# HEIF case studies 2021: Cluster X

The Research England-funded Higher Education Innovation Funding (HEIF) supports higher education providers to exchange knowledge with business, public and third sector organisations, community bodies and the wider public, increasing economic and societal benefits from their work.

The case studies below demonstrate the ways that English higher education providers have used HEIF to support knowledge exchange activities, and the impact they have achieved. Cluster X includes large, high research intensive and broad-discipline universities with significant amounts of research, much of it funded by UKRI and government bodies.

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# Loughborough University: Minimum Income Standard – defining a decent standard of living and helping more people to achieve it

Our research – conducted by the Centre for Research in Social Policy (CRSP) – to define the <u>Minimum Income Standard (MIS)</u> began in 2006, with first results published in 2008.

The Minimum Income Standard, developed by the Centre for Research in Social Policy, provides policy makers, practitioners and campaigners with an evidence-based method for compiling household budgets based on input from the public. It enables them to develop practical solutions and policies to address the needs of low-income households.

# What is MIS?

MIS identifies the amount of money different types of households require to achieve a socially acceptable standard of living. In 2018-19, 30% of the UK population (19.6 million people) were living below MIS – an increase of 3.4 million since 2008-9. For people living below MIS, it can be a struggle to cover the cost of essentials.

## Our research and its impacts

Since 2009, we have recalculated and updated MIS annually. This involves consultations with the public to determine the weekly budgets needed by different households to maintain an acceptable standard of living that supports participation in society.

This research is principally funded by the <u>Joseph Rowntree Foundation</u>, but other organisations have supported specific studies around the cost of living, for example, in rural communities; for those with sight and hearing loss; and for children in foster families. Our work defining MIS for London is supported by Trust for London.

MIS now informs efforts to tackle low income in the UK. For example:

- It has demonstrated that the National Minimum Wage is too low for many households to reach a minimum acceptable standard of living – encouraging employers to adopt instead the <u>Real Living Wage</u>. To date, more than 7,000 Living Wage employers have increased the pay of more than 250,000 workers.
- Charities use MIS to disburse £20 million every year to households in need.
- Meanwhile, the Scottish Government spends £10-12 billion to reduce fuel poverty, defined using MIS.

MIS supported the 2017 Supreme Court ruling that outlawed employment tribunal fees. Since then, 64% more workers have accessed tribunals.

In addition, MIS is being piloted and adopted worldwide – in France, Ireland, Japan, Mexico, Portugal, Singapore, South Africa and Thailand – to explore ways to introduce policy and practice that will ensure a decent standard of living for people across a range of socio-economic situations.

# How HEIF supported this activity

This research has received on-going support from the University's HEIF-funded Professional Services staff – including Partnership Development and Consultancy – to leverage external funding to develop the Standard.

HEIF funding was also awarded through the University's Enterprise Projects Group to enable CRSP to apply the MIS in South Africa and Mexico through specific project activity. The focus was on knowledge exchange through providing training and expertise to enable on-going programmes of MIS to be established. In the longer-term, there is the potential to influence and shape policy and practice in each country.

# Loughborough University: Previsico – commercialisation of the world's first property-level surface water forecasting tool

Over 20 years of world-class research has been translated to deliver the world's first real-time surface-water flood nowcasting technology.

Partnering local, national, and international stakeholders, this activity has resulted in the global commercialisation of third-generation technology, crucially aligned to UK Government's long-term resilience plan (infrastructure and place: <u>Industrial Strategy</u>) and the UN framework for disaster-risk reduction.

In 2016, driven by the lack of openly available data about which properties flooded, to what depth and damage level, the Cabinet Office, the Environment Agency and the Met Office invited Loughborough University to develop a high-resolution surface-water forecast method that would integrate with ResilienceDirect, a free service to councils, emergency services, utilities, transportation companies, and government agencies.

In 2019, the spinout, <u>Previsico</u>, was launched to exclusively licence the technology. In July 2020, following validation in 50 cities across 5 continents, Loughborough's surface-water flood nowcasting was integrated into ResilienceDirect – a world first for an emergency planning system.

Harnessing the latest IBM Weather rainfall data, Previsico uses property-level forecasts for surface water, river and coastal flooding to provide bespoke and off-the-shelf analytical solutions showing the accessibility of operations teams, enabling organisations to proactively mitigate the impact of flooding.

HEIF provided funding for proof of concept and business planning. HEIF-funded Business Partnership Research Commercialisation and Marketing teams have facilitated stakeholder engagement, spinout and promotion.

## Impacts achieved in less than two years

- A nationwide, flood forecasting system transforming Terabytes of data into actionable warnings
- A dashboard that aggregates and presents data from the Environment Agency, Natural Resources Wales, and the Scottish Environmental Agency.
- An email warning service that automatically alerts customers if they have an asset at flood risk.
- Service migration from research servers to manage, process and store data into the Cloud with AWS, using UK and Ireland data centres for resilience.
- Successful prototype sensor trials to capture real-time flood data with the Somerset Drainage Board and communities in Cornwall and Lancashire, leading to a minimum viable product that will result in the ingestion of remote data to calibrate and improve the performance of Previsico's flood model.
- A cutting-edge near real-time satellite image processing technology which integrates with the modelling system to produce validated hindcasts.
- A real-time accessibility mapping tool to help emergency responders coordinate where to locate vehicles during flood emergencies

- A new product pipeline using both sensor and satellite data to further improve the service.
- Establishment in the UK and the US (the world's largest insurance market) and an office launch in Hong Kong to facilitate roll out to the Asian market.
- Raised over £1M, created 20 technical jobs.
- Service subscriptions for two leading insurers, with a major commercial client, and a housing association with 70,000+ homes
- Successful modelling of Tokyo across a variety of historical flood events for a major Japanese commercial client.
- Successful delivery of first humanitarian project delivered with Kenya Red Cross, continued service expected.

# Royal Holloway: StoryFutures – collaborative R&D for innovation and growth in creative industries

## What is the activity?

<u>StoryFutures</u> fuels growth by linking creative innovators in the Gateway Cluster and Greater London with academic experts to develop ground-breaking R&D, prototypes and products that use next generation storytelling technologies such as VR, AR, haptics and AI. It is led by Royal Holloway working with industry partners such as The National Gallery, Discovery, NFTS, the BFI, Figment and Nexus Studios, and HEI partners Brunel University and University for the Creative Arts. StoryFutures is part of the £80m <u>Creative Industries Clusters programme</u>. It is home to the National Centre for Immersive Storytelling <u>StoryFutures Academy</u>, which helps the UK's screen professionals develop cutting edge skills in immersive storytelling.

## How did HEIF support this?

HEIF covered the cost of a member of the University's Research and Innovation staff to work closely with the academic team to develop the initiative, and to lead on delivering knowledge exchange activities, collaborative R&D and industry engagement. This FTE contribution provided professional skills in knowledge exchange, partnership development, evaluation, and access to external contacts. This embedded way of working has ensured active engagement between industry and academic community, aligning research strengths with industry needs.

## What are the benefits?

By December 2020 the programme had enabled 82 R&D collaborations and engaged 750 companies. We held over 60 workshops and events on topics such as IP, commercialisation, tax credits, access to funding etc. Our work supported 16% average company growth. We secured nearly £3m of further investment for creative industry R&D, encouraged SMEs to invest £1m in prototype development, and helped create or save 128 employed roles.

"Being awarded a StoryFutures Fellowship isn't just a great honour, it is also the key to accessing a wealth of world-class expertise, support and partnerships which are absolutely priceless and simply could not be found anywhere else."

(Jon Meggitt, Co-founder, Arcade)

"Working with StoryFutures was fantastic. The access provided to excellent psychologists at the top of their fields was invaluable for ensuring a solid, psychological, evidence-based product was developed." (Sarah Campbell, CEO, Play Well For Life)

StoryFutures' work also tackled social and cultural challenges. Our collaboration with Nesta supported 4 projects addressing mental health and wellbeing; with Heathrow Airport we delivered Cupsy, an immersive recycling bin that increased coffee cup recycling by 130%. We helped The National Gallery launch its first audience-facing immersive experience, and are now working with Roald Dahl Children's Charity to develop new ways to engage children with transition of care.

## How has this supported government's and UKRI/OfS objectives?

The Government's Industrial Strategy committed significant investment to create new products and experiences that "position the UK as the global leader in immersive technologies". Our work responds directly to this priority.

We are strongly aligned to UKRI's strategic mission: we convene and catalyse business networks, foster partnerships, develop new approaches for innovation, and conduct collaborative R&D. We regularly involve students in our projects thus supporting student participation, learning and employability.

# Royal Holloway: Realising the quantum economy

Royal Holloway, University of London is supporting the UK National Quantum Technologies Programme funded by the UK government to drive industrial innovation in this field using our established quantum expertise. Superconducting quantum devices are expected to have wide applications in sensing devices that operate at sensitivities beyond the standard quantum limit, quantum information processing, new electrical standards, quantum simulators, new types of metamaterials. Superconducting quantum technology is widely thought to be a successful route to the construction of a quantum computer which is being pioneered by companies such as Google, D Wave and IBM etc.

Higher Education Innovation Fund (HEIF) has pump primed our support to the UK quantum supply chain for superconducting devices using our facilities and knowledge transfer on fabrication, new materials and device design. In particular, the quantum device supply chain has been supported with the nanofabrication capabilities of "SuperFab" at Royal Holloway. The £10M Class 5 cleanroom is aiming to support UK industry and the academic community to provide access to world-class nanofabrication equipment. This leading edge equipment is too expensive for private venture capital to purchase for early stage development therefore the college is making it available for industrial use.

HEIF funding has provided:

- professional support for reaching out to industry, especially supporting early-stage, spin-out and start-up quantum technologies companies to be able to design and build new components. In addition the funding support has allowed for industry user friendly facilities to cater for the needs of non-academics for example specialist equipment, working areas and storage to maintain confidentiality of the project work.
- 2. a quantum launch of SuperFab at the college in April 2019 to over 60 company delegates from around the UK to advertise our facility and networking with interested parties.
- 3. for licensing of our Hybrid Superconducting Quantum Interference Device (HyQuid) to Croton Healthcare Ltd for the use in a new generation of MEG medical imaging devices.

Our collaboration with industry has led to an award of an Innovate UK grant "Reliable, high throughput production and characterisation of coherent superconducting devices". The UK's innovation agency, awarded Oxford Quantum Circuits-led consortium the largest ever Government grant (£6.8 million) aimed at the commercialisation of superconducting quantum technologies, and positions the UK as a global leader in the field.

SuperFab has now been used to manufacture bespoke Qubits by industry with high coherence properties which will be a critical component for a UK-designed quantum computer. It is through the above activities that SuperFab is helping to realise a whole new quantum economy in the UK, and helping the facility to be sustainable for the future.

# Durham University: Orbit – University Enterprise Zone

In 2016 Durham University created a small economic development team within Research and Innovation Services (RIS) using HEIF resources to enable and support the development and delivery of knowledge exchange initiatives at the University. This team have been instrumental in successfully bidding for a variety of substantive external resources supporting our civic mission as well as ensuring compliance and delivery objectives are met. They actively partner with other universities in the region as well as strategic partners; maximising the local impact from the programmes of support developed.

Currently the team are in the final stages of launching the Durham University Enterprise Zone - **Orbit.** The team successfully bid for £1.4million of capital from the Research England UEZ programme and also accessed revenue resources from ESIF funds to ensure the tailored centre management and business development resources are maximised at launch.

The UEZ funding is being used to refurbish an underutilised University building at <u>NetPark</u> into business accommodation and hot desking space with an explicit focus on university engagement and supporting

R+D investment in the region. Orbit will be co-located with the Universities Centre for Advanced Instrumentation enabling access to facilities, expertise and equipment for Orbit members alongside the wider facilities. The space will also incorporate a dedicated knowledge exchange and networking space and the physical surroundings will enhance the ability for local business engagement with the university. Orbit will become a hub for business interactions, start-up / spin out support and partner engagement in County Durham.

Orbit is due to open in June 2021 and will be a significant part of the local innovation ecosystem where there are limited similar facilities available and represents the first such facility led by the University. Our partners at Orbit are CPI (a member of the High Value Manufacturing Catapult) and Business Durham (the economic development arm of Durham County Council). We have an MoU in place to support the development of NetPark alongside these core partners and Orbit will contribute to levelling up, enhancing local R+D spend and graduate retention.

None of this would have been achieved without the HEIF resource supporting the economic development team in Research and Innovation Services.

# Durham University: Extraordinary co-operation – the P&G Durham University Strategic Partnership

HEIF resources have been used to support core Research and Innovation Services team members to firstly develop and then support, nurture and grow a strategic partnership which is global in scale, multidisciplinary and collaborative yielding real world economic and societal impacts as summarised below.

Our strategic relationship with the global, fast-moving-goods leader, Procter and Gamble (P&G), has been cited as a 'best in class' exemplar. Already significant, the size, scale and scope of this relationship continues to grow. Key highlights include:

- More than 100 funded projects.
- The Durham–P&G model being cited as a case study in influential reports to the UK government.
- Being presented as a global leader in multidisciplinary research to the US Congress.
- Both parties using the relationship to broaden industrial and academic collaboration.
- Research outcomes of far-reaching impact.

Activity as part of this relationship has been cross-University, embracing both the research and education agenda and involving the departments of Biological Sciences, Chemistry, Earth Sciences, Engineering, Geography, Mathematics, Physics, Psychology and the Business School, as well as several of our research institutes; and it has been international, through our work with P&G in the UK, USA, Germany, Belgium, Singapore and China.

Examples from the research portfolio include:

- Liquid-repellent surfaces (surface science): simulations for developing superhydrophobic surfaces and understanding the key parameters affecting the stability of these surfaces, allowing P&G to produce new, adsorbent materials and save on development costs.
- A complete metal sensory system (life sciences): understanding *in vivo* metalation processes responsible for ~50% of human life processes, to help reduce bacterial growth using ionophores.
- Skin model transformative platform technologies (life sciences): understanding the structure and function of skin, to help develop tools to protect and repair the skin as well as reverse ageing.
- **Anti-counterfeiting** (data sciences): developing a deep-learning system, to analyse image features for detecting counterfeit goods and protecting intellectual property.

Strongly supporting the Levelling Up agenda and the R&D Roadmap, the partnership functions on both a regional and international level with very close collaboration with P&G's Newcastle Innovation Centre driving UK-based innovation in support of P&G's major research assets in the Northeast and subsequent research investment from their US-based headquarters.

# University of Hull: Occupational stress risk assessment

## **Brief description**

The University of Hull has had extensive contract research with industry, providing comprehensive assessments of workplace stress-risks and an evidence base for interventions. This work has developed into a major commercial workstream. Initial development work expanded the Health and Safety Executive's approach to managing work-related stress by incorporating health outcomes and developing bespoke stress-risk assessments. This resulted in the development of commercial tools and a formal collaboration with HSE.

## **HEIF support**

HEIF has supported three closely-related projects:

- 1. **Knowledge Exchange post (2019)** a post was created to explore the work's commercialisation, including market-research, strategy and marketing materials. The high success led to an opportunity to develop a digital customised tool.
- 2. **Digital tool development (2020)**. This produced a tool automating data collection, enhancing the consultancy service and allowing the approach to be scaled up for wider exposure. The HSE collaboration agreement resulted in expansion of their existing Stress Indicator Tool.
- 3. Data collection (2020-21) A suite of specific stress-risk instruments are in development, including a Remote Working Stress-risk Assessment Tool, emerging from an MHCLG-funded project supporting Local Authorities managing COVID-19 challenges, but relevant for any remote workers. HEIF supported *Snap Surveys* to develop the existing HSE platform for data-collection from two Local Authorities, providing tool validation, development of case-studies and creation of industry benchmarks.

### Societal and economic benefit

Work-related stress is a national concern with major socio-economic implications. Incidence has risen significantly: >800k workers currently self-reporting work-related stress, anxiety and depression, accounting for 55% of work-related-ill-health days lost. The programme has had regional and national impact, promoting proactive approaches to control stress-risks and improve worker health and wellbeing.

- 1. Four local authorities have utilised the remote-working tool to influence recovery planning/policy, including new guidance, and briefing papers. These evidence-based primary interventions address work-related stress causes.
- 2. The tool is being incorporated by HSE into their digital platform, bringing additional functionality and flexibility to the data that organisations can collect. This will help users to manage work-related stress in their organisations.

3. The approach has provided improved income streams for University of Hull, contributed new IP to existing HSE tools and established the foundation for improved income for HSE.

#### Support of government priority area and RE-UKRI and OfS

This work contributes to 'People: Good jobs and greater earning power for all' within UK Industrial Strategy. Good jobs depend on healthy workplace characteristics. This work has delivered a new approach to enhancing healthy work, providing tools and a framework for organisations to assess the nature and prevalence of their stress-risks and links with health outcomes, and help develop targeted interventions addressing the sources of stress-risk.

This work is also highly relevant to the RE-UKRI COVID-19 recovery objective. Many UK workers have had to adopt some level of homeworking. This work delivered a tool supporting organisations in evaluating the unique impact of remote working stress-risk on health and wellbeing. This will continue to be useful as new working patterns develop.

# University of Hull: Strategic collaboration with Smith & Nephew

## Brief description of activity

HEIF funding was awarded to support the development of a new strategic collaboration between the University of Hull and the multi-national company Smith & Nephew (S&N) in the area of advanced wound care.

# Activity supported by HEIF

The funding directly supported the salary of a Business Services Technician to deliver a proof-ofconcept project for S&N in one of their priority development areas. The Business Services Technician remained in the advanced wound group after the HEIF funding, working on multiple S&N projects over the last 3+ years.

## Societal, economic or student benefit

**Training:** The HEIF funding led to a cluster of 8 PhD students, who have been trained in woundrelevant biology, chemistry and engineering. Since the HEIF funding an additional 22 Undergraduate and 2 MSc students have undertaken projects involving S&N. 8 research staff have been employed/trained on follow-on projects. 12 Academics from biology, chemistry, engineering, computer science and the Medical School have been involved in projects, gaining important industry insight and exposure.

**Economic impact:** HEIF funding was instrumental in initiating the S&N/Hull strategic collaboration which has delivered over 30 collaborative/contract research projects valued at over £1.5M. Multiple high impact research publications and a patent application have developed from the S&N relationship.

**Societal impact:** Projects have spanned proof-of-concept, through early stage product development to clinical and claims. We have contributed to mode-of-action studies for existing wound products, including clinical studies. Hull University has been instrumental in shaping the S&N 3-year plan for wound research and innovation.

## Supporting a government priority area and RE-UKRI and OfS strategic objective

HEIF funding has supported new capabilities and raised research ambitions in advanced wound care, a pioneering area of industry engagement at Hull. We have grown a strong place-based collaboration sharing resources and facilities across the University of Hull and Smith & Nephew's state-of-the-art advanced wound research and development centre (located in Hull). In the last 3 years we have continued to build capacity and develop world-leading infrastructure. We have partnered with an additional 5 companies in wound care, and secured MRC, InnovateUK and charity funding.

Chronic wounds are a major societal issue and a key clinical challenge, closely linked to the ageing population and a deprived local demographic. We have attracted and retained talented individual researchers expanding an area of strategic research importance to the University. This includes recruiting 2 new lecturers in wound healing to support and build upon our established international reputation. We have integrated students (undergraduate, MSc & PhD) into the partnership, providing important industry-relevant training.

# **University of Kent: the Kent HR Network**

The <u>Kent HR Network</u> was established in 2017 to enable HR professionals and small business owners responsible for HR to engage with academic experts from the University of Kent, aiding collaboration and KE. The network is sponsored by external organisations, and offers regular webinars, networking and training events, and an annual HR conference.

## Activity supported by HEIF

The network is led and supported by the central KE professional team members, whose roles include liaising with the Network sponsors, arranging academic participation in events and monitoring and promoting the Network's online channels. One such channel is the Network's dedicated LinkedIn group, which taps into the social media platform's facility to connect HR professionals from a range of businesses in a virtual space. As a result of recent staff efforts to target and invite HR professionals to the Network, the group has grown from a few hundred to over 1,300 members.

## Societal, economic or student benefit

By establishing this sector-specific community, the team has been able to target its events to appeal to HR professionals and has therefore seen a threefold increase in the number of people registering for webinars. As well as showcasing the University's expertise in HR-related subjects, the webinars widen awareness of the University's willingness to embark on KE activity with businesses. It poses new opportunities for businesses to discover and get in touch with us, and for our Business Relationship Officers to connect directly with businesses through individuals in the network.

## Supporting a government priority area and RE-UKRI and OfS strategic objective

The network has clear alignment with government priorities, such as:

- Encouraging the adoption of innovation is central to the government's Build Back Better agenda. Showcasing the latest research and ways to collaborate with academia, and providing space to discuss, will develop ideas and increase awareness of potential to collaborate to innovate.
- "Excellent universities ... which work closely with businesses and international partners. This research ecosystem stimulates innovation through the exchange of ideas, knowledge and talent." (Build Back Better, p. 50)
- Build Back Better also states that delivering an improved infrastructure, skills and innovation will be a joint endeavour.
- Skills for jobs: lifelong learning for opportunity and growth White Paper to engage in a sustainable, two-way exchange with industry, building up long-lasting networks with employers.

# University of Kent: Covid-19 business recovery webinar series

The <u>Covid-19 Webinar series</u> was introduced by the University's central KE team in response to the impact of the pandemic on the business community. Developed in June 2020, the team collaborated with academics to help businesses through the crisis. The topics included:

- career callings in the Covid-19 workplace
- making effective business decisions after Covid-19
- flexible working post-pandemic and return to work
- e-commerce, how to enter the virtual retail world
- scanned handwritten signatures, fodder for forgery
- Show me the money! What financial support is available
- (re)Imagining tourism
- translating culture online
- stories, wellbeing and business: finding meaning in Covid-19
- working with neurodiversity in mind: what can we learn from lockdown
- rethinking inclusive employment practices in lockdown: live comedy
- backup or pack up
- creating value through innovation: in the tourism and leisure sector.

Their aim was to aid businesses in getting back up and running, with advice and guidance on how businesses could progress and continue to grow post Covid-19.

The webinars were organised by the central Business and Innovation Gateway team, in partnership with academics and businesses.

Ten webinars were held between June and December 2020, with over 300 people having registered for the events, and over 400 having watched the recordings of them on the KEI YouTube channel.

Positive feedback on the series included:

"This series of webinars for SME's run by the University of Kent was very useful and provided a number of action points to support our future planning. Thoroughly recommend this series to clients who would be interested or benefit from the webinars." (Christopher Savage, FISM Director)

"[This is a] challenging time for the thousands of Kent businesses which make up the visitor economy. Visit Kent is delighted to support the University of Kent's Business Resilience webinars to discuss top tips on innovation, business modelling and key trends." (Deirdre Wells OBE, Visit Kent)

"Webinars were very well researched & presented & it was a pleasure to be part of. The opportunity for questions to speakers and interest in what the delegates attending the webinar have according to their own interests has proved really valuable." (Lydia Saul MA, Bedford Borough Council)

Webinars continue to be developed and are freely available online.

The webinars align with government priorities:

#### • Build Back Better:

'As the economy starts to recover, we must confront the challenges created by COVID-19 and minimise the risk of lasting economic damage from this crisis'. 'Encourage the adoption of innovation'.

'Showcase the latest research and ways to collaborate with academia, and providing space to discuss, will develop ideas an increase awareness of potential to collaborate to innovate'. 'Excellent universities... which work closely with businesses and to stimulate innovation through the exchange of ideas, and knowledge'.

#### • Lifelong Learning for Opportunity and Growth – White Paper:

'Engage in a sustainable, two-way exchange with industry, building up long-lasting networks with employers'.

# University of Surrey: Vidiia – portable COVID-19 test-kit spinout

The University of Surrey used an accelerated and collaborative approach to spinout commercialisation with local company Vidiia to take a COVID-19 test kit to market during the pandemic.

When the COVID-19 pandemic affected the UK in early 2020, scientists in our Vet School, our Centre for Vision, Speech and Signal Processing (CVSSP) and their colleagues in the universities of Lancaster and Brunel realised that research they had been working on to create a portable loop-mediated isothermal amplification (LAMP) test kit for use on poultry could be adapted to detect SARS-Cov-2(COVID-19). LAMP technology offered society the opportunity for affordable point-of-care testing if it could be successfully and safely migrated out of the laboratory. Brunel's engineering designs, married with Lancaster's and Surrey's microbiology expertise and Surrey's AI technology and laboratory capability to create a functioning prototype by early May 2020.

Vidiia Ltd was formed in June 2020 by experienced software entrepreneur David Rimer and the Director of GB Electronics to take the prototype forward to commercialisation. Whilst David and his team understood software and business, they did not understand virology and diagnostics and so continued intensive support from the University of Surrey's Vet School team was essential to help the newly formed company progress.

Along with dedicated support from the technology commercialisation team, navigating and negotiating the IP ownership in the collaboration, £60k of HEIF funding was channelled by the University of Surrey's Innovation Strategy team to the Vet School to buy out academic resource to support a range of KE activities including:

- helping the Vidiia team understand the science of LAMP, and the processes that the testing kit would need to perform
- receiving feedback from the Vidiia team on what changes and adaptations the market required as plans were made to migrate previously laboratory-only based processes into point-of-care use.
- applying for NHS ethical approval for access to human COVID-19 swab samples in collaboration with neighbouring NHS Trusts at Frimley Park and Royal Surrey County Hospital and BSPS.
- evolving buffers, primers and reagents used in laboratory-based LAMP processes for use in a portable test kit
- optimising the LAMP reaction and AI detection technology
- conducting extensive testing on the product versions being rapidly produced by Vidiia as they iterated through product improvements
- supporting Vidiia staff on site at external and on-campus test locations to conduct demonstrations of the technology and actual tests
- support from SETsquared Surrey incubation programme in developing their business model and investor proposition and pitching to S100 Club Angel investors.

The outcome of this knowledge exchange activity has been that Vidiia Ltd has:

- supported the University of Surrey in its on-campus testing services in conjunction with our Vet School scientists
- achieved strong commercial traction with COVID-19 test service providers in the market
- increased their engagement within our innovation ecosystem by basing their HQ on our Research Park
- philanthropically donated shares to the University (qualifying it as a spin-out)
- secured over £250k of private investment from an Angel investor
- accelerated their commercialisation of an intelligent COVID-19 test platform.

# University of Surrey: Smart Separations Ltd – developing antiviral coatings and microfiltration on the Surrey Research Park

The University of Surrey has an active local Innovation Ecosystem, helping innovative companies to grow, through access to skills, facilities, funding and talent. Smart Separations is an example of a company that has maximised the support available through the ecosystem and achieved innovation commercialisation success.

Smart Separations joined the SETsquared Surrey incubator in 2014, locating their UK headquarters on the Surrey Research Park and receiving world-leading business acceleration support services. Smart Separations Ltd has created a new generation of antiviral coatings and ceramic membranes. From manufacturing to air purification and from transportation to health care, Smart Separations works with partners where antiviral coatings or microfiltration is needed.

Smart Separations have been supported to collaborate with academic experts at the University of Surrey in Chemistry, Chemical Process Engineering and Mechanical Engineering in order to explore different applications of their ceramic membrane technology. They have been supported to facilitate access to the most appropriate funding sources depending on the nature of the collaboration. Successful collaborations have included:

- HEIF SME Innovation Voucher project: Combining Smart Separations' microchannel membrane technology and the University of Surrey's novel catalysts for CO2 conversion, the project enabled the effective chemical conversion and separation of CO2 to added value products (syngas and methane) in one single step
- CCF SPRINT project: Testing the performance of micro-catalytic ceramic filters for use in mono-propellant thrusters in small satellites
- a funded studentship
- Innovate UK-funded collaborative research project on the development of biodegradable and recyclable antimicrobial stickers
- successful award of Innovate UK grant on efficacy and safety assessment of the personal air sanitizer, Gino
- Impact Acceleration Account-funded placement
- recruitment of a Surrey graduate to the development team.

"The collaboration with Smart Separations has been a very successful experience. We have strengthened our industrial co-operation while delivering ground-breaking catalytic membranes to combat global warming." (Dr Tomas Ramirez Reina, Head of the Catalysis Unit, Chemical and Process Engineering Department)

"We are very pleased with the results of our recent collaboration. On the scientific part, we exceeded everyone's expectations regarding the performance of the Smart Separations membranes and have demonstrated that our membranes can be used for catalysis." (Dr Hugo Macedo, CEO, Smart Separations Ltd.)

Smart Separations have grown to a team of over 25 people, with development labs in Europe and at the Surrey Research Park, contributing to local growth of highly skilled employment. They have won an impressive collection of awards and funds demonstrating their excellence in innovative product development.

The Covid-19 pandemic brought a new focus to Smart Separations. The team were able to quickly pivot to applying their coating expertise to developing solutions aimed at limiting the spread of the virus. A result of those efforts is ViraTeqR, a revolutionary nanocoating technology that destroys SARS-CoV-2 on surfaces. The company is now launching its first ready-to-use product which utilises ViraTeqR technology by applying it to self-adhesive stickers, a customisable solution for all industries and sectors.

# **University of York: Entrepreneurship support**

York provides students, staff and local entrepreneurs with a great package of support to help test ideas and to build up experience in business. This includes training and mentoring, access to our startup incubator Phase One, funded internships with regional SMEs and grants through our new Fund Venture One, developed to support the most promising startup businesses.

Examples include Yoyo Chang, a management school student, who developed **KodyPay**, a hardware-free next-generation mobile phone retail payment app. Kody was able to trial the app in a real-world environment and received support from the University to pilot KodyPay in our campus supermarkets.

Yoyo benefited from close support and early-stage finance from the University's Enterprise Team, Santander Universities and connections with alumni entrepreneurs. Recently, Yoyo secured a £1.8m investment from a consortium of private investors including IBM's Cognition Foundry.

Michael McCreadie, another Management School student, took advantage of Venture One to develop **Kit Keeper**, which enables students to securely store their possessions between terms without the hassle of sourcing their own boxes and arranging their own transport. The funding allowed Michael to hire brand ambassadors and a digital marketing manager as part time employees.

Kit Keeper is the official Storage Partner for York, Brighton and Oxford Student Unions and is expanding into Nottingham and Cambridge universities. He has developed partnerships with national couriers and storage operators and featured in *The Mover* magazine.

In 2021 Michael received a Young Innovators Award from Innovate UK and the Prince's Trust, and cited the Venture One award as a key component of his success.

Aidan Laycock, founder of **Elbowspace Ltd** was an employee at the University of York when he applied for Venture One. The fund allowed him and his team to work full time on the business which provides Student Unions with a modular platform for managing customers. It also allowed the company to start winning larger contracts, accelerating cash flow and should lead to further jobs within 6-12 months. As the business has developed Aiden has started to look at further investment opportunities from other education providers and EdTech incubators. The fact that Elbowspace has received endorsement from the University of York, through the Venture One funding, has given the business an additional level of credibility with these potential new partners.

Our support does not only extend to entrepreneurial undergraduate students. In 2018, we established the **York Enterprise Fellowship Programme** which allowed researchers to spend a year, fully funded, developing their research idea into a commercial application. Fellows and their teams receive one-to-one expert mentoring and take part in a series of courses on business and finance, customer engagement and leadership.

Examples of successful outcomes include the commercial development of <u>EarthBound Scientific</u>, an ecosystem monitoring system, and <u>The Four Mountains Test</u>, a spatial visualisation test for the early diagnosis of Alzheimer's Disease.

# **University of York: Safe Autonomy**

Safe Autonomy is one of the University of York's strategic priorities, and is an area of research where we are truly world-leading. In 20/21, through two initiatives, The Assuring Autonomy International Programme (AAIP) and the Institute for Safe Autonomy, we have developed this area to include more research, translated this research into educational content, and developed further relationships with external partners.

**The Assuring Autonomy International Programme (AAIP)** is a £12million partnership between Lloyd's Register Foundation and the University of York, to advance the safety of robotics and autonomous systems (RAS) globally. The programme runs from 2018-2023, and works with multiple external partners to develop practical guidance on the assurance of RAS.

In 20/21, HEIF supported several KE activities within the AAIP, including the development and delivery of bespoke CPD for NHS Digital and supporting staff to develop a robotic demonstrator to support knowledge exchange. We have worked with industry, academic and regulatory partners, and the activities of AAIP are now a cornerstone of the University's new Institute for Safe Autonomy.

**The Institute for Safe Autonomy (ISA)** is a £35m strategic initiative for which the University of York secured £10.5m of funding from the UK Research Partnership Investment Fund. We have developed a strategy that brings together a unique set of competencies, and focuses on the following pillars:

- Design & Verification
- Assurance
- Advanced Communications
- Society & Ethics

In the past few months, researchers have worked with NATS (National Air Traffic Services), BSI (British Standards Institution) and the City of York Council on different projects, and hosted a workshop on the applied ethics around autonomy, all with the purpose of supporting engagement with policy-makers. This work was funded by HEIF, supporting staff time (academic buy-out and researcher time), strategic communications work, as well as consultancy to accelerate the safe adoption of autonomous shuttles in the city of York.

We are working with industrial and philanthropic partners who are contributing significant match funding, and developing strategies to embed economic development activities into ISA. In addition, we have engaged with members of the public to gauge their understanding of risk and interest in adopting autonomy in different settings.

We hosted workshops across the UK in early 2020 to understand the trust people are willing to place in autonomous systems - using driverless cars and autonomous infusion pumps in hospitals as case studies. We are expanding this work to gauge changes in attitudes because of the Covid-19 pandemic, and this will inform our work in ISA.

# Keele University: Smart Energy Network Demonstrator

Keele University Smart Energy Network Demonstrator (SEND) is a small town scale environment providing a platform that allows energy generation, distribution, storage, forecasting and energy balancing to be intelligently carried out across different energy sources using the Keele University campus as a 'living laboratory'.

Supported by UK Government Regional Growth Fund, BEIS and University funding and European Regional Development Funds, partially match-funded with HEIF.

The project capitalises on the area's competitive advantage in energy sector businesses, bringing this together with Keele's expertise in the Internet of Things, AI, complex systems, sensor and battery technologies, governance and behaviour change relating to sustainability to grow the sector locally.

Developed with Siemens UK, the project not only positions the University as a leading institution in decarbonising its estate and operations, but also provides an environment to enable business research, development and innovation at all levels. Supporting programmes include a Doctoral Training Academy supporting intensive R&D within local businesses, three-month graduate projects, and a supply chain development programme with our partners Stopford UK. Together these have supported over 200 businesses in the area since 2016.

#### See Siemens' video about SEND.

### HyDeploy

The demonstrator environment at Keele provided the trials site for <u>HyDeploy</u>, a pioneering programme involving Cadent, Northern Gas Networks, Keele University, HSE, ITM Power and Progressive Energy, the first ever in the UK to test and blending 20% hydrogen into the gas supply, without the need to modify appliances. This first trial on Keele's campus demonstrated the safety case, Keele's research providing valuable consumer insights. Trials are now underway in neighbourhoods in the North East and North West of England. As hydrogen does not produce CO<sub>2</sub> when burned, it presents potential to take large amounts of carbon out of the supply of heat to homes and businesses, accelerating progress towards Net Zero. The project was partially matchfunded by HEIF.

### Zero Carbon Rugeley

Keele's track record in delivering a research-informed smart localised energy system led to an invitation from Engie UK to partner on Zero Carbon Rugeley to deliver a detailed design for a smart local energy system for the town of Rugeley. This project focuses on user-centric approaches to engagement (led by Keele), business models and marketplace design, bringing together a number of leading organisations that are delivering solutions in the heat, transport and power sectors.

Again partially match-funded by HEIF, the project funding secured is part of the UK Government's (Department for Business, Energy & Industrial Strategy) £21m Detailed Design of Smart Local Energy Systems programme, part of a wider Industrial Strategy Challenge Fund programme called Prospering from the Energy Revolution

The SEND project (ref. 32R16P00706) is part-funded through the European Regional Development Fund (ERDF) as part of the England 2014 to 2020 European Structural and Investment Funds (ESIF) Growth Programme, and is available to ERDF eligible companies. The project is also receiving funds from the Department for Business, Energy and Industrial Strategy (BEIS).

# Lancaster University: Centre for Global Eco-Innovation

The Centre for Global Eco-innovation (CGE) pioneered by the Lancaster Environment Centre (LEC) represents a nationally-leading SME innovation centre developing clean growth technologies and services for global markets. Since 2012 it has engaged with more than 700 SMEs across the Northwest (NW), enabling them to access world-leading research expertise, facilities and international partnerships. It has supported more than 100 PhD and 50 MRes cross-disciplinary studentships. Through 'thinking globally and acting locally', CGE has extended its reach from the NW of England to international contexts through the China Catalyst (HEFCE Catalyst) and pan-African RECIRCULATE project (GCRF).

Eco-I NW is the new £14M programme delivered by CGE that will work with over 360 businesses across the NW to support R&D-led innovation in clean growth technologies, products and services to drive a green economic recovery. Viewed as a pilot for future UK Shared Prosperity Fund (UKSPF) opportunities, the project is led by CGE in collaboration with five NW based universities. The programme will enable businesses across the NW to capitalise on the region's knowledge base and research talent through supporting 70 PhD and MRes studentships, aligning fully with the OfS objective to drive increased student engagement with KE as a priority of their investment in HEIF. A 2019 independent evaluation of our regional innovation collaboration programmes including CGE and Eco-I NW projected **economic impacts of £18-28 per £1 of public investment**.

HEIF supported posts have been instrumental in working with broader academic colleagues in developing the initial centre, supporting delivery of activity, developing broader partnerships to grow the centre activities across SMEs, large businesses, local and regional government, Local Enterprise Partnerships (LEPs), and international partners who have all contributed to co-designed innovation based collaborations.

CGE continues to deploy student and graduate talent extensively to support research and development (R&D) projects in their delivery. This directly enhances graduate employability and the retention of talent in the region as well as developing innovation collaborations with regional businesses. The environmental impacts of these initiatives are as significant as the economic ones. The original CGE programme saved 27,000 tonnes CO<sub>2</sub> equivalent, 78,000 tonnes of water use and 60,000 of materials use over three years.

CGE directly supports the national 2.4% R&D, and levelling-up priorities. Partnerships established through CGE enabled the NW Coastal Arc Partnership Science and Innovation Audit, which identified significant global growth opportunities for businesses across all sectors focussing on a low carbon regional economy. It has provided significant input into the development of the N8's Net Zero North, a significant funding proposal to Government focused on R&D, innovation and skills to drive the national Green Recovery.

Lancaster is also the lead academic partner with Eden Project International on the development of 'Eden Project North' in Morecambe. We are also leading the collaboration between Lancashire, Cheshire and Cumbria LEPs to develop joint strategies on Clean Growth and on leading the national 'green recovery' through the Massachusetts Institute of Technology Regional Entrepreneurial Acceleration Programme (MIT-REAP). We were one of only six regions invited to participate in this new national pilot sponsored by BEIS focussing on the stimulation of place-based innovation ecosystems.

# Lancaster University: Business leadership for innovation-led growth

Building upon a nationally significant and highly impactful track-record in the development and delivery of SME leadership development programmes, Lancaster University Management School (LUMS) has created a suite of regional and national initiatives over the last 5 years directly aimed at improving national productivity performance in line with Government priorities. This began with a UK Commission for Employment and Skills/BEIS funded programme called Innovation in Manufacturing and Engineering (IME). This focused on innovation in leadership of advanced manufacturing SMEs and was co-created with BAE Systems. Within BAE's localised supply chain, there is an urgent need to improve the understanding of innovation and develop skills to recognise market opportunities (such as those created through digitalisation) in order to drive productivity gains.

This demonstration to BAE Systems of the impacts of collaboration with Lancaster and their supply chain on a local level, coupled with their direct involvement with the Government's Productivity Leadership Group (now Be The Business), led to the development of the Productivity through People (PtP) Programme. PtP, which has received Government recognition for its impact, is a nationally unique programme focused on behavioural change within advanced manufacturing owners/managers to empower positive employee engagement to boost productivity. The programme has received sponsorship from leading companies including BAE Systems, Rolls Royce and Siemens. A pilot programme delivered in the North West (NW) by LUMS led to a national roll-out delivered by a number of regional universities.

LUMS was then selected to develop and deliver a leadership programme under the Made Smarter NW Pilot Programme, supported by BEIS and working in collaboration with the Growth Company (Manchester), regional Local Enterprise Partnerships (LEPs) and the North West Business Leadership Team. The programme was designed for advanced manufacturing SME owner-managers wanting to improve productivity through Industrial Digital Technology adoption. LUMS also aligned a student consultancy stream within the pilot to support SME adoption through additional absorptive capacity resource, aligning with the OfS objective to drive increased student engagement with KE as a priority of their investment in HEIF. Following initial success, the programme was extended through new Government funding and forms part of a broader suite of provision under Lancaster's University Enterprise Zone focused on Secure Digitalisation.

Most recently, LUMS developed a new Innovation Catalyst model, focused on stimulating placebased innovation clusters, which have formed the basis of a number of regional Community Renewal Fund submissions to local authority partners. LUMS are also in dialogue with the Chartered Association of Business Schools to take a significant role in the delivery of the Government funded Help to Grow programme.

The development and delivery of these programmes were all enabled by an expert HEIF funded Knowledge Exchange team, who were critical to developing the strategic relationships and partnerships across both private and public sector key stakeholders. Through these combined programmes, LUMS and their partners have worked with almost 400 SMEs, directly supporting Government priorities including the Industrial Strategy, Productivity Leadership Group, Made Smarter Review, Build Back Better, the national 2.4% R&D, levelling-up and green recovery priorities, as well as regional LEP strategies.

# **University of East Anglia: Productivity East**

Economic growth and regeneration is an area of KE where UEA has been able to combine its strength in research, teaching and KE to deliver solutions. An example of this is <u>Productivity East</u> that targets the skills gap and will provide access to facilities through a combination of teaching, CPD, consultancy and access to facilities.

The programme will drive up productivity and growth within the region and includes establishing a new School of Engineering in response to local business demand. Productivity East is a collaboration between the Schools of Engineering, Computing and Norwich Business School, together with <u>New Anglia Advanced Manufacturing and Engineering Group</u> (NAAME) and <u>TechEast</u>. This £7.5 million initiative is co-funded by New Anglia LEP. With an initial focus on the advanced engineering and manufacturing sector, activities within Productivity East will also support the growing digital technology, agri-food and energy sectors.

Productivity East will provide new state of the art facilities on UEA's campus to deliver a new regional hub for engineering, technology and management. Working in partnership, UEA students, academics and businesses will be able to discover practical solutions to current and future challenges, explore new ideas, develop prototype designs and create innovative products and services.

Within the first five years, the initiative will provide 1,500 professional development opportunities for individuals from engineering and related sectors as well as enrolling an additional 1,268 new engineering students and learners to meet regional demand. To achieve this, sixteen new academic posts will be created, supported by thirteen research posts and eight skilled staff jobs.

The ability to design, raise funding and deliver complex partnership-based programmes such as Productivity East is greatly enhanced by the HEIF-supported Business Development Team.

# University of Essex: KTP at the University of Essex

## Details

The new business leads we develop with HEIF enable us to support our KTP programme with a highly agile team of five managing our entire portfolio. We take a proactive approach to making our research accessible to industry and through our KTP programme we are facilitating the application of Essex's world-leading research expertise to some of the major challenges of our time and addressing government priorities to Build Back Better.

# Fruitful partnerships

We aim to build sustainable relationships, with over **10% of projects being repeat business with partners on their second or third KTP with us**. A partnership of over 5 years and a hugely successful KTP with Orbital Global led to a new company being created. In addition to the KTP, we have made collaborative funding applications to the Smart programme, and jointly support tech entrepreneurship in our region. Another long-term partner, Above Surveying, has engaged with us on **3 separate Innovate UK funded collaborations**, taken on **3 Essex interns, a placement student** and scaled 3 times within our **Knowledge Gateway Business Park**.

## **Real-world impact**

Signal AI was founded on innovation through a KTP which supported their growth from **3 people working in a garage to a global company of over 150 staff**. We have now completed a second KTP and this collaboration has helped Signal access new markets and **raise a Series C round of £20m**. They attribute **2% of profits directly to their most recent KTP**. Signal's platform is also being used by **NGOs** such as Scholars at Risk and Amnesty International to monitor and verify reports of human rights violations.

### **Research momentum**

The KTP portfolio covers emerging/enabling technology, plus significant volumes of partnerships from other research clusters, spanning **8 different University departments**. Our Business School colleagues were one of the first Knowledge Bases to secure competitive **BEIS funding** to deliver management strategy KTP support to two local SMEs. Our **Psychology** experts are driving the adoption of energy saving behaviours, and increasing GP buy-in to technology.

### Access to talent

We pride ourselves on leveraging our graduate skills base for KTPs. We recently submitted 4 award nominations for Innovate UK's Future Leader award, celebrating researchers, such as one who modernised 300,000 lines of legacy code for Blackman & White, overhauling motion control software on their precision cutting machines. An impressive **12 months ahead of schedule**, they have extended the project scope including **building a novel machine vision system** and will be staying with the company post-KTP to **lead their new software team**.

# Agility to match business

Essex matches the passion and dynamism of our industry partners, providing expert guidance and support. Our agile approach has never been more important than during Covid; we have been able to **support our partners with additional flexibility**, **continued sign-posting to government support** and setting up additional support for project researchers through initiatives like **wellbeing drop-in clinics.** Maximising the benefits gained from the programme enables Essex to fully optimise HEIF to commercialise our research through working with businesses.

## Facts and figures

- Total industry income from KTP (2016–2021): £5.7 million
- Number of academic departments involved in KTP projects: Seven Computer Science Electronic Engineering, Maths, Government, Life Sciences, Law, Essex Business School, Psychology
- Number of Academics involved in KTP projects: 122
- Live KTP project number growth: 245% over 5 years



#### Visualisations - growth and breadth



# University of Essex: The economic impact of knowledge exchange at the University of Essex

To support our commitment to Knowledge Exchange (KE) we have undertaken an independent economic assessment to establish the baseline of impact that the University of Essex's research and KE activity delivers for the economy. A period of five years was assessed and the infographics below illustrate the key impacts delivered.

The overall impact is shown here, where all of the investment in research and KE accounts for 2,483 net jobs and £170.3m in Gross Value Added (GVA). Of this total 67% of impacts are generated from contract research and consultancy, and 17% from KTP activity.



Looking further into the detail of each area that we assessed, the KTP portfolio alone shows impressive statistics to enable the economy and jobs.

Last Five Years	- 8 -
KTP Projects   Investment 56 £12.5m	
Gross Jobs (Net) 913 (475)	<b>i p</b> ir
Gross GVA (Net) £54.7m (£28.5m)	
Return on Investment (Rol) £2.28 per £1	Ê

An area of growth for the University of Essex is our IP and commercialisation where our figures detail the benefit for our growing portfolio and demonstrate the potential for future expansion.

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	Last Five Years	
New Patent Applications	IP Income £92,000	
41	Gross Jobs (Net) 17 (9)	
IP Disclosures	Gross GVA (net)	
32	£1.0m (£0.54m)	
Licences 20	Rol £1.38 per £1	
	New Patent Applications 41 IP Disclosures 32 Licences 20	

The graduate start-up figures are also encouraging. A dedicated team has responsibility for the delivery of support relating to graduate start-ups. This is another growth area for the university, with the figures demonstrating our clear potential for further growth in this field.

Last Five Years	<u> </u>
Graduate Start-Ups 77	
Gross Jobs (Net) 178 (92)	<b>i p</b> ir
Gross GVA (Net) £10.7m (£5.5m)	

Whilst the restrictions due to Covid-19 have restricted delivery of Continuing Professional Development (CPD) over the past year, over the period of assessment the university is estimated to have generated £21.6 million of net GVA for the economy. The delivery of skills development and professional training achieved revenues of £9.6 million for businesses (£4.3 million), non-commercial organisations (£2.1 million) and individuals (3.2 million).

These figures indicate a strong basis to increase CPD provision over the next five years with regard to supporting the lifelong learning ambitions set out in the government's Plan for Growth (Build Back Better, March 2021).



The principal KE activity for the University of Essex resides within our contract research and consultancy portfolio with impressive econometric data profiling the benefits to the economy.

Last Five Years	- 8 -
Consultancy and Contract Research Investment £73.2m	O,
Gross Jobs (Net) 3,667 (1,907)	Î
Gross GVA (Net) £219.5m (£114.2m)	
Rol £1.56 per £1	Ē

The contribution of KE delivered by the University of Essex to the economy and our communities is evident and demonstrates the value leveraged through our HEIF investments. In addition to capturing our successes, the data informs our strategy for growth over the next five years which aligns with the governments' priorities such as; increasing R&D spend and innovation, the levelling up agenda and supporting students and graduates to increase the shared prosperity of communities.

# University of Exeter: SWEEP - a novel regional impactfocused partnership

<u>SWEEP</u> is a major NERC impact programme (2017-2022), which connects expertise at the Universities of Exeter and Plymouth and Plymouth Marine Laboratory with a large group (200+) of highly-engaged regional and national businesses, policy makers and community partners. SWEEP supports the region's decision-makers to adopt a Natural Capital Approach to investments and policy through the development of bespoke guidance, decision support and mapping tools. SWEEP is helping the SW to become a national exemplar for Natural Capital-led economic growth, social gains and environmental improvements.

SWEEP delivers a coherent programme of high-impact, co-designed and co-delivered research translation and innovation activities. The main services include provision of bespoke information, predictive modelling and spatial mapping, and the main types of impacts delivered to date include contribution to capacity building, up-skilling, training and learning and changes to attitudes, perceptions and organisational cultures in relation to Natural Capital.

Tackling single environmental issues will not deliver the innovation and impact required, SWEEP has therefore invested in a diverse set of impact projects. To date it has delivered 23 impact projects, with another 35 underway ranging from advising local authorities on coastal flooding risks, supporting Dartmoor's recreation strategy and helping farmers tackle pollinator decline.

One of the core deliverables is to produce tools, models and products that will empower land managers and policymakers to better understand the environmental consequences of their decisions. To date, SWEEP has produced 86 tools, services, products and protocols.

SWEEP has contributed to, or informed, 115 different private and public sector policies, strategies, business or management plans. It has also influenced over £95M of partner investments and business cases, supported partner cost saving in excess of £200M and created or safeguarded 17 jobs.

Building on £4M awarded from NERC, and with support from HEIF funding, SWEEP has received an additional £7.3M of match funding from partners (including £1.1M cash). SWEEP has also helped leverage over £43.3M of new projects to the UoE, UoP and PML and its partners to date.

SWEEP has a very active schedule of events, workshops and outreach activities to enable collaboration and co-design and co-delivery with our partner, with a total of 340 individual activities taken place to date.

SWEEP is delivering on influencing decision making in relation to the management of Natural Capital in the South West.

## Use of HEIF

Through the University of Exeter Open Innovation Platform, HEIF supported the SWEEP project with a contribution of £208k over a 5 year period starting in 2016/17. The funding contributes to the costs of Impact Fellows who work with the partners to support the delivery of impact. These roles are highly mobile, spending significant proportions of time embedded with partners using their academic expertise and background to deliver projects with impact.

# University of Exeter: HEIF funding seeds growth of Exeter innovation community

The University of Exeter's support for innovative and high growth, early stage ventures has been a regular recipient of HEIF funding. This has included funding the University's membership of the SETsquared Partnership, working alongside the Universities of Bath, Bristol, Southampton and Surrey to collaborate and share best practice around support for Research Commercialisation, Business Acceleration and Student Entrepreneurship.

Originally based in the Innovation Centre on the University's Streatham Campus, the SETsquared Exeter team leveraged HEIF to grow Business Acceleration services for student entrepreneurs and other Exeter businesses matched with income from membership fees and lettings.

These Business Acceleration services had a direct impact on regional businesses, attracting over £50M in equity investment for them in the past three years. SETsquared Exeter's alumni include Crowdcube, the world's first equity crowd-funding platform which is still headquartered in Exeter; Simpleware, a spin-out from the University which was acquired by US-based company Synopsys in a \$multimillion deal; and student start-up Charged-Up which started life as a masters project but has rapidly grown into a £multi-million venture-backed greentech company supported by M-Ventures, Founders Factory and Shell.

In 2015 the SETSquared Exeter team took over the operations of the 30,000 sq ft incubator building at the new 26 hectare Exeter Science Park. Since the launch of the incubator building, Exeter Science Park has accelerated the development of new buildings and facilities to meet the growing demands of STEMM businesses in the SW. It now hosts more than 400 high-tech staff.

In 2020, the University moved all its incubation and acceleration operations to the Exeter Science Park in a £2.25M deal guaranteeing 11 years of funded SETsquared Exeter Business Acceleration Services to regional high-tech businesses. This will be delivered from a dedicated accelerator space. SETsquared Exeter has successfully secured £1.5M additional funding to enable the continued expansion of the Business Acceleration Service across the region via the University of Exeter Enterprise Zone (UEEZ) funded by Research England and European Regional Development Funding (ERDF).

This combination of skills and funding has been transformational and has led to the growth of a hightech community in the Exeter region including companies like Role Mapper – named UK Tech Start Up of the Year for 2020. Exeter has now been quoted by Tech Nation as one of the UK's cities most likely to become the next big thing in high-growth acceleration.

# Use of HEIF

Consistent support from HEIF has enabled Exeter to play a key role in the innovation economy through subscription to SETsquared membership; directly funding staff to deliver services; and supporting the Student Start-up team. Over the five-year period this investment totalled £835k, leveraged further investment of c £4M in high-growth support and led to investment for regional business of more than £50M.

# University of Reading: Using knowledge exchange to leverage inward investment

The newly created Commercial Function brought together the existing Knowledge Transfer Centre with a new Commercial Projects team. We consciously created a team where knowledge exchange underpinned the strategic drivers for the new Function and acted as a core driver in all commercial transactions.

The team were tasked with developing a new strategic vision for Thames Valley Science Park (TVSP), that leveraged significant benefits for the University, the region and the wider UK. The team have already delivered Cine Valley, bringing the UK's largest purpose-built film studios to the Thames Valley. The tenant is the first partner in the University's new creative media hub. Work is underway on building four temporary studios on the site, with a major global brand due to start filming in September 2021. Assuming planning permission is granted, the permanent film studios complex is due to open in 2022.

Benefits leveraged include:

- Over £500 million per annum of inward investment
- Additional £200 million for development of the film studios
- Creation of 1,500 jobs onsite plus 1,500 associated jobs in the supply chain and ecosystem
- Joining the gap between industry and academia to solve a real-world problem, building an inclusive education supply chain that will develop and retain skills across the UK
- Further development of the University's School of Film, Theatre and Television
- Consolidation of the UK's leading creative-digital university research, in a dynamic creative industries ecosystem

The scale and level of investment ensure this work links to many key government priority areas. Selected highlights include:

- **Build Back Better and the Levelling Up Agenda** attracting significant inward investment, creating jobs at all levels (supporting inclusive growth) and delivering skills for the creative sector a strategically important sector to the UK as a whole.
- Skills for jobs and Research England/Office for Students priorities Cine Valley is bringing key industry partners (including a number of global brands) into partnership with the University and our relevant areas of research and education, including Film, Theatre and Television; and Computer Science. This gives the industry a direct voice in informing the skills needed, and will provide a diverse range of students with opportunities to gain experience and exposure within the industry. Through our pipeline work, we are supporting inclusive growth by creating opportunities for good jobs at all levels, and supporting regional upskilling.

To deliver this, we worked closely with the University community, local residents and regional stakeholders, to create a vision that positioned TVSP as the University's business and innovation campus. The team worked closely with key stakeholders, including local and national government (e.g. Department for International Trade), to promote the opportunity around our geographic location alongside the ability to partner with a globally excellent University. We are now expanding this model into other sectors, starting with Life Sciences.

These activities drew on new and existing posts already supported through HEIF. However, by building financial sustainability into the model, some posts will now be funded through income generated by the initial transactions secured by the team.

Examples of press coverage:

- UK Hollywood film studio plan lease agreed in Reading (BBC News)
- Hollywood film company could be coming to Reading to bring more entertainment industries
  to the UK (The Reading Chronicle)
- Deal signed to build £200m film studio in Reading (Construction Enquirer)
- UK Hollywood film studio plans approved near Reading (BBC News)

# University of Reading: How to support and develop a knowledge exchange professional

In 2020, we appointed a Knowledge Transfer Partnerships (KTP) co-ordinator, the purpose of the role is to work in partnership with the Business Relationship Manager (BRM) team to co-ordinate and manage the delivery of KTPs from proposal development to post-award activity and project completion. The BRMs are responsible for knowledge exchange and commercialisation (KEC) activities across the University's thematic priorities; this ranges from general enquiries via our Front Door initiative, supporting a large application for collaborative funding and delivering workshops and seminars to help develop KEC skills and share best practice.

After review, the BRM Team reached a consensus that while our Mission as a team is to "design and deliver a range of structured knowledge exchange activities and commercialisation services to facilitate collaborations between the UoR, businesses, the public sector and charities and add value by finding and supporting innovative ways to overcome barriers and solve practical problems, connecting the right people and driving forward projects with a swift route to deliver mutually beneficial results", if we were to scale our activities and take full advantage of the changing KE landscape we need to adopt a different approach. The route that was agreed was the appointment of a specialist role rather than a generic one starting with KTPs.

The University has a long history of success in KTPs and our ambition was to grow our portfolio. The new role was multi-faceted and both operational and strategic, with clear objectives to (i) prepare and submit KTP applications (ii) develop a robust process (iii) capture and share best practice (iv) identify work streams e.g. recruitment strategy and (v) marketing and communication.

To date the role has been hugely successful with the submission of a project which was comfortably funded, the first KTP for the School of Architecture being awarded, 3 events with academics and external stakeholders promoting KTPs and the preparation of a KTP Manual that provides all you need to know in one place. By approaching KTPs as a 'product' of the KTC and appointing a strategic lead for this has helped us identify where we need to focus and how to successfully scale our offering. By setting clear objectives in the role we are able to easily monitor our success.

The reason that we decided to focus on KTPs is because of their benefits to society, economy and graduates. KTPs are a key mechanism to achieving the Government's Build Back Better by driving economic growth and jobs and supporting companies to boost productivity and competitiveness by employing a Graduate. At the UoR, KTPs are a key 'product' for us to take our scientific excellence (including arts and humanities and social sciences) to support business, attract and develop talent and therefore delivering against the expectations of the R&D Roadmap. KTPs deliver demonstrable benefit to employers, a key objective of RE and OfS.

# University of Sussex: Predictive modelling of COVID-19 health care demands

## The challenge

Public bodies struggled to predict how Covid-19 would spread in response to infection rates or interventions. The *Sussex Modelling Cell* (i.e. relevant local authority and NHS organisations) turned to the University of Sussex to help support their modelling of COVID data.

## The solution

In response, Sussex researchers developed <u>Halogen</u> - a forecasting tool for healthcare planners to predict the impact of COVID on local healthcare demand and capacity. It was developed by mathematician Prof Anotida Madzvamuse and his research group in the School of Mathematical and Physical Sciences. Unlike national disease modelling, Halogen uses local, relevant population data for accurate, instant scenario planning.

### What does Halogen model?

Infection: Who is infected, at what rate Hospitalisation: Admissions and discharges Deaths: Hospital, care homes and others Hospital capacity: General and acute beds Susceptible population: Who is still vulnerable

### HEIF as a catalyst

An initial contribution of £60k from the University's HEIF in 2019-20 (taken from projected underspend arising as a result of plans disrupted by COVID-19) enabled the university team to work with public health collaborators to develop a model that proved invaluable to being able to manage pressured health care resources with much greater precision at the height of the pandemic. Application of the Halogen predictive model saved valuable time, money and healthcare resources.

This achievement demonstrated the potential of the approach – not just in response to the exigencies of the COVID pandemic but also beyond.

### HEIF leverages further investment in innovation and commercialisation

Since the initial 'proof of concept', a further £340,000 to refine the tool has been contributed by public authorities grappling with the more general challenge of predicting demand for healthcare. Funding partners now include Brighton & Hove City Council; East Sussex County Council; West Sussex County Council; the NIHR Clinical Research Network and the Health Foundation.

Post-doctoral research mathematicians are now collaborating with Sussex machine learning specialists and local web development companies to design a more user-friendly tool. This will be

widely applicable to managing health care demand not just resulting from COVID but also from seasonal illness and mental health crises. Sussex KE professionals are working to commercialise and roll-out the tool commercially to both public and private health care providers – across the UK, Nigeria and South Africa.

A collaborative publication has also just been accepted for the International Journal of Epidemiology.

# The University of Bath: Improved efficiency and reduced energy use in global transportation systems using adsorption media tubes

Innovative technology developed at the University of Bath by Prof. Semali Perera (CEng and FIChemE) and colleagues has led to the development of adsorbent media tube technology (AMT) that has revolutionised air filtration. The technology and its impact align to the UK government's 'Build Back Better' priorities in innovation and sustainability.

AMT generates clean dry air over long periods of repetitive operation and has been deployed not just in pneumatic operated train doors including the New York City subway, but also train air braking systems, self-levelling systems, pantographs and even train horns across 12 countries including UK, USA, and South Korea. AMT is helping to reduce energy consumption compared to traditional methods by 50% as well as contributing to the reduction of carbon dioxide emissions by an estimated 4 million tonnes by 2050 (The carbon trust Ref No. 075-048). The technology continues to be successfully adopted on train systems the world-over while new potential applications for the technology are ever evolving.

The path for the emergence of AMT from fundamental research through to a commercial product has only been possible through support from specialists funded by HEIF. The University's technology transfer and contracts teams helped identify the commercial application and build value through patent protection of the intellectual property. Industrial Partnership Managers worked with Prof. Perera to identify and engage commercial partners. This ultimately led initially to the formation of a spin-out company (Nano-porous Solutions Ltd) and with it the creation of 24 new jobs. The technology owned by NPSL was acquired by the FTSE 100 international engineering group IMI plc UK, for £6.1 m (IMI plc Annual Report, 2014). AMT is now marketed and sold by IMI Precision Engineering under its IMI Norgren® Rail Dryer brand.

More than 700 systems are now being supplied by IMI annually to the rail sector and expanding. This demand translates to an annual net profit of  $\sim$ £2.25m per year. AMT is designed and tested at IMI, Birmingham with the units manufactured at its facility in Leeds. This has created 4 positions and safeguarded a further 17 positions across both sites.

IMI maintain a close working relationship with Prof. Perera including a current Innovate UK funded Knowledge Transfer Partnership managed through the Industrial Partnerships team, and together the next generation of AMT products are being developed. This work is providing teaching material for current students as case studies exemplifying the translation of research into a successful commercial product and demonstrating how the HEIF funded specialist team at the University of Bath supported this process.

Prof. Perera, working with the commercialisation and industrial partnerships team, continues to push the boundaries of the technological capability of this innovation, where societal benefits beyond rail applications will be realised. One area of current research is focussed on developing the next generation AMT to remove green-house gases and volatile organic compounds (VOCs). While this work is showing exciting promise, the main current tangible benefits to society are reduced carbon emissions and trains with greater reliability.

# The University of Bath: SETsquared – collaborative enterprise and business incubator

The University of Bath has utilised HEIF funding to help shape and build the SETsquared incubation network with its partner universities of Bristol, Exeter, Surrey and Southampton. As part of this network, Bath's SETsquared Centre hosts and supports start-ups and the university's spin-outs such as GEN3D, 3D Metal Printing, and also guides students into entrepreneurship. In 2015, SETsquared was ranked as the top university-based business incubator in the world by UBI Global and has maintained this status since. Independent research carried out by Warwick Economics has estimated the economic impact of SETsquared supported companies to £8.6bn, with the creation of 20,000 jobs, by 2030 this is set to grow to £26.9bn.

Initially, HEIF grant (from HEFCE, pre-formula funding) was used to set-up SETsquared and HEIF now continues to fund an annual subscription for central, joint staff & activities and Bath's SETsquared Innovation Centre, its staff and activities.

Stable HEIF funding has allowed leverage of the central joint staff & activities to secure additional funding from Research England (e.g. CCF for Scale-Up). While the University's SETsquared Centre staff & activities has attracted funding from ERDF for innovation and business support programmes in the West of England and Swindon & Wiltshire LEP areas.

Since 2018 the University has been able to leverage HEIF funding to further develop the SETsquared model to promote university-to-business collaboration activities through the Scale-Up Programme. In the Scale-UP programme, interaction between SETsquared's 'growth company' members and the university are supported through innovation advisors at each university. At the University of Bath this advisor is embedded within the Industrial Partnership Team (IPT) that specialises in Knowledge Exchange. The IPT and innovation advisor reduce the barriers of engaging with SME-led collaborative research by reducing the 'time cost' of accessing public and private funding, identifying research talent, and synchronizing access to finance and R&D within an agreed business plan.

In the last year (2019-20), Scale-Up Programme members that collaborated with Bath accessed £11m of public and private sector finance for R&D and business growth, and some £2m of that was awarded to Bath for collaboration research. The Programme has been particularly successful in attracting SMEs from sectors that are strategically aligned to the University of Bath's research agenda in healthy ageing, future of mobility, artificial intelligence and NetZero.

Significantly, SETsquared has also helped the University of Bath grow its regional engagement partnerships with the West of England Combined Authority, the West of England and Swindon and Wiltshire, the LEPs and Growth Hubs, the National Composites Centre (NCC), Digital Engineering Technology Innovation (DETI), and Academic Health Science Networks. This has led to the University of Bath creating greater support, presence and impact for the region.

# University of Leicester: Space Park Leicester: Preparing to launch the Leicester economy

### Space Park Leicester (SPL): Preparing to launch the Leicester economy

The space sector is crucial for Global Britain [1]. It is vital for security, public services and commerce, underpinning 15% of GDP [2], a dependency only set to grow. The Government has formed a cross-Government National Space Council, taken equity in a satellite company and is developing satellite launch sites. The UK sector set an ambition [2] for 100,000 new jobs, capturing 10% of global revenue by 2030. Space is a key lever for post-pandemic economic revival.

The University of Leicester has over six decades' experience in space science. We have the largest space research grouping nationally, and have deployed over 90 space instruments with international space agencies. Despite this, the East Midlands only has 3% of national space employment, with London plus the South-East enjoying 50%. Levelling-up is required.

We co-created a vision for exploiting our research excellence with our City Council, Local Enterprise Partnership, Midlands Engine and strategic partners including industry, the UK Space Agency, various Catapults and the National Space Centre. The vision centred on a new space-focussed research and innovation cluster integrating industry with academia: Space Park Leicester (SPL).

Opening in the summer of 2021, SPL is the beacon of Leicestershire's place-based recovery, providing a regional centre of excellence promising 2500 jobs and an economic boost of £750m p/a. SPL will deliver research, innovation, training and public engagement in a sector shaping the UK's future [3].

In addition to the core SPL team, HEIF funding was used to:

- **Boost inward investment and economic development:** With the DIT, we secured three Foreign Direct Investments. Over 100 new jobs have been created and we have developed a vibrant pipeline of industrial interest allowing SPL to open with >80% occupancy. A remarkable achievement given the pandemic. To attract industrial investment, HEIF supported the rebranding and marketing of SPL (www.space-park.co.uk).
- **Create a scale-up ecosystem:** We are creating a space-focussed community at SPL, with large corporates working alongside scalable SMEs. HEIF funding helped secure a European Space Agency Business Incubation Centre and a cluster of innovation projects facilitating the support of start-ups and KE with regional and national space businesses.
- **Grow business R&D:** A major programme was formed with over 15 companies providing ~£40m contribution, focussed on reducing the cost of satellite manufacture and space data capture, analysis and application. HEIF funding supported academics, programme management and commercial activity including consultancy on open IP. Investment was directed at specialist space innovation advisors, a regional Satellite Applications Centre of Excellence, account management of major space businesses and KTP officer focus on space leading to over 50 innovation projects.

• **Create high-value manufacturing:** HEIF was used to develop the business case and delivery plan for an open-access satellite manufacturing facility at SPL. The facility has supported UK launch capability, facilitated growth of UK manufacturers, whilst providing an impact channel for SPL R&D. The facility is included in the East Midlands Freeport strategy.

HEIF support for SPL is allowing Leicester and Leicestershire to "Build Back Better".

- [1] Global Britain in a Competitive Age, March 2021.
- [2] Size and Health of the UK Space Industry, 2018.
- [3] Build Back Better, our Plan for Growth, March 2021.