengthen research capacity and capability at Indian and UK partner institutions.

Key Updates

SPARC has funded 61 projects in 2018-19. These are all under the key thematic areas and the partnerships are spread across the university landscape of UK and India.

For details of the partnerships see Annexure I.

3. UKIERI-MSDE Skills Research Partnerships

The UKIERI-Ministry Of Skill Development And Entrepreneurship (MSDE) Skills Research Partnerships programme aims to foster strong partnerships between UK and Indian institutions in skills development. Partnerships have been chosen following a joint call for proposals in thematic areas of skills-based training, ICT blended learning, qualifications portability, joint certification, recognition of prior learning, curriculum development, benchmarking NOS and assessments.

Expected Outcomes

Contribute towards improved employability of the youth in India.

Development of skills infrastructure and delivery capacity in education.

Development of India-UK academic collaborations in research that are of mutual interest.

Strengthen bilateral relationships between the UK and India.

Key Updates

Seven chosen partnerships are now working on various themes of skills development including curriculum development, pedagogy development, train the trainer, capacity building etc.

For details of the partnerships see Annexure II.

4. UKIERI Policy Dialogues

UKIERI funds joint dialogues between the UK and India on key issues in higher education, fostering high level interaction between institutional leaders, policymakers, government officials and legislators. The programme responds to the UKIERI objective of developing sustainable partnerships between the UK and India in higher education by bringing highly influential policy makers to a common platform.

Expected Outcomes

To bring together UK and India academia.

To discuss and explore emerging partnerships and areas of collaboration.

Key Updates

Potential themes for dialogue have been identified, namely the following:

- Graduate employability
- Internationalisation of higher education in the UK and India

5. UKIERI – UK-India International Mobility Programme

(in the pipeline)

The development of an international student mobility programme has been identified as a priority in Phase 3 of the UKIERI programme. Use of UKIERI funding to support the mobility of UK students to India will respond to UK and Indian objectives, by increasing the number of UK students in India and contributing to the internationalisation of Indian institutions, in line with the objectives of the Study in India programme of the Government of India. The programme will have outward mobility focus to India from the UK, for UK students from traditionally underserved backgrounds who have hitherto had limited opportunity to travel outside of the UK to study in Indian HEIs.

Expected Outcomes

Support the employability of UK graduates, recognising the positive correlation between international experience, academic performance and graduate employability.

Support the internationalisation of Indian higher education through the diversification of the student body, and through strengthening of inter-institutional links between Indian and UK HEIs.

6. UKIERI Higher Education Leadership Development Programme

(in the pipeline)

The MHRD in India has emphasised the need for capacity building and leadership development programmes for higher education administrators in India. This is reflected in its new initiatives such as the 'Leadership for Academicians Programme' (LEAP).

LEAP primarily focuses on central HEIs, while there is also an increasing need for training of leaders at the state-level HEIs in India. In recognition of the latter, the proposed leadership training programme will focus on enhancing leadership capacity of 300 education administrators from state-level HEIs in India. The programme will utilise the UK's expertise in the field of higher education administration and leadership thereby strengthening academic collaborations between the UK and India.

Expected Outcomes

Contribute towards improved employability - development of skills infrastructure and delivery capacity in education.

Development of India-UK academic collaborations in research areas that are of mutual interest - sustaining existing partnerships and development of new partnerships.

STRAND 2: RESEARCH AND INNOVATION

PROGRAMME PROGRESS | SUMMARY | HIGHLIGHTS

Key Objectives

- Development of India-UK academic collaborations in research areas of mutual interest
- Improve innovation, research and knowledge transfer between the UK and India.
- Facilitate researchers from both countries to come together to obtain an overview of developments and trends on shared themes, exchange research findings and explore joint research proposals.

Activities

1. Research and Innovation Partnerships

With the aim to facilitate and encourage research collaborations between the UK and Indian HEIs and to develop knowledge products from joint partnerships with a potential to inform innovation in mutual areas of interest for India and the UK, several research partnerships have been funded. These include high impact research partnerships in areas such as environmental science and climate research, data science, human health, material science, environmental engineering, physics, advanced manufacturing, cyber-physical systems, humanities and social sciences.

Key Highlights

Until 2018-19, UKIERI Phase 3 has funded a total of 105 joint research partnerships – representing 43 with the University Grants Commission (UGC) and 62 with the Department of Science and Technology (DST).

The awardee institutions are well-distributed across the Indian geography and reasonably well distributed across the UK as well.

See Figures 1. 2. and 3.

Figure 1. Geographical Distribution of the 105 UKIERI Research and Innovation Partnerships Among UK Regions

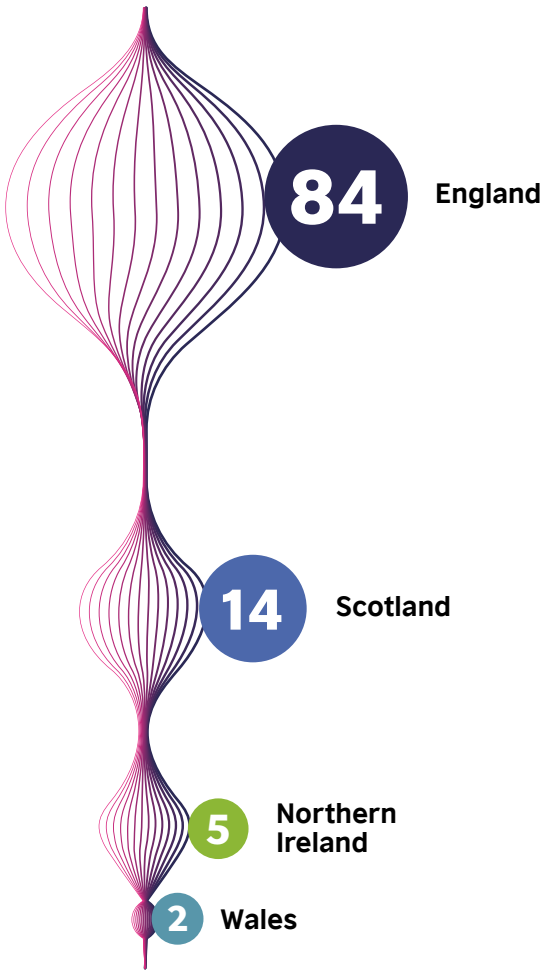


Figure 2. Geographical Distribution of the 105 UKIERI Research and Innovation Partnerships in India

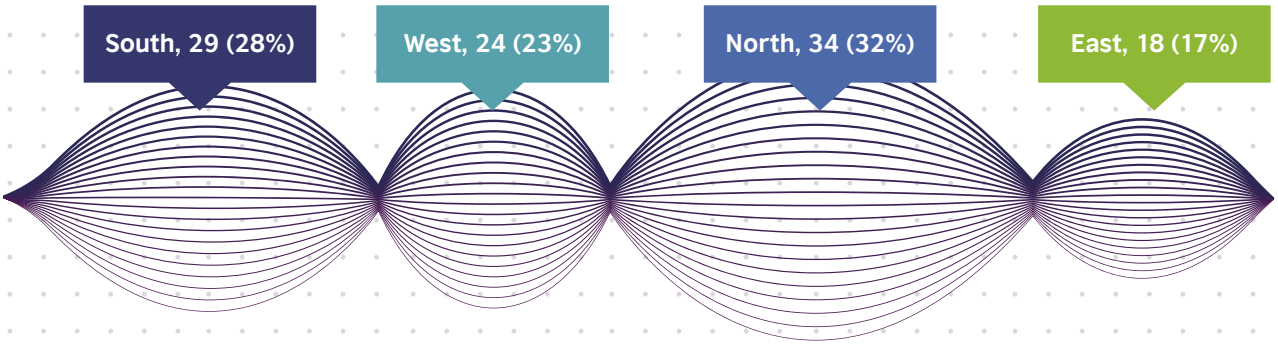
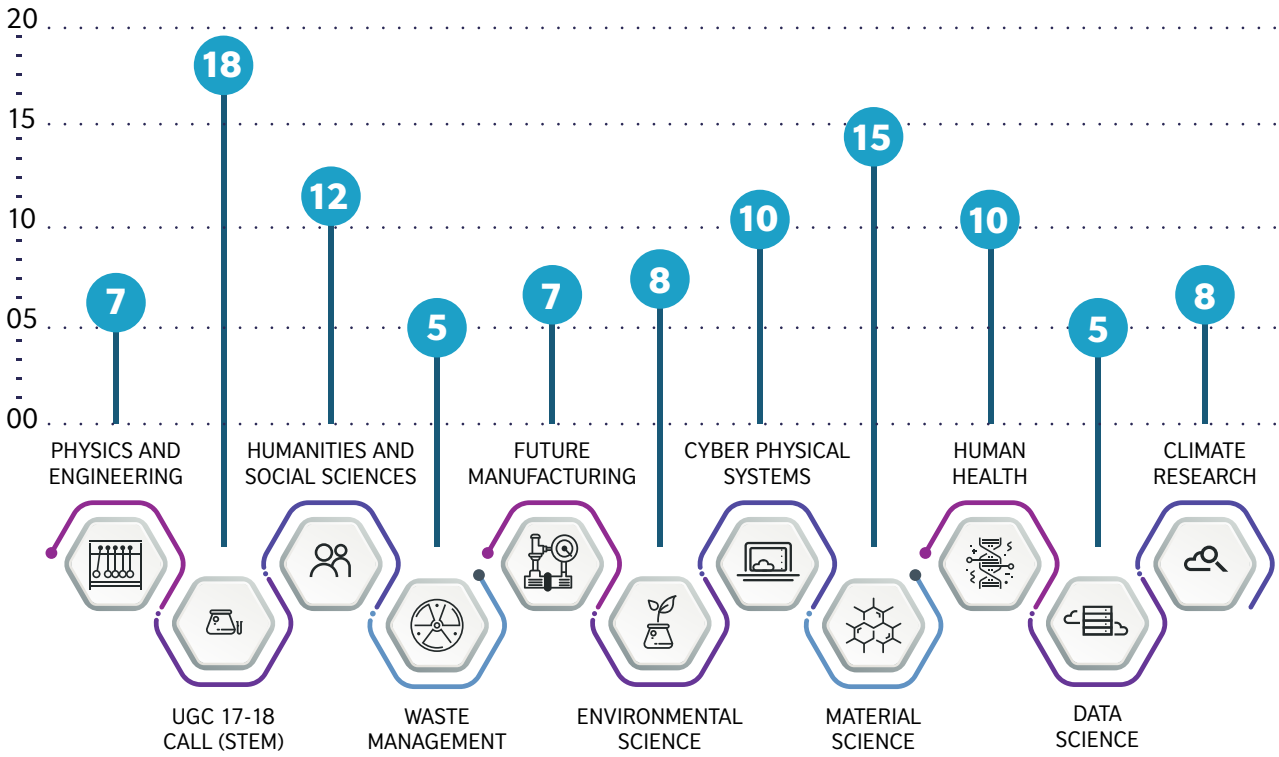


Figure 3. Thematic Distribution of the 105 UKIERI Research and Innovation Partnerships



a. UKIERI-DST 2018-19 Research Partnerships

In partnership with the DST, UKIERI launched a call for proposals in December 2018 focusing on developing jointly funded research and innovation partnerships with core societal benefit outcomes. The proposals were invited on two key thematic areas – cyber-physical systems and waste management. These themes emerged from the India-UK Joint Statement during the visit of Indian Prime Minister Narendra Modi to the UK in April 2018 as part of the Commonwealth Heads of Government meeting and the UK-India Science and Innovation Policy Dialogue. Research outputs relating to waste management are expected to support innovation in addressing this global challenge, which is particularly relevant in India given the challenges arising from rapid urbanisation.

To support applications, the UKIERI Secretariat conducted two online webinars. 110 participants from 30 institutions took part, from both India and the UK. 91 applications were received in response to this call and 11 high quality research proposals worth GBP 1.2 million were selected and funded. The partnerships will facilitate the exchange of academicians, and research and post-doctoral students.

b. UKIERI-DST Partnership Development Workshops *(in the pipeline)*

UKIERI in collaboration with DST, will introduce a call, for partnership development workshops with the aim to engage 300 researchers and faculty in research themes over 10 workshops between October 2019 and December 2020 with a budgeted funding of GBP 200,000.

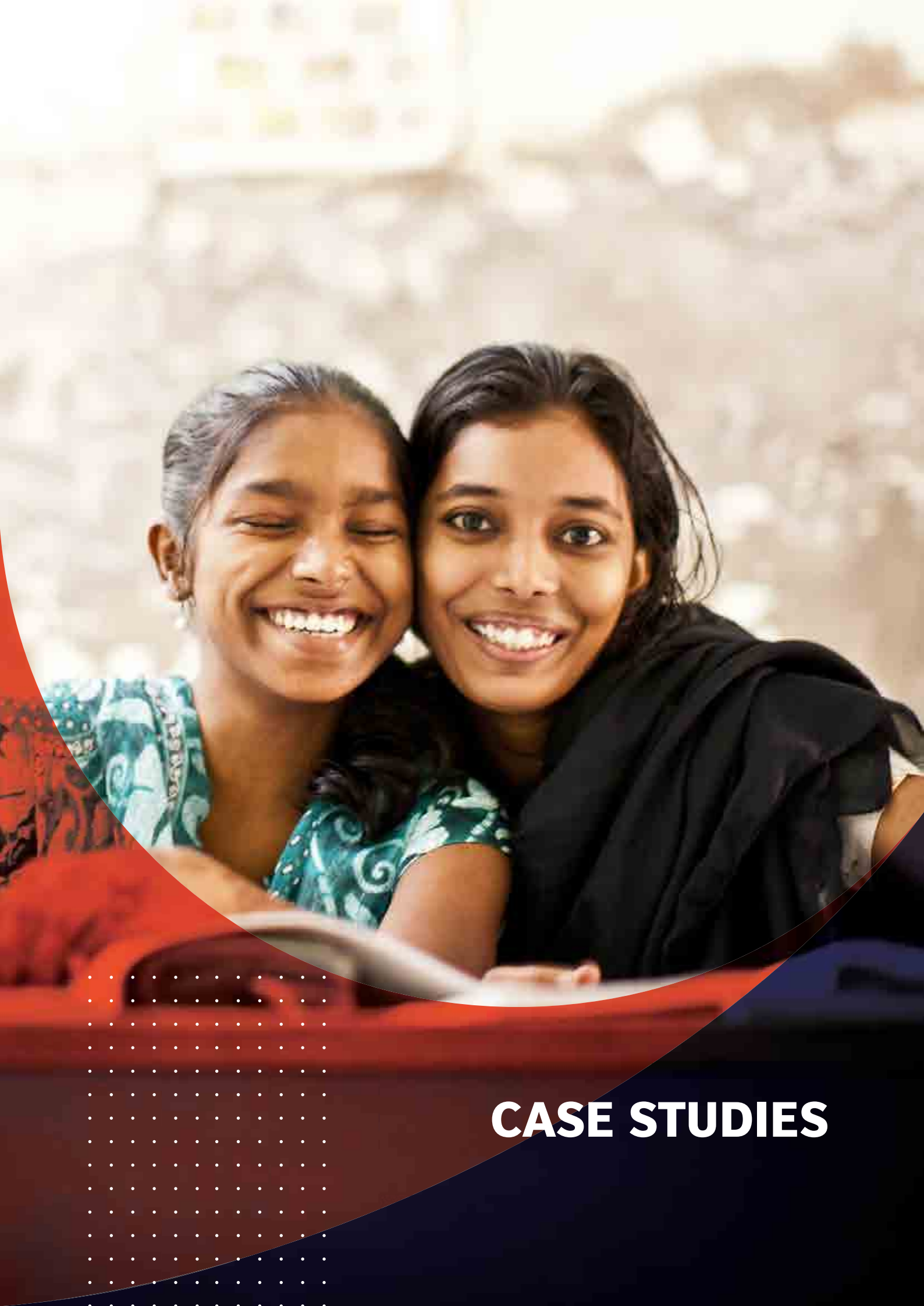
The aim of the UKIERI-DST Partnership Development Workshops is to help researchers from both countries to come together and provide an overview of developments and trends on mutual themes of interest, share their research findings and explore joint collaborations and partnerships. In addition, the workshops aim to support international development-relevant research. Workshops will support new, emerging, and under-researched areas relevant to themes.

Multidisciplinary proposals will be welcome and may include elements of social impact studies with a quantitative approach. Under this call, priority will be given to the following research and innovation challenges.

- Cyber physical systems: Data science, cyber security, artificial intelligence, and allied themes.
- Water Management and improving its Access and Quality.
- Alternative Energy: Solar and other alternative energy like tidal, wave and wind.
- Affordable and Preventive Health Care – other than pharmaceutical formulation development. It can include themes like portable diagnostic devices / equipment for better reach and access.
- Specialised and Advanced Manufacturing.
- Waste Management and Urban Design.

We expect that the workshops will support the development of joint research collaborations by seeding relationships and highlighting national and international sources of funding.

Workshops would also facilitate universities in India and the UK to strike research partnerships with the aim of creating innovations and social impact by engaging industry.



CASE STUDIES

NATURE AND NURTURE IN ARSENIC INDUCED TOXICITY

Anugrah Narayan College Patna, India; University of Salford, UK

Long-term exposure to arsenic has been observed to cause malignant and non-malignant outcomes, and even loss of life. The Indian sub-continent, particularly the Gangetic River Basin, has seen degeneration and morbidity due to the presence of high level of arsenic in its immediate environment.

Today, Bihar, the third most populated State in India, estimates an alarming 10 million or more people to be under arsenic health-risk like other affected areas in South-East Asia, exposure to arsenic toxicity in Bihar is no longer restricted to drinking water and food alone.

OBJECTIVE

Study the impact of diet, lifestyle and socio-economic factors on arsenic induced health effects among residents of Bihar, India and develop a defense system against arsenic.

OUTCOMES

- Demonstration-led public awareness across Bihar about the existence of arsenic in drinking water and the long-term health impact.
- Co-development of arsenic remediations by local stakeholders and partners in Bihar.
- INR 30 million grant by Honorable Deputy Chief Minister of Bihar, Shri Shushil Kumar Modi, for the establishment of three sub-divisional laboratories in rural areas of Bihar for testing of water samples.

FUTURE PLAN

- Greater research and experience transfer across India and the UK through the development of a network of multidisciplinary collaborative partner organizations, including institutions and stakeholders.
- Continued training, career development and capacity building for students and investigators and exposure to other critical research projects not limited to the UK and India.

INNOVATION IN CHRONIC WOUNDS MANAGEMENT FOR DIABETICS

Amity University, Noida, India; University of Ulster, Northern Ireland, UK

Diabetes is one of the leading causes of deaths in India. According to the International Diabetes Foundation (IDF), there are nearly 70 million diabetics in India with a further 36 million undiagnosed. UK shows a lesser number, around two million. However, numbers in both countries are predicted to rise. Diabetic foot disease (DFD) is a common ailment among patients and wound healing continues to remain slow, which can lead to limb and life-threatening infections. Existing antimicrobial wound dressings minimise risks of infection, but do not prevent it.

OBJECTIVE

Design an affordable, wireless and connected wound dressing that can monitor the condition of the wound and spot early signs of infection.

OUTCOMES

Designed screen-printed sensors that operate with high accuracy in a range of commercial dressings, and are unaffected by cellular/tissue debris.

One patent received - Mathur A, Roy S, Wadhwa S, Kumar R, 'Smart bandage for impedimetric detection of L-tyrosine in diabetic foot ulcer patients.' Indian Patent File Number 201811039747

One international award received - Jury finalist and nominated for the Cahn Prize 2019 via publication in the Journal of Materials Science.

Developed real world case study materials on wound diagnostics for use within the Biomedical Engineering Undergraduate Course at Ulster (> 150 students) and the Masters Course in Podiatry (>50 students).

FUTURE PLAN

- File for invention disclosures, leading to patent submission that will enable commercialisation and offer access to funding streams.
- Develop smart wound dressing to prototype stage and successfully complete pre-clinical study on wound fluid, leading to possible opportunities for MRC Biomedical Catalyst. This will help in the pursuit of mainstream funding (with industrial collaboration).

MODIFYING SOCIAL ENTERPRISE WITHIN SOCIAL SCIENCES CURRICULUM

Kirorimal College, University of Delhi, India; University of Huddersfield, UK

Social enterprise has become the cornerstone in universities today. In the higher education sector, institutions are building partnerships in local, national and global contexts. The increased awareness of social enterprise has emerged since the global financial crisis that took place in 2008. This recognition of social enterprise has brought about new thinking on how social enterprise works at a university level. This is evident in government policy from both the UK and India context. Both countries, at governmental levels, have re-examined the purpose of universities with regard to their contribution to society, in global, national and local economies.

OBJECTIVE

Develop a curriculum programme in the social science discipline by critically exploring the debates on social enterprise from a social science perspective.

Develop educational tools that advance social enterprise in the global higher education sector.

OUTCOMES

- Produced a new social enterprise model.
- Produced several publications.
- Collaborated extensively with stakeholders on new courses and modules at both University of Huddersfield and University of Delhi. For instance, from September 2019 students at the University of Huddersfield will be able to undertake research with external stakeholders who work in social enterprises.
- Received approval on a prototype course curriculum developed in consultation with other HEIs.

FUTURE PLAN

- Establish proposed Center for Social Innovation and Social Enterprise at the University of Delhi.
- Partner with The Design Innovation Center, University of Delhi for courses, boot camps and internships.
- Extend collaborative links with other countries (such as Brazil and China) that embrace social enterprise.

MONITORING FETAL MOVEMENTS THROUGH WEARABLE SENSOR SYSTEM

Christian Medical College (CMC), Vellore, India; Imperial College, London, UK

Maternal and prenatal fetal healthcare systems have made significant advances over the years. However, monitoring of fetal movement outside of the clinical environment still remains a challenge, especially in developing countries. Currently, there is no reliable monitoring system that can observe and help understand fetal movement in a non-clinical set up. Therefore, the aim is to develop a cost-effective wearable sensor system that is capable of monitoring fetal movement over an extended time period, without necessitating clinical visits.

OBJECTIVE

Develop a wearable sensor system for detecting fetal movement and clinically validate it.

OUTCOMES

Developed an initial prototype of the wearable fetal movement monitor along with a software package to analyse monitored data.

- The initial prototype has been able to detect a very high percentage (≈ 78%) of distinct fetal movements.
- Results validated with concurrent ultrasound tests on a cohort of 44 pregnant women.
- Findings published in a paper titled, 'Performance of a wearable acoustic system for fetal movement discrimination.' Plos One, 2018.

FUTURE PLAN

- Additional research to improve accuracy of detection of the current system is in process.
- An improved prototype has already been designed by accommodating additional sensors to eliminate detection of 'noise'. This prototype will be used in several clinical validation tests with concurrent ultrasonography in the upcoming months.

MULTIFUNCTIONAL NANOPARTICLES IN CANCER THERAPY

University of Delhi, India; University of Central Lancashire, UK

Millions of lives are lost every year due to limitations in diagnostic procedures for early stage detection of cancer, and from the tremendous side effects of existing chemotherapy.

The project aims to develop nanoparticles having magnetic and optical properties that can carry optimum concentrations of anticancer drugs to the target sides, by the application of an external magnetic field. Monitoring the distribution of nanoparticles in cancer cells using Magnetic Resonance Imaging (MRI) and fluorescence bio-imaging techniques, followed by localised heating under the Alternating Current (AC) magnetic field or laser light can destroy the malignant cells. Controlled drug release is also possible under the thermal condition as a dual therapy.

OBJECTIVE

Develop nanoparticles for early stage human cancer diagnosis and cure.

OUTCOMES

Developed magnetic nanoparticles with controlled sizes and morphology using porous silica cells for drug loading and release. Resultant particles will be used in liver cancer diagnosis and therapy, in collaboration with Royal Blackburn Hospital, UK.

Developed a multimodal nanoparticle formulation based on a platform of ormosil nanoparticles, that contain entrapped methylene blue, and surface-attached gold nanoparticles. These have been found to enhance the photodynamic therapy effect of the entrapped photosensitiser. Further exploration is aimed at to achieve better results in photodynamic therapy of cancer.

FUTURE PLAN

- Initiated a process of forming a consortium involving hospital clinicians and industrial partners in the UK, India and the USA for the submission of a large research bid using initial project outcome under the Global Challenge Research Funding (https://www.ukri.org/research/global-challenges-research-fund/) on ‘sustainable health and well-being’.

ECO-FRIENDLY PROCESS TO RECYCLE WASTE PRINTED CIRCUIT BOARDS TO RECOVER VALUABLE METALS

Indian Institute of Technology (Banaras Hindu University) Varanasi, India; and University of Edinburgh, Scotland, UK

In today's time of superior technology and countless gadgets, electronic waste is a critical issue. For instance, today there is 200 times more gold in a smartphone than in gold ore. However, appropriate recycling of waste remains alarmingly critical. In countries like Asia, hazardous chemicals and exploitative labour practices are employed during recycling processes, raising serious concerns on the environment as well as the health of the workers.

OBJECTIVE

Develop a new, eco-friendly and non-hazardous process to recycle waste printed circuit boards (PCB) to recover valuable metals.

Help integrate the new method into industries that currently use hazardous recycling processes.

OUTCOMES

- Developed a chemical method for delaminating waste printed circuit boards.
- Recovered 98% of the copper present from solutions of dissolved metals using solvent extraction techniques.
- Introduced a post-graduate interdisciplinary course, 'Management and Recycling of Electronic Waste', at the Indian Institute of Technology (Banaras Hindu University) Varanasi.

FUTURE PLAN

- Exploring alternative methods for dissolving metals from waste PCBs that will lead to non-hazardous process of recycling waste PCBs; investigating separation and recovery of metals other than copper (e.g. gold) using solvent extraction methods.
- Scrutinising and evaluating final stage of one technical paper, prior to submission.
- Planning an international conference to bring together researchers and the recycling industry for a more collaborative approach to problem solving. Tentatively this will be titled MetWaste-2020 and will be hosted at the Indian Institute of Technology (Banaras Hindu University), Varanasi .
- Engaging with industry partners to provide suitable economic, environmental, and societal impact.

FACETS OF SKILLS TRAINING IN ENGINEERING AND NON-ENGINEERING TRADES

Government Women's Polytechnic College, Thrissur, India; Dudley College of Technology, West Midlands, UK

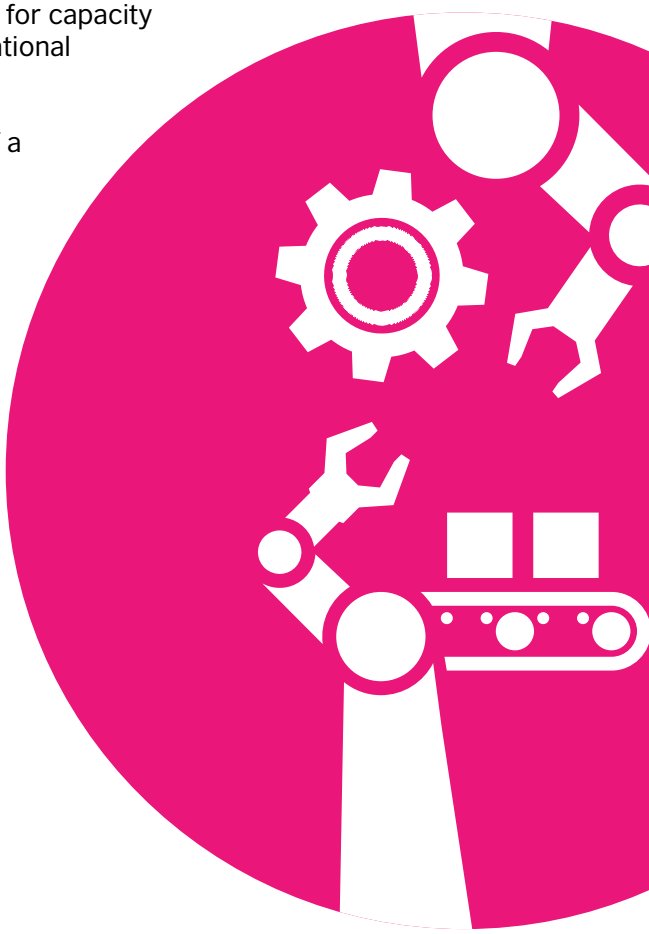
The National Skill Development Corporation (NSDC) conducted a study on skill development and related aspects, across nine states of India (Tamil Nadu, Andhra Pradesh, Telangana, Karnataka, Pondicherry, West Bengal, Orissa, Assam and Kerala). Out of the nine, six states showed presence of over 6,600 skills training institutions. The study revealed a disparity between demand and supply owing to irrelevance of skills training as per industry requirements. In addition, quality, standardisation of skills training delivery, and impetus from employers to engage with training delivery institutions – all pose as concerns in the area.

OBJECTIVE

Review, assess and analyse gaps existing between demand and supply of skills needs in engineering and non-engineering trades across targeted geographical areas.

Develop and deliver pedagogical skills development workshops for capacity building of skills training instructors, to deliver high quality vocational education, training and assessments.

Basis the national and global agenda, facilitate establishment of a sustainable model for trainers' training in the region.



OUTCOMES

- Submitted report highlighting current status of technical, vocational and skills training, along with Leadership and Management Training within Polytechnics, ITI, Skills Centre of NSDC.
- Developed a five-day Leadership and Management training programme for senior leaders and managers, and a five-day engineering-specific pedagogical skills training for trainers.
- Delivered six 'Train the Trainer' workshops reaching 180 beneficiaries directly, with each beneficiary connecting to five people, thereby indirectly impacting an additional 900 beneficiaries.
- Trained the faculty of 60 Indian institutions to deliver industry relevant curriculum for specific sectors.
- Facilitated development of technical expertise of UK specialists to create an internationally relevant 'Train the Trainer' content and curriculum for the Indian market.

FUTURE PLAN

- Develop a modular India-specific training programme that can be delivered to trainers and heads of institutions in India by Master Trainers trained by UK training providers.

IMPROVED ACCESS TO TRAINING AND EMPLOYMENT FOR PEOPLE WITH ADDITIONAL SUPPORT NEEDS

Skill Council for Persons with Disability, Delhi, India; Glasgow Kelvin College, Glasgow, UK

People with additional support needs, such as Autism and Down's Syndrome, are, in most cases, socially excluded and opportunity-deprived, and face significant challenges accessing training and employment. This social injustice is a priority that lies at the heart of government policy both in India and Scotland. To address this discrimination and to offer relevant positive outcomes, this project utilises the expertise in both countries to develop a set of accredited, work-based training frameworks. Employers will be core to the project development and will not only have a significant influence on the project outcomes, but will provide work placements and, ultimately, sustainable employment.

OBJECTIVE

To facilitate economic sustainability of people with additional support needs, develop accredited work-based training frameworks within several sectors; create Centres of Excellence for training in Scotland and India; and engage employers that are prepared to offer employment opportunities.

OUTCOMES

- The Scottish Government directly engaged in the project through a visit by the Deputy First Minister, who met with project partners in India to review how people with additional support needs are trained and employed.
- The Scottish Government Agency, Social Security Scotland, have pledged to commit to the aims of the project.
- The employers in Scotland in the hospitality sector have committed to engage in the project development and implementation.
- 12 organisations, including employers and support agencies, attended a seminar delivered by Indian delegates to Scotland, to learn from the India best practice model for training and employing people with additional support needs.
- Indian partners have taken elements of Scottish best practice to integrate into Indian training models.

FUTURE PLAN

- Framework to be delivered by a wide range of training providers across locations, in order to provide the widest geographic access possible to individuals and families.

IMPROVED ROBOTIC EFFICIENCY IN WAREHOUSING ENVIRONMENT

Indian Institute of Technology Kanpur, India; University of Edinburgh, Scotland, UK

The e-commerce environment across the globe has seen phenomenal growth over the last few years. This necessitates competitive warehouse automation solutions. Along with human employees, modern warehouses are evaluating deployment of robots to drive greater efficiency in warehouse operations. While robots are already able to move items inside the warehouse, they will now have the ability to manipulate, receive, stack, pick, and pack goods. This synergistic operation involving both humans as well as robots is expected to drive greater speed and efficiency in the back-end of e-commerce services.

OBJECTIVE

To facilitate safe and robust warehousing tasks, develop hardware such as next generation of coordinated control and planning algorithms and sensing that goes beyond identifying items and builds on human input.

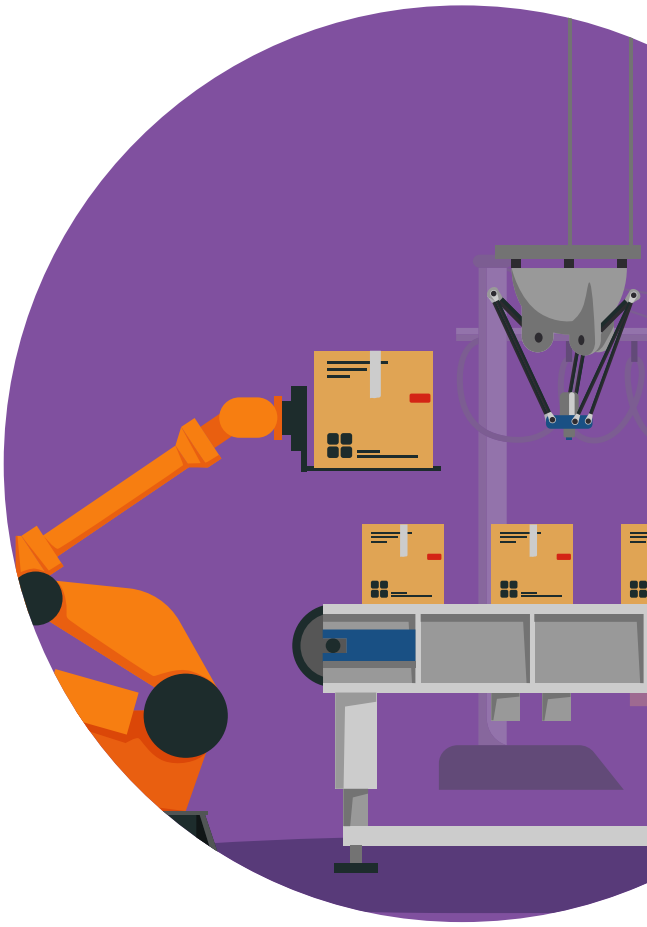
OUTCOMES

Developed a demonstrator of warehouse automation - a robot equipped with state-of-the-art motion planning and control software that is driven by deployment of deep-neural networks. The motion planning and control software has been developed at the University of Edinburgh, while sensing features have been developed at The Indian Institute of Technology Kanpur.

Established collaboration with Adabotics Ltd, a UK based robotics startup.

Presented six research papers at international conferences.

Received the 1st prize at the Robots for Resilient Infrastructure Challenge, conducted at the University of Leeds.



FUTURE PLAN

- Further develop robot capabilities and evaluate capabilities based on machine learning, software and hardware modularity, and robust whole-body control.
- Continue to address the robustness and performance.
- Tackle the problem of certification and providing safety and performance guarantees.

TOXICOLOGICAL EFFECTS OF ULTRA-FINE NANOPARTICLES ON HUMAN HEALTH

Indian Institute of Technology Bombay, India; Cambridge University, England, UK

The toxicological effects resulting from ultra-fine nanoparticles (< 100 nm) have been documented abundantly. However, there is not much evidence on its impact on human health.

This is primarily due to lack of availability of deployable technology which provides insight into size, mass and composition simultaneously.

OBJECTIVE

Design, develop, test and prototype a system for ultrafine particulate matter (UFPM) monitoring, using custom and novel MEMS resonators, Application Specific Integrated Circuits (ASIC) and system integration for measuring incremental frequency of the modulated resonance of silicon thin-film bulk-acoustic resonators (target accuracy of 1ppm), digitisation and data storage. A particle generator arrangement is also to be designed to produce silver nanoparticles for studying concentrations of various UFPMs.

OUTCOMES

- A novel hand-held prototype system for signal capture from various MEMS sensor resonators has been developed.
- The Cambridge University team has designed and fabricated a MEMS chip comprising several highly sensitive particulate detectors. This team also developed the Aerosol generation and MEMS detector characterisation setup.
- Two novel Complementary Metal-Oxide-Semiconductor (CMOS) ASIC's have been designed and fabricated by the IIT-Bombay team – one for sampling of MEMS detector signals and data acquisition, and the other comprises of an oscillator circuit for the MEMS detector.

FUTURE PLAN

- ***Journals to be submitted on*** –

  Handheld portable resonator characterisation device along with front-end air filter and measurement setup, based on measurements in an indoor airflow-controlled environment.

  Frequency estimation techniques studied in both time and frequency domain.

  Measurements obtained by testing out ASIC's taped out, 'IIT-Bombay_DataConv_ASIC' and 'IIT-Bombay_Osc_ASIC'.

- Novel handheld portable resonator characterisation system for indoor particulate sensing will be designed, developed and used with the resonator designed by Cambridge University.
- Patent applications will be filed for the novel outcomes of the project.

COLLABORATIVE MEDICAL DEVICE DESIGN INITIATIVE

King George's Medical University, Lucknow, India; Cardiff Metropolitan University, Cardiff, UK

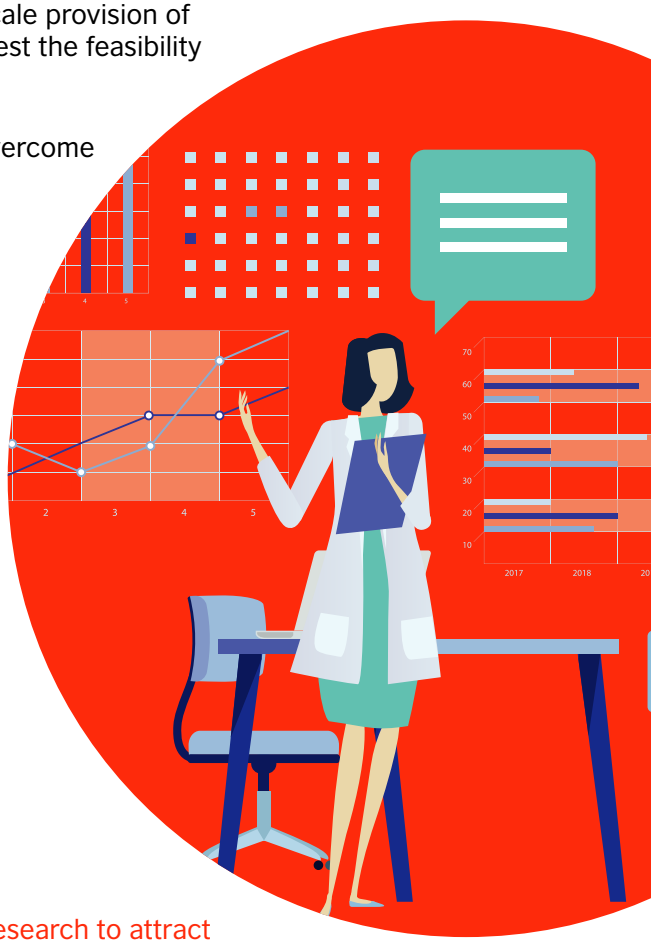
New age healthcare devices are being engineered to address critical healthcare needs in India and across the world. However, the provision for patient-specific medical devices in India is currently severely limited. High costs involved in procuring/ manufacturing these devices, and the lack of expertise act as detriments to wide scale use. As a result, the benefits of digital technologies, such as inherent accuracy, quality and efficiency, do not reach patients. Building technical capabilities among healthcare practitioners is equally important. For the healthcare services of a country to improve and evolve, there is a need to develop and implement technologies that are safe and sustainable. The CO-MeDDI focuses on collaboratively developing new design methods for building as well as deploying devices used to correct facial deformity, keeping in mind the need for better community resilience.

OBJECTIVE

Develop regionally appropriate methods that will enable widescale provision of custom-made devices used to correct facial deformity, and to test the feasibility of the new approach.

Identify and prioritise new collaborative research projects to overcome the challenges identified.

Develop community, industry and training partnerships that will help to implement the research results.



OUTCOMES

Engaged over 150 leaders, teachers, trainers and students in India and the UK.

Worked with eight industry collaborators to help develop a robust supply chain and to support training.

Developed a process that follows patients from presentation to discharge and maps the resource and service factors facilitating the journey.

Assisted King George's Medical University (KGMU) to implement 3d design and surgical planning software and 3d printing capability in this area.

Opportunities identified for high-impact collaborative research to attract funding and accelerate uptake of the technology.

Planned one research programme to prepare KGMU for design service roll out and generate three high quality research publications by mid-2020.

FUTURE PLAN

- New capabilities are being developed at KGMU for a democratised patient-specific healthcare.
- Planning is in progress for a new Postgraduate certificate in 3D surgical planning that will be the first of its kind in India.

SAFE AND SECURE IOT SYSTEM FOR RURAL INDIAN HEALTHCARE SERVICE

Indian Institute of Technology Kharagpur, India; Loughborough University London, UK

The IoT system (Internet of Things) offers a gigantic scope for application to improve efficiencies in almost every domain – both where technology already plays a role, such as manufacturing and transport, healthcare etc, and also where technology has been underpenetrated, such as farming. IoT applications can help speed up service penetration in remote areas. This is true of healthcare access as well where the the IoT system promises to provide context-aware and end-to-end access control to patients' data using blockchain technology. That said confidentiality of the patients' health data is critical and new systems must eliminate the risk of data compromised over unsecured communication channels.

OBJECTIVE

Develop a blockchain-based and context-aware IoT-based system to facilitate secure data transaction, thereby enabling seamless healthcare service in rural India.

OUTCOME

Developed a prototype system that uses wearables, an IOT hub/ node with encryption capabilities, a blockchain based transmission network and remote server. The patients will be able to share their health record/ status electronically via wearable devices, which are collected at the IoT Edge layer in a local hub and processed to extract attributes. This recorded data is subsequently encrypted at the local hub, and sent to a remote server through a Blockchain network for authentic and secure data transaction.

FUTURE PLAN

- Development of several papers for publication will also be initiated in parallel.
- Participation in workshops and conferences – in order to showcase the prototype and drive industry interest will be undertaken.
- Conducting an Indo-UK conference along the thematic lines of the project is being actively considered by the project partners.

NEXT-GEN MULTIWAVELENGTH TIME-DOMAIN ASTROPHYSICS

Inter-University Centre for Astronomy and Astrophysics, Pune, India; University of Southampton, UK

India harbors huge ambitions in the field of time-domain astrophysics. India's capabilities and readiness in science and research infrastructure have already been demonstrated by the massive infrastructure/ scientific projects such as the AstroSat space mission, and construction of world-leading facilities such as the Devasthal Optical Telescope and the gravitational wave detector arm of the Laser Interferometer Gravitational-Wave Observatory (LIGO). Conditions are therefore appropriate to carry out unprecedented investigations of the cosmos, with a core focus on development of time-domain astronomy.

OBJECTIVE

Foster a world-leading collaboration in time-domain astronomy between UK and India, by combining the observational capabilities, theoretical expertise and access available to both countries.

Train the next generation of scientists who can exploit new facilities to make scientific breakthroughs.

Secure a foundation on which the collaboration can be sustained and nurtured.

OUTCOMES

- New science exploitation proposals submitted and accepted by major international astronomy facilities.
- Strategic Memorandum of Understanding activated between the two academic partner institutions.
- Project results presented at four international astronomy conferences.
- Joint funding for long-term PhD students secured.
- Data intensive science training for students conducted in collaboration with a local predictive solutions and data intelligence company.

FUTURE PLAN

- Intensify efforts in exploiting time-domain facilities, and build research capacity to understand black hole growth.
- Continue exchange of young people between UK and India for a sustained partnership.

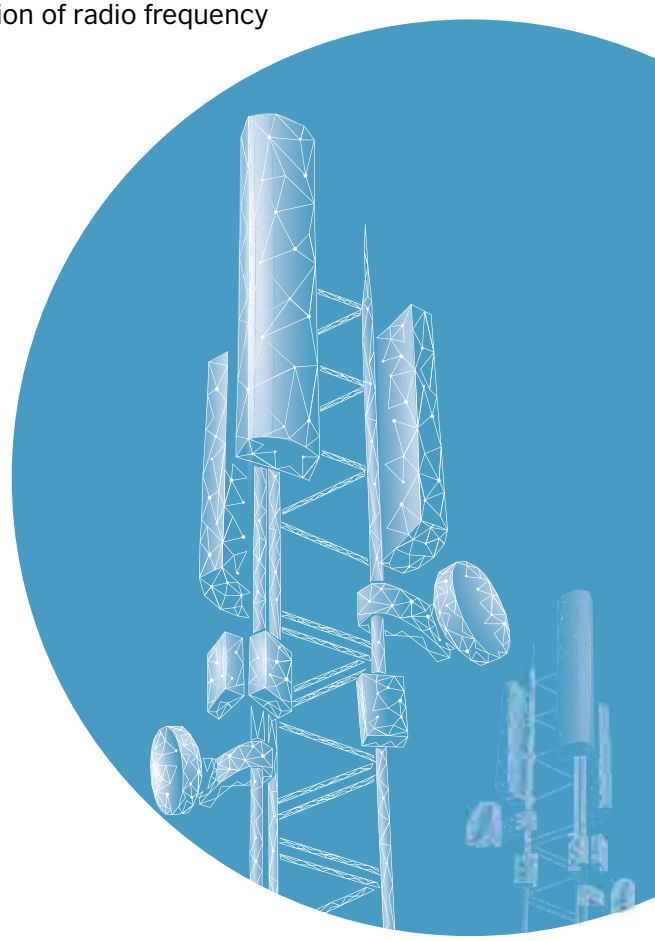
FULL DUPLEX AND COGNITIVE RADIO ARCHITECTURES FOR SPECTRALLY, EFFICIENT COMMUNICATIONS

National Institute of Technology, Tiruchirappalli, India; Heriott Watt University, Scotland, UK

There has been explosive increase in mobile data traffic globally, driven by, but by no means limited to, the increasing popularity of data hungry applications such as social media applications, and also the availability and demand for bandwith guzzling technologies such as 4K, 8K video streaming. In fact, global data traffic is expected to increase 1,000-fold and 10,000-fold by the years 2020 and 2030 respectively. However, millimeter wave frequencies 10-60 GHz (5G) are inadequate in providing the necessary spectrum scale up, eventually resulting in congestion. In general, wireless technologies available today, are not able to provide the necessary efficiency, ie squeeze more data into the given bandwidth.

OBJECTIVE

Develop efficient spectral occupancy through optimum utilization of radio frequency and full-duplex transmission.



OUTCOMES

- Conducted theoretical analysis and derived results that highlight effectiveness of full-duplex.
- Developed algorithms at simulation level and experimented with prototyping of full-duplex cognitive radio systems.

FUTURE PLAN

- Funding through industrial and research council can facilitate further research and development.

DEVELOPING PLACEMENT OPPORTUNITIES FOR DIPLOMA STUDENTS

Arasan Ganesan Polytechnic College, Sivakasi, India

In a bid to provide maximum exposure and opportunities to its students, the Arasan Ganesan Polytechnic College employed several innovative solutions, following the leadership and management training programme. A career guidance programme was put into place, including topics such as goal setting, personality development, personal excellence and higher studies opportunities. An aptitude skills training programme was conducted in parallel which saw participation of guest lecturers from across industries. Soft skills such as English Language Skills was also a focus, including discussions on the better use of internet while applying for jobs. Alongside this, a special awareness raising programme was held around Government job opportunities, and ways of applying for the same.

OBJECTIVE

Create job opportunities for students.

Prepare students for the world of work upon graduation, and inculcate soft skills and values.

Increase student admission.

OUTCOMES

- Achieved 100% employment rate amongst graduates.
- 320 graduates achieved an improved salary package upon finding employment (a 5.9% increase from the 2013-14 academic year).
- The college emerged as a front runner in achieving employment outcomes for Diploma students.
- Prestigious corporates such as ITC Chennai and Sharon Solutions, among others were involved in the learning and placement opportunities.
- MOU's have been signed with a number of organisations such as Kalasalingam University, Prince Builders, Waxwing Automation Systems and Elite Electro-medical Equipment, Madurai.

This project is an outcome of the Technical Education Leadership Development Programme with All India Council for Technical Education (AICTE).

EFFECTIVE USAGE OF SMART CLASSROOMS TO ENHANCE TEACHING AND LEARNING PRACTICE

Tamil Nadu Polytechnic College, Madurai, Tamil Nadu

World over, knowledge creation and its dissemination has seen a metamorphosis towards the 'digital'. Students as well as faculty members who are not digitally agile, fall behind in knowledge accumulation and application, making them unsuitable for the current as well as future global economy. Tamil Nadu Polytechnic College aims to incorporate ICT (Information and Communications Technology) in every aspect of the institution, to make it at par with other global learning establishments. As part of it's efforts, the institution employed practices such as use of blended teaching, and lecture distribution through video conferencing. Students were involved in online learning programmes and teaching training was carried out to more effectively integrate the use of ICT across the organisation. Team leaders were identified and tasked with disseminating a vision for the use of ICT to their colleagues, thereby encouraging more effective use of the ICT facilities of the college.

OBJECTIVE

Integrate ICT throughout Tamil Nadu Polytechnic College using smart classrooms to enhance teaching and learning.

To encourage staff to use ICT in learning.

To make use of existing smart classroom facilities in the most effective way possible.

To encourage students to use laptops for learning purposes.

OUTCOMES

- 40% increase in the effective usage of class hours in smart classrooms.
- 30% improvement in the quality of teaching material and in teaching methods.
- 40% increase in the ability of staff to make use of ICT integrated learning.
- 40% increase in the acquisition of knowledge by students outside traditional sources of information (ie, textbooks).
- 10% increase in academic performance among students.
- Students achieved second place at the Indian Institute of Technology Bombay's e-Yantra Robotics Competition, becoming the first team from a polytechnic to reach the finals of the competition.

This project is an outcome of the Technical Education Leadership Development Programme with All India Council for Technical Education (AICTE).

STUDENT SUPPORT SYSTEM (S3)

Raj Kumar Goel Institute of Technology, Ghaziabad, India

Raj Kumar Goel Institute of Technology (Pharmacy) has put together several initiatives across the student lifecycle with the singular aim of providing enhanced student support services. It has convened an early intervention committee among the first-year faculty, appointing a senior manager as coordinator of the committee. Additional academic support was provided to students who scored less than 50% in their first sessional examination.

In parallel, a placement team was formed to identify and support student placements, as also improving attendance. The team consisted of a placement coordinator, a training and placement officer and final-year students.

Faculty members provided counselling and pastoral support to students with low attendance. This was done with parental approval, and engagement where necessary. Further, final year students were surveyed on their career interests. Based on findings, industry representatives were invited as guests to deliver lectures, and industry specific training workshops were introduced.

OBJECTIVE

To improve the quality and scope of student support services.

- Improved student feedback by 10%.
- Improved attendance by more than 40%.
- Reduced percentage of failures.
- Greater level of academic support provided to students.
- Improved faculty satisfaction by 12%.

This project is an outcome of the Technical Education Leadership Development Programme with All India Council for Technical Education (AICTE).

TO INTRODUCE AND DEVELOP STRATEGIC PLANNING FOR INCREMENTAL GROWTH

Government Girls Polytechnic, Dehradun, India

With a two-fold aim of improving existing work culture among its staff, and placing students at the helm of all activities, the Government Girls Polytechnic, Dehradun evaluated the barriers, and introduced reformatory parameters within the institution. Among the key barriers identified were poor communication skills among students, the need for a healthier working environment, the lack of a clearly articulated strategy, vision and mission, and a need for individual target setting. Therefore, priority was given to establishing new Language Labs and Smart Classrooms, as well as to creating mission and vision statements. This was done with the objective of developing specific Action Plans in the immediate future. The faculty was deliberately involved in the process, such as in drafting of the institutional objectives and aims as well as in designing a logo for the institute, resulting in enthusiastic participation and greater ownership over the process of change.

OBJECTIVE

Introduce and develop strategic planning for growth in the working culture of Government Girls Polytechnic, with an emphasis on student-focused approach to delivery.

OUTCOMES

- Increased student retention and academic performance.
- Improved communication skills and confidence among students.
- Improved job satisfaction among staff.
- Enhanced student results to meet comparative industry benchmarks.
- Strategic planning introduced within the organisation.
- Target-oriented goals for work of staff.
- Students placed at the centre of all activities across the organisation.

This project is an outcome of the Technical Education Leadership Development Programme with All India Council for Technical Education (AICTE).

IMPACT STORIES

Scientists from the **Indian Institute of Technology Gandhinagar, India** and **Newcastle University, UK** used a memory-stick sized device - a portable laboratory that fits into a suitcase to comprehensively characterise wastewater treatment microbiomes on-site and in near-real time. In what is likely a world-first, these portable kits are already in use to investigate other pollution sources in river catchments. Furthermore, scientists from both institutions plan to apply the same methodologies to evaluate performance of an innovative decentralised wastewater treatment system in India.

Promoting Sustainable Pilgrimage and Protecting Heritage in Gujarat and Uttar Pradesh is an archeological research and excavation project carried out by **The Maharaja Sayajirao University, Baroda, India** and **Durham University, UK.** Several workshops were held under the partnership to examine pathways to the protection and development of heritage sites for positive social and economic impacts on local communities within India, South Asia, as well as globally. A total of 78 students were trained in this programme (27 male and 51 female) who received hands on experience of working at sites also known as field laboratories. The field laboratory also involved training on the digitisation of recorded data and its safe storage methods. The sites identified in association with the Archeological Survey of India were the Champaner-Pavagadh World Heritage site in Gujarat, the Nevern Castle in South Wales, and the Jama Masjid, the Saharki Masjid and the Delhi Gate in New Delhi.

Indian Institute of Technology Kanpur, India and the **University of Leicester, UK** organised a workshop on Earth Observation Techniques in March 2018. Thirty students from different institutes and universities in India participated, and received hands-on sessions in handling satellite data that developed their skill set on geo positioning data. The partners followed this up with a consultation meeting in April 2019 to discuss agricultural challenges in a changing climate to adapt new agricultural practices and support rural farming communities impacted by this change.

Indian Institute of Science, Bangalore, India and the **University of Bath, UK** held two workshops and one international conference on Alkali Activated Earth Building Products Utilising Non-Organic Solid Wastes at IISc. These events attracted 180 delegates and participants from 37 countries. The research work aims at developing low-cost, sustainable and stablised earth construction materials. The partnership has successfully developed solutions with reduced embodied carbon content compared to the existing cement stabilised products. The new solutions reduce the environmental impact of construction whilst maintaining performance. The team has submitted two papers in international journals and have presented three papers at international conferences.

Department of Petroleum Technology, Dibrugarh University, Assam, India and the **University of Edinburgh, Scotland, UK** have a partnership on developing a novel technique for the depleted oil reservoirs of the Upper Assam Basin. Scientists have developed Silica Nanoparticles (SNs) from rice husk and have formulated CO2 foam with nano stabilisers. The project has four PhD scholars from Dibrugarh University contributing to the research and the partnering scientists have published one paper in the Journal of Petroleum Exploration and Production Technology (Springer).

ANNEXURES

ANNEXURE I

UKIERI-AICTE TECHNICAL EDUCATION LEADERSHIP DEVELOPMENT PROGRAMME

Examples of change projects initiated by the participants show that the training provided and collaboration between UK and Indian HEIs is creating change on the ground

Title of Project	Indian HEI
Create More Entrepreneures Than Managers at MBA Institutions	Punyashlok Ahilyadevi Holkar Solapur University, Solapur, Maharashtra

Impact

The number of students taking up entrepreneurship as a course increased to 46% compared to eight percent in the previous year. The Institute has since been awarded the 'NAAC A' grade and has also conferred the 'Best Professional College' award by SP Pune University. The Institute is now eligible for Autonomous Status accreditation by the University Grants Commission (UGC), Government of India.

Following the project, the workshop participant has also been nominated the 'Director Innovation, Incubation & Linkages' of the University.

Title of Project	Indian HEI
Scheme For HER Empowerment	Government College of Engineering (GCE), Kannur, Kerala

Impact

The project was aimed at developing technical capabilities and talent among female students and develop student leaders who will be torchbearers of a move towards facilitating women empowerment in the college. This is eventually expected to lead to women taking up more leadership roles.

As a result of the project more women are now heading several professional bodies. There is also an increase in the number of girls taking up campus interviews as well as opting for technical jobs and higher studies. There is an increased representation of women in campus activities and alumna interactions and networking. The Government of Kerala is planning to implement similar projects in all its institutions with GCE, Kannur as the nodal agency.

Title of Project	Indian HEI
Deployment Of A Face Recognition Based Attendance System For Student Records	Gauhati University, Guwahati, Assam

Impact

Development and deployment of a Face Recognition Student Attendance System (FRSAS) has been found to reduce error and intricacies observed in the traditional system. It has been found that 65% respondents in a survey conducted after deployment of the new system indicated that the system has a positive influence while 63% opined that the system is required for better management of student record keeping. Further, 72% thought that the system improves transparency - which was one of the objectives of the project.

Title of Project	Indian HEI
SMART (Sensitive Modern Adaptable Responsive Technocrat) Students: A Desire	Indraprastha Engineering College, Ghaziabad, Uttar Pradesh

Impact

The project aimed to bring about holistic transformation in the teaching-learning process for better engagement of students and teachers. The main goal was to ignite minds through "Learning by Doing" and to prepare students for the world of work by inculcating skills and values. The project was successful on several counts – the employment rate of graduates increased to 100%, coupled with a doubling of the highest salary offered during placements. MOUs have also been signed with several organisations, and the improvement in industry-academia interface will deliver better engagement and exposure for students. There is also an increase in upskilling of faculty members and an increase in research activities at the Institute.

Title of Project	Indian HEI
Improving Employability and Entrepreneurship of Students	School of Engineering & Technology, ITM University, Gwalior, Madhya Pradesh

Impact

The project aimed to develop research-based and skill-based learning environments, in order to strengthen employability and entrepreneurship abilities among students. The project created a platform, titled Idea pad/ Research pad to nurture student-innovations and their entrepreneurial ideas, with awards for the best ideas and projects. The University has also identified several focus areas in which rigorous training (technical and non-technical) was required, and training sessions have since been organised, and syllabi and their delivery mechanisms also updated. The University has also signed MOUs for training and research purposes. The change in delivery of subjects, nurturing of ideas and hands on training have involved faculty members and have been well accepted by the students. The placements this year have been improved considerably as a result.

ANNEXURE II

LIST OF PARTNERSHIPS FUNDED UNDER MHRD-SPARC in 2018-2019

	Title	Indian HEI	UK HEI
1	Designing of Integrated Sensor Arrays for Multianalyte Detection for Higher Quality of Life OR for Better Human Health Monitoring	Banaras Hindu University, Varanasi	University of Surrey
2.	Edge Caching for High Capacity Wireless Networks Exploiting Big Data Analytics and Machine Learning	Indian Institute of Technology Indore	University of Edinburgh
3.	Engineering Nanoionics Interface for High Ionic Conductivity in Batteries	Indian Institute of Technology Kharagpur	University of Cambridge
4.	Improved Community Performance From Seismically Resilient Strategic Infrastructure Facilities	Indian Institute of Technology Bombay	UCL (University College London)
5.	Novel Human Machine Interaction Technology for the Tetraplegics (NITT)	National Institute of Technology, Tiruchirappalli	Newcastle University
6.	Vlc-based Vehicular Communication for Enhancing Road Safety in Smart Cities	National Institute of Technology, Warangal	University of Edinburgh
7.	Design And Development of Low-cost, Easy to Install, Sustainable Foundations for Renewable Energy Devices	Indian Institute of Technology Bhubaneswar	University of Dundee
8.	Design and Evaluation of Nanostructured Materials for Wastewater Treatment	Maulana Azad National Institute of Technology, Bhopal	University of St Andrews
9.	Intermolecular Interactions of Hydrogen Sulphide	Indian Institute of Science, Bengaluru	Newcastle University
10.	New Approaches for Conformal Quantum Field Theories	Indian Institute of Science, Bengaluru	University of Oxford
11.	Combating Carbapenem Resistant Enterobacteriacae (CRE): Using Combinatorial Approach of Conventional Therapeutics and Theranostic Nanomedicine	Indian Institute of Technology Roorkee	University of Cambridge
12.	Travel Well-being Indicators to Support Urban Planning Policy: A Tale of Two Indian Cities	Indian Institute of Technology Bombay	Imperial College London

	Title	Indian HEI	UK HEI
13.	A Digital Narratology of Technology as Literary Actors and Artefacts of Settings in Indian English Novels	Indian Institute of Technology Indore	Lancaster University
14.	Digital Expression of the Self(ie): Photographic Performativity in Contemporary India	National Institute of Technology, Silchar	Goldsmiths, University of London
15.	Catalysing Medical Diagnostic Technology Innovation from Bench to Bedside	Indian Institute of Technology Delhi	University of Edinburgh
16.	Non-filamentary Three-terminal Memristor Architecture for Bio-Mimetic and Logic Design	Indian Institute of Technology Roorkee	The University of Sheffield
17.	confinement-induced Dynamics in Nanoscale Phase Transition	Indian Institute of Technology Kharagpur	The University of Warwick
18.	Flexible and Disposable Heavy Metal Sensing Patch for Public Health and Regulatory Applications	Indian Institute of Technology Delhi	University of Glasgow
19.	Determining the Role Of Extracellular Vesicles as Communicosomes in Progression to Multi Organ Failure in Advanced Liver Disease	Institute of Liver and Biliary Sciences, New Delhi	King's College London (KCL)
20.	Developing an Integrated Land Use - Transport - Emissions Model Utilising Emerging Big Data Sources for Quantifying the Energy and Environmental Impacts of Ridesharing Services	Indian Institute of Technology Kharagpur	University of Leeds
21.	Development of Exhaust After-treatment Systems for Advanced Low Temperature Combustion	Indian Institute of Technology Bombay	University of Birmingham
22.	Collusion and Fake News: Are Social Networks Being Orchestrated in Favor of Fake News?	Indraprastha Institute of Information Technology, New Delhi	Queen's University of Belfast
23.	Applying Artificial Intelligence to Improve Outcomes for Children Undergoing Maintenance Chemotherapy for Acute Lymphoblastic Leukemia in Low Resource Settings	Indian Institute of Technology Kharagpur	The University of Manchester
24.	Precision Nanoengineered, Wettability Patterned Surfaces with Potential Applications In Energy and Healthcare	Indian Institute of Technology Madras	UCL (University College London)

	Title	Indian HEI	UK HEI
25.	Role of Binding Site-flanking DNA Conformation in Genome-wide Recognition by Development-Associated Transcription Factors	Jawaharlal Nehru University, New Delhi	The University of Manchester
26.	Renewable Energies from Ocean: Adoptable and Sustainable Technologies for Indian Conditions	Indian Institute of Technology Bombay	University of Edinburgh
27.	Development and Demonstration of Hydrogen Redox Flow Battery using Non Precious Electrocatalysts	National Institute of Technology, Warangal	Newcastle University
28.	Readiness Assessment of Cloud-based Manufacturing Systems (RACM)	Indian Institute of Technology Madras	The University of Nottingham
29.	Aluminium-Cerium Based Alloys for High Temperature Applications	Indian Institute of Technology Bhubaneswar	Brunel University
30.	Doping-Driven Tunable Multifunctionality in Half-Heusler Systems	Indian Institute of Technology Delhi	Loughborough University
31.	Shaped Light for Novel Studies in Imaging and Measurement	Indian Institute of Technology Madras	University of St Andrews
32.	Experimental and Numerical Modelling of Wave-Vegetation-Structure Interactions (EMOD-WVSInt)	Indian Institute of Technology Madras	UCL (University College London)
33.	Developing Novel Strategies to Capture Phytopathogen-Agricultural Host Metabolic Crosstalk by Cell Type Specific 13C Metabolic Phenotyping	Indian Institute of Technology Mandi	University of Oxford
34.	A Multicentre Clinical Study Evaluating the Novel Biomarkers: Dimethylarginines and Ischemia-modified Albumin in Patients with Acute-on-chronic Liver Failure	All India Institute of Medical Sciences, New Delhi	UCL (University College London)
35.	2D-QDs (Two Dimensional QDs): Synthesis and Applications in Electroluminescent Diodes, Sensors and Solar Cells.	Alagappa University, Karaikudi	Brunel University
36.	Mitigation of Stimulated Brillouin Scattering (SBS) for Power Scaling of Narrow Linewidth Fiber Amplifiers	Indian Institute of Technology Madras	University of Southampton

	Title	Indian HEI	UK HEI
37.	Design of Non-Orthogonal Multiple Access (NOMA) Systems for Future Vehicular Communications.	Indraprastha Institute of Information Technology Delhi	University of Surrey
38.	Computational Modelling of Polydisperse Multiphase Bioreactor Systems for Wastewater Treatment	Indian Institute of Technology Mandi	Imperial College London
39.	Engineered Nano Hydrogel for Target Specific Delivery in Squamous Cell Carcinoma.	Indian Institute of Technology Kharagpur	The University of Manchester
40.	Evaluation of Cleft Care Outcomes of Non-Syndromic Unilateral Cleft Lip and Palate (UCLP) Patients at Ages 5,12 And 20 Across India: The Cleft Care India Study.	Jamia Millia Islamia, New Delhi	The University of Manchester
41.	Self-Powered Sensor System for Condition Monitoring of Nuclear Waste Packages	National Institute of Technology, Tiruchirappalli	University of Bristol
42.	Data Driven Neuro-Behavioural Clusters in Adults Who Were Born Very Preterm Using Multivariate Analysis	Indian Institute of Technology Guwahati	King's College London (KCL)
43.	Congestion Pricing: Planning for Optimal Strategies and Commuters' Behavioral Implications Under Different Pricing Schemes	Birla Institute of Technology & Science, Pilani	Cardiff University
44.	Wind Farm Layout Optimisation Under Uncertainty Using Wind Speed Forecasting Through Probabilistic Models and Comparison With Machine Learning Algorithms.	Indian Institute of Technology Hyderabad	University of Exeter
45.	Framework for Developing Training Model to Strengthen Diabetic Retinopathy Screening and Research in North India	Post Graduate Institute of Medical Education and Research, Chandigarh	London School of Hygiene and Tropical Medicine
46.	Creating Accessible STEM Documents	Indian Institute of Technology Delhi	University of Birmingham
47.	Vibration Absorption Using Metamaterial Based Composites	Indian Institute of Technology Kanpur	Swansea University
48.	Neural, Behavioural, and Genetic Underpinnings of Social Behaviour in Autism Spectrum Disorder and Attention Deficit Hyperactivity Disorder	Mahatma Gandhi University, Kottayam	University of Reading

	Title	Indian HEI	UK HEI
49.	Mitigation of Porosity in High Pressure and Additive Manufacturing of Advanced Light Alloys	Indian Institute of Technology Bombay	UCL (University College London)
50.	India-UK Partnership in Laboratory Astro-Particle Physics	Indian Institute of Technology Hyderabad	University of Oxford
51.	Impact of Artificial Intelligence on Productivity, Employability and Business Models in Health Care Sector	Indian Institute of Technology Delhi	Brunel University
52.	Towards Sustainable Surface Water Ecosystems in India: Predicting the Fate, Transport and Effects of Urban Wastewater Pollutants in Rivers.	Mahatma Gandhi University, Kottayam	University of Leicester
53.	Gut Microbiome - Regulators of the Intestinal Stem Cell Niche in Health and Inflammatory Bowel Disease	All India Institute of Medical Sciences, New Delhi	University of Oxford
54.	Transit Oriented Development (TOD): Developing an Integrated Housing and Transport Model	Indian Institute of Technology Kharagpur	Queen's University Belfast
55.	Hybrid 3D Printing With Gmaw-Twin Wire Based Additive Layer Enhanced by Friction Stir Processing	Indian Institute of Technology Patna	The University of Manchester
56.	Perylene-Based Supramolecular Polymers: from Controlled Structure to Controlled Function	Indian Institute of Technology Kharagpur	University of Bristol
57.	Mitigation of Dam Induced Flood Disaster Due to Hydrological Extremes	Indian Institute of Technology Roorkee	Heriot-Watt University
58.	Market Models for Local Energy Transactions	Malaviya National Institute of Technology	Cardiff university
59.	Time-Critical Distributed Software (TiCDSoft)	Indian Institute of Technology Bombay	University of Liverpool
60.	Re-imagining Teacher Education	Tata Institute of Social Sciences, Mumbai	University of Sussex
61.	2D-QDs (Two Dimensional QDs): Synthesis and Applications in Electroluminescent Diodes, Sensors and Solar Cells	Alagappa University, Karaikudi	Brunel University

ANNEXURE III

LIST OF UKIERI-MSDE SKILLS RESEARCH PARTNERSHIPS

Developing and Sustaining India's Capacity for Pre-clinical Drug Discovery

Develop an education, training and CPD curriculum, using the latest pedagogical methods and to internationally recognised standards, for laboratory animal pharmacologists, which is tailored to India's needs.

Develop sustainable "Train the Trainer" programmes for these activities.

Share the resources as open access e-learning resources across the sector.

Develop educational links between India and the UK.

Guide trainers in the subsequent development and delivery of their courses.

Centre for Advanced Research for Pre-clinical Toxicology, Hyderabad, India	University of Leeds, UK

Empowerment Through Knowledge: A Programme for Social Justice

This multi partner project will put learners at its heart. It will, through combining Scottish and Indian expertise, develop a new framework of training of qualifications aimed at helping disabled people and the most disadvantaged to access employment opportunities. It will support a Centre of Excellence in Coimbatore and, through engagement with skills councils, learners, employers and support organisations, generate sustainable learning and social outcomes in India and Scotland.

Skill Council for Persons with Disability, New Delhi, India	Glasgow Kelvin College, Glasgow, UK

E-Learning in Action

The objective of the project is to carry out a virtual learning environment development programme between Dudley College in the UK and Government Women's Polytechnic College in Thrissur (Kerala). This will involve Dudley College delivering training around the best use of the 'Blackboard' learning environment (a user friendly online platform for e-learning) in India, leading to the development of new e-learning materials across a range of skill based curriculum areas. There will also be staff exchange opportunities for staff from Government Women's Polytechnic to visit Dudley College to share good practice in e-learning.

Government Women's Polytechnic College, Thrissur, India	Dudley College, West Midlands, UK

Nursing Skills Development to Improve Quality of Mental Healthcare in West Bengal

The overall project objective is to increase mental health awareness and to enable nurses to develop an integrated and systematic approach to provide quality care to patients with mental health conditions. The project will primarily target the nursing workforce but will facilitate opportunities for inter-professional learning and spread to other professions including doctors and allied health professionals.

Adaptation of Health Education England mental health awareness raising resources, in order to develop a similar package relevant for West Bengal.

Develop a strategy and guidance for roll out of the mental health learning package to the West Bengal nursing workforce.

Support the implementation of the guidance, promoting the package and strategy.

Support nursing staff to educate patients and their families about mental health conditions to help reduce stigma and improve outcomes for patients.

To link West Bengal partners to other successful projects in India which aim to improve care for people with mental health problems.

Facilitate opportunities for bi-directional learning, including identifying different ways of working with limited resources.

Explore potential for institutional partnerships and initiate pilot nurse placements/volunteering opportunities.

Institute of Health & Family Welfare, Kolkata, India	Health Education England, UK

Building Social Entrepreneurship Capacity Among Technology Graduates in Tamil Nadu and Kerala

"The project brings together UK and Indian expertise in technology and social entrepreneurship education and incubation to:

Develop entrepreneurial skillsets among technology graduates

Increase capacity for socially entrepreneurial activity within India's technology sector Social entrepreneurship education serves a dual purpose of developing technology students' entrepreneurial skills whilst also empowering them to apply their technological training to solve real world problems. By exposing students at Indian technology colleges to the principles of social entrepreneurship, the project will simultaneously offer them a platform to develop their own skills as social entrepreneurs and bridge the gap between technology and community challenges. "

Centre for Social Innovation and Entrepreneurship, IIT Madras, India	University of Southampton, UK

Training for All (T4A)

The overall aim of T4A is to develop a world-class apprenticeship programme for equipping special education needs (SEN) students in India and mainstream students in the UK with employability skills to compete for job opportunities among SMEs in the IT industry. Drawing on strengths of partners in each country, T4A will develop two curricula underpinned by the latest pedagogical approaches. One, leverages UK's expertise in new ways of SEN teaching to enable Indian trainers to move away from the one-size-fits all-model. The other draws on India's unique expertise to develop apprenticeship programmes for UK institutions. In both cases, the objective is to customise learning processes to specific needs of individuals. The first curriculum will 'train the trainers' in Tier I and II institutions in India so they systematically train trainers in lower tier colleges. In the UK, the curriculum will engage industry, colleges and universities in the process of identifying best practices and success stories from India to incorporate in apprenticeship qualifications.

Indian Institute of Technology Delhi, India	Brunel University London, UK

Training of Trainers Towards Capacity Building in Skills and Education (TOT-CBSE): A Sustainable Approach and New Directions

The overarching aims and objectives of the Training of Trainers towards Capacity Building in Skills and Education (TOT-CBSE) project is to:

Carry out a systematic review, assessment and analysis of the gaps existing between the demand and supply of skills needs in the areas of engineering & non-engineering trades across the geographical areas of Tamil Nadu, Andhra Pradesh, Telangana, Karnataka, Pondicherry, West Bengal, Orissa, Assam & Kerala

Generate awareness and sensitivity to the relevance and importance of trained and experienced skills instructors with behaviours, attitudes and knowledge of vocational education and skills needs, quality improvement of manufacturing and engineering demands

Develop and deliver Leadership and Management workshops for ITI principals, heads of institutions within private and govt organisations, skills training providers to build capacity for progress and growth

Develop and deliver Pedagogical skills development workshops for capacity building skills training instructors to deliver high quality vocational education, training and assessments

Facilitate the establishment of a sustainable model for trainers training in skills and vocational education in the region taking into account the national and global agenda.

National Institute of Technology, Tiruchirapalli, India	Dudley College, West Midlands, UK

ANNEXURE IV

LIST OF PARTNERSHIPS FUNDED UNDER UKIERI-DST CALL FOR RESEARCH PROPOSALS

	Project Title	Indian Institution	UK Institution
1.	Concentrating Solar-Thermophilic Anaerobic Reactor for Municipal Solid Waste (COSTARMSW)	Indian Institute of Technology, Delhi	Brunel University London
2.	Developing Explainable Artificial Intelligence for Safety Arguments for Connected and Autonomous Vehicles	Indian Institute of Technology, Kharagpur	University of Warwick
3.	Conversion of Wet Waste to Fuel and Value-added Products Using Hydrothermal Carbonisation	Indian Institute of Technology, Bombay	University of Leeds
4.	Waste to Engine-Low Temperature Combustion of Sustainable Green Fuels	Anna University, Chennai	Aston University
5.	Secure and Resilient Cyber Physical Systems	Indian Institute of Science, Bangalore	University of Strathclyde
6.	Analysis of Human Action in Unconstrained Videos	Indian Institute of Technology, Bombay	Oxford Brookes
7.	Development of Control and Power Electronics Schemes for a Smart, Micro Grid With High Penetration of PV Generation and Electric Vehicles	National University of Technology, Rourkela	Northumbria University
8.	Recycling Lithium Ion Batteries for a Sustainable Technological and Economic Development (Relisted)	Indian Institute of Technology, Hyderabad	Open University
9.	A New Framework of High-value Added Zero-Waste Recycling of Concrete From Construction and Demolition Waste	Indian Institute of Technology, Madras	Brunel University London
10.	Charm: Context-Aware Human Activity Recognition and Monitoring for Intelligent Vehicles	Indian Institute of Science, Bangalore	Edge Hill University
11.	Digital Twin Modelling for Automation, Maintenance and Monitoring in Industry 4.0 Smart Factory	Indian Institute of Information Technology (IIIT) Sricity	Middlesex University

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Development (MHRD)

Department of
Science & Technology

Ministry of
Skill Development and
Entrepreneurship

Department for
Business, Energy
& Industrial Strategy

Department
for Education

Department for the
Economy
www.economy-ni.gov.uk

The Scottish
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of Colleges

Universities UK