



UNIVERSITY OF
LIVERPOOL

Research, Partnerships
and Innovation

ENTERPRISE AND ENTREPRENEURSHIP

ANNUAL REPORT
2021 – 22

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THE ORIGINAL

REDBRICK

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Foreword



Professor Anthony Hollander Pro-Vice-Chancellor for Research & Impact

I am delighted to introduce the first of our Annual Reports, intended to highlight recent achievements in founding new spin-out companies and licensing, successes in Student Enterprise activity and providing a timely introduction to the recently launched Brett Centre for Entrepreneurship, based within the University of Liverpool Management School. Entrepreneurship is an area of increasing focus for the University and we have committed to expanding the size of our Enterprise Investment Fund year on year, over the next 5 years, currently set at £1m per annum. Over the past few years, this Fund has been of vital importance for kick-starting commercialisation activities and supporting our new spin-out companies and we expect to see more co-investments and follow-on investments as our spin-out portfolio matures.

The Liverpool City Region (LCR) Innovation Board

The innovation ecosystem which supports University spin-outs is vital to their success. LCR's Innovation Board was established in 2014, making it the first dedicated sub-regional body of its kind in the UK. Earlier this year, Professor Rasmita Raval from the University's Department of Chemistry, was invited to join me as a Board member, and Professor Matt Reed, Strategic Director of the Materials Innovation Factory, also sits on the board as an Observer. The Board provides strategic leadership for the LCR innovation agenda, including driving the commercialisation of specialist knowledge, enhancing skills and attracting talent, and accelerating growth across all sectors of the economy.

LCR Innovation Prospectus

I recently joined colleagues from The Liverpool City Region Combined Authority (LCRCA) to present the first LCR Innovation Prospectus to government. The prospectus showcases some of our flagship projects and facilities. The University is central to innovation activities in the LCR, and we are excited about what the next few years will bring. We are thrilled with the LCRCA's plans to support and raise additional investment funds for innovative companies (including spin-outs) and the ambition to create a thriving angel investor network in the region.

Impact of the Pandemic

The past three years have seen significant changes in the operations of the University, and we will doubtless continue to feel the impact for years to come. At Liverpool, we are immensely proud of the way in which the University and its staff and students responded to the change in circumstances. The academic community came together and worked incredibly hard during these challenging times. The University's IP Commercialisation team worked alongside other colleagues in Professional Services, to provide support to academics to commercialise their ideas.

We were able to access and negotiate significant grants to the University to fund platforms and new technologies to accelerate the development of new therapies in relation to infectious diseases. During this time, we also provided bridging funding to some of our spin-outs that were facing delays in accessing investment or who had experienced delays and slowed the rate of progress of their R&D efforts, due to the effect of the pandemic on supply chains and access to laboratories.

University Commitment

I am the chair of the Enterprise Board which oversees and governs the delivery of the University's IP exploitation activities, stimulates an enterprise culture across the University, maintains connections with all University initiated enterprise activities and reviews delivery against aims and best practice. The Board consists

of experienced internal and external members with professional insight and expertise in key areas of research, IP management and commercialisation, legal and finance. The University and its spin-out companies both benefit enormously from the combined knowledge, expertise and contacts of the Board members across multiple sectors and domains.

Knowledge Exchange Framework

It was fantastic to see the University's strong performance once again in the Knowledge Exchange Framework (KEF). Led by Research England, the KEF provides information about the achievements of English Universities in serving the economy and society for the benefit of the public, business and communities. It allows universities to better understand and improve their own performance, as well as providing businesses and other users with the information to help them access the world-class knowledge and expertise embedded in English universities. The University attained Quintile* 4 positions, representing high engagement, for IP and Commercialisation and this reflects the hard work of many colleagues across the institution.

Future Plans

Having overseen the creation of a new in-house model for technology transfer in 2016, and having a stable model for this length of time, we are now starting to reap the benefits of the approach. The strategy for the next 5 years will be to scale up our capabilities in technology transfer and enterprise activity to match and even exceed that of our peers whilst placing the University at the heart of the LCR entrepreneurial ecosystem. We expect the availability of funding to increase with the support of LCRCA and other initiatives in the LCR and more generally in the North of England linked to the levelling up agenda, and we are ready to match this with commitment and resources which are commensurate with our ambitions.

Anthony Hollander

PROGRESS THROUGH PERFORMANCE

Another year of growth from the University of Liverpool's Intellectual Property (IP) Commercialisation



Emma Nolan, Head of IP Commercialisation

This has been an exciting year – the IP Commercialisation team has grown significantly, thanks to University support. Our ambitions over the next phase of our development, are to found increasing numbers of investible spin-outs year on year, we also strive to nurture a culture of entrepreneurialism internally in the academic community. Our key aims are to raise the quality of the spin-out management teams, provide stronger post-incorporation support and to build a more sophisticated approach to equity and portfolio management. With the growth of the team we will be in a position to provide specialist support to academics in some of the University's areas of research strength, including advanced materials and digital/data technologies.

Although our technology transfer team is relatively young, when compared with peer universities, the team has experienced the full lifecycle

from company incorporation to exit – including the trade sale of a spin-out company in September 2021, in less than two years from incorporation. However this is not a typical spin-out journey: we are acutely aware of the challenges facing our new ventures. We have some exciting companies in our portfolio, highlighted here – but they need our on-going commitment and support. Whilst we want them to thrive, we also need to create an environment in the LCR where they can scale-up. Retaining spin-outs in the region has been shown to enrich the local economy, retain graduates as part of skilled workforce and generate jobs for the region. These are key drivers and provide rationale as to why the University invests significant resources in the Commercialisation Team and the Enterprise Investment Fund.

This year we have founded, and/or committed investment into five spin-out companies:

- **Thiotech** is based on research from Dr Tom Hassell's group, developing materials which are selectively attractive to heavy metals, including gold and mercury. Having been through the Innovation-to-Commercialisation of University Research (ICURE) entrepreneurial training programme the team was successful in securing £300k of follow-on-funding from Innovate UK alongside £150k from the University's Enterprise Investment Fund.
- **ReNewVax**, also a successful ICURE project, is developing new vaccines based on a novel development platform. The team secured

~£300k from Innovate UK and the University's Enterprise Investment Fund matched the grant funding with £300k investment.

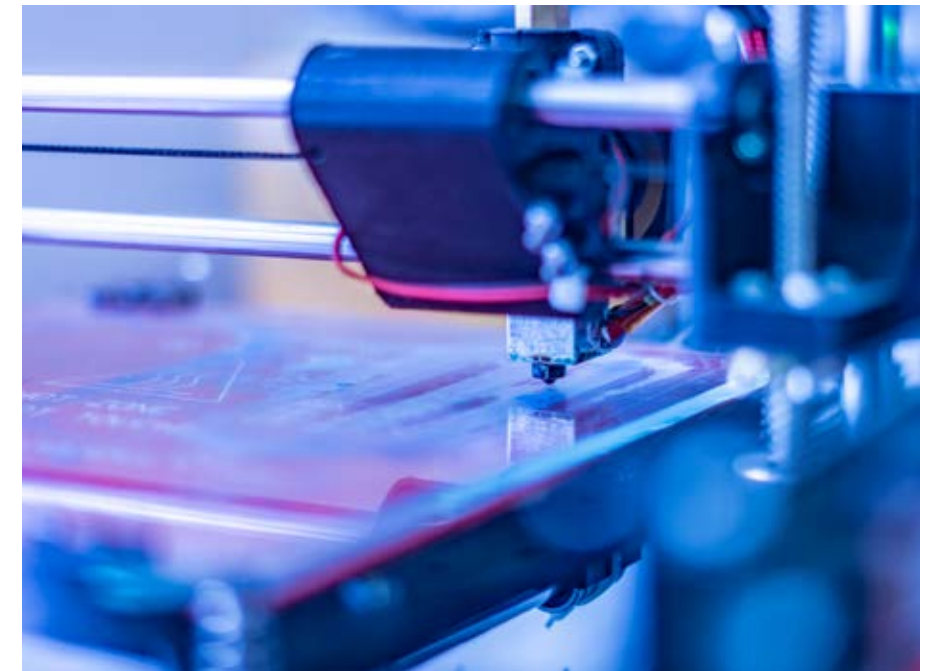
- **Sight AI** is a new spin-out company which is aiming to improve and speed up the diagnosis of eye conditions. The company is founder-driven and has attracted an experienced management team and Board. The Enterprise Investment Fund provided start-up capital to the company, which will be starting to seek seed investment in Q4 2022.
- **Gearu** is a spin-out company from Professor Andy Cooper's group in Chemistry, which aims to change the way in which new materials are discovered. The company has to date gained significant traction in the marketplace and is working in partnership with the University and the impressive robotic facilities in its flagship knowledge exchange centre, the Materials Innovation Factory (MIF 2017; Unilever joint venture; £82m.)
- **Sulantrix** is a new drug discovery company based on research expertise developed over 20 years in the research group of Professor Pat Evers. The company has an impressive management team in place and will be looking to raise seed funding in 2023. The University has committed to investing £300k in the company as start-up capital and to fund early stage "target to hit" work (early stage drug discovery and development), via Professor Evers' laboratory.

Introduction

The University has identified IP Commercialisation as a strategic area for investment to ensure that resources, capability and funding is available to support growth in activity and provide the basis for a potentially thriving entrepreneurial ecosystem within the University – and the Liverpool City Region – over the next 5 years and beyond.

This report sets out our achievements over the past few years, provides case studies for four of our most exciting spinout ventures, and outlines the strategy for growth over the next 5 years.

Contributing to the Advanced Manufacturing cluster and the innovative ecosystem in Liverpool City Region: Meta Additive Ltd



Strategic context



Materials Innovation Factory, University of Liverpool, @McCoy_Wynne

A key pillar of the University's Knowledge Exchange (KE) strategy is to 'create an entrepreneurial ecosystem based on student activity; enterprise education; a growing spin-out portfolio; networked funds and investor relations.' This is further reinforced by the KE concordat which outlines the ambition to continue to improve performance in two crucial areas for the University and our region: IP commercialisation – creating impact and economic growth ; and Student enterprise – to support employability and enterprise growth, particularly in the Liverpool City Region.

Externally, our IP and commercialisation performance is benchmarked against other Higher Education Institutions (HEIs) as part of the Knowledge Exchange Framework (KEF), which focuses on three metrics: Estimated current turnover of all active firms per active spin-out; Average external investment per formal spin-out; and Licensing and other IP income as proportion of research income.

The KEF metrics are largely based on spin-out performance (turnover, investment and equity realisation) plus any additional licensing income. Liverpool is in Cluster V ('Very large, very high research intensive and broad-discipline universities undertaking significant amounts of world-leading research'). Its peer universities in this cluster include Leeds, Newcastle, Nottingham, Sheffield and Manchester.

In the last academic year, the team has grown from 6 FTEs to 9, with an additional 5 posts approved and recruitment underway. Whilst the past 6 years have been effectively a start-up phase for this activity at Liverpool, we are now building a team structure and size which is commensurate with our peer University Technology Transfer Offices. The next 5 years should demonstrate significantly increased activity and outputs for Liverpool, based on increased capacity, specialist skill-sets within the team and a mature framework for new ventures, investment and portfolio management!

1. Manchester (~40 FTE), Nottingham (~16 FTE), Sheffield (~17 FTE), Leeds (14 FTE) and Newcastle (13.4 FTE).

IP Commercialisation



14

Total number of spin-outs formed in the last 4 years



5

Number of companies in the spin-out pipeline



£7.3m

IP-related income (HE-BCI in 2021/22)



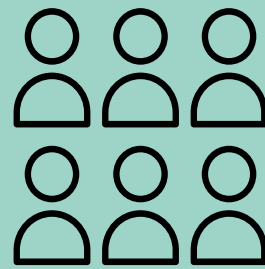
£2.8m

Enterprise Investment funding invested/committed*



£14m

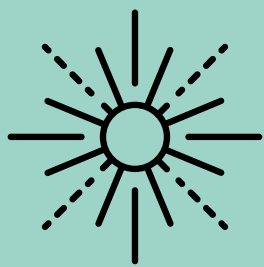
Leveraged investment, industry or grant funding into spin-out companies/the University in a 4-year period***



79

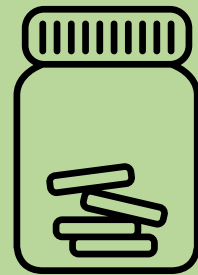
Number of jobs created in the Liverpool City Region (HE-BCI 2021/22)

Student Enterprise



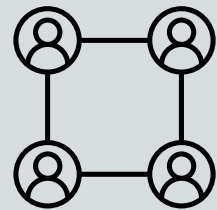
132

Newly founded student/graduate start-ups



>£139k

Funding provided to start-ups from 2020



500+

Students engaged with enterprise activities since 2021

STUDENT ENTERPRISE AT LIVERPOOL

Student Enterprise

The enterprise offer within Careers and Employability provides all students and recent graduates the opportunity to contribute to the creation, survival and/or growth of a business. Enterprise and entrepreneurship are a key part of our graduate employability offer. We have increased the amount of in-curricular, co-curricular and extra-curricular real-world challenges and interdisciplinary enterprise

opportunities. The University now has a vibrant community of entrepreneurs with an ecosystem of support within the Liverpool City Region (LCR), regionally and nationally. The core start-up offer 'Design Your Future' includes a variety of activities ranging from a 10 week business development programme, workshops, specialist skills development, The Enterprise Fund, Showcase events and more.

The University has recently been recognised for achievements within the area of start-up, growth and scale up at the International Enterprise Educators Conference and is currently delivering a partnership European Regional Development Fund Project 'LCR Founders' with Liverpool John Moores University.



*Committed from the Enterprise Investment Fund (EIF) since 2018 which, to date has resulted in £14 million of investment, industry and grant funding into spin-out companies or the University**, a 4-fold leverage on the EIF investment***.

Creating investable founders: training, coaching and mentoring

3 key aims of the IP Commercialisation Team in its next phase of development:

- 1** Develop and deliver a framework of quality training, coaching and mentoring for new academic founders;
- 2** Creation of strong and collaborative links in enterprise education across the University – The IP Commercialisation Team, Student Enterprise, the [Brett Centre for Entrepreneurship](#) and the [Institute of Digital Engineering and Autonomous Systems \(IDEAS\)](#).
- 3** Work with external partners to facilitate and develop a framework of strategic partnerships (e.g. Institute of Directors) to provide support, access to networks and recommended suppliers for academic founders.

In March 2022 the IP Commercialisation team delivered a pilot Liverpool Future Founders Programme, co-developed with the Brett Centre for Entrepreneurship. The programme delivered training for spin-out founders in the role of the Board and legal responsibilities of being a Director, modules on finances, investor relations and sales & marketing. In addition it provided an opportunity to develop softer skills such as self-awareness, team-building, change management and leadership qualities. The programme funded on-going professional mentoring and coaching to assist academics in their transition from academia into the start-up environment. All modules were delivered by external experts (e.g. Institute of Directors, Venture Capital (VC) fund manager, coaching and mentoring professionals).

Beyond this pilot programme, the team has ambitions to develop additional modules to extend the entrepreneurship training. The provision of quality enterprise education to the academic

Future Founders is a well-organised and engaging programme consisting of several workshops led by dynamic experts. A great learning experience overall.

Dr Helen Box, Business Development Manager for University of Liverpool spin-out TandemNano.

community both supports academics and demonstrates the University's commitment to the innovation agenda in the Liverpool City Region.

Alongside training, the IP Commercialisation team have engaged with coaching and mentoring professionals to provide additional support and skills development for academics. The team will assist academic founders to become investable founders, via the introduction of a formal framework for mentoring and/or coaching.

The recent appointment of an Enterprise Manager is a key position in the team, a new post dedicated to encourage

and promote access to entrepreneurial training, accelerator programmes and entrepreneurship funding over the next 5 years and beyond.

Alongside the training programme, Liverpool is a partner in the NxNW consortium of Universities, which coordinate and manage the Lean Launch Programme (LLP) and Innovation-to-Commercialisation of University Research (ICURE) programmes on behalf of Innovate UK. The programme is currently managed by Queen's University Belfast with Liverpool, Leeds, Sheffield, Manchester, Edinburgh, Ulster and Lancaster as partner Universities. The IP Commercialisation team encourages all academics who want to spin-out to join an LLP, ICURE or other accelerator programmes. The partner group of Universities actively share their networks, contacts and guidance for good practice and collaborate with Innovate UK to continuously improve the ICURE programme. The University of Liverpool has to date benefitted from ~£1.3m Innovate UK follow-on funding into its spin-out companies via ICURE.

Future Founders Programme participants, 2022.



The Future Founders Program very neatly wraps up the fundamentals of starting a company and becoming a successful founder

Dr Srijan Jindal, Chief Scientific Officer of PhenUtest

It's exciting to see the real-world application of my research coming to life. Being involved in programs for university start-ups and applying for technology IP has introduced me to a whole new world. Exposing me to the business side of things, while bringing me out of my comfort zone as a scientist. This has given me the drive to develop ideas into potential businesses, providing solutions to issues that could make a true difference to a wider community.

Dr Aaron Dickenson, Department of Electrical Engineering and Electronics

The Brett Centre for Entrepreneurship

The Brett Centre for Entrepreneurship, launched in March 2022, is a dedicated group of researchers, enterprise educators and practitioners focused on raising our understanding of entrepreneurship and contributing to policy, practice and programmes. The Centre aims to raise levels of expertise and activity in entrepreneurship across the University, provide academic leadership, instill a culture of entrepreneurship, deliver programmes and ultimately contribute to impact.

The three pillars of the Brett Centre are research, education and impact. We drive ground breaking entrepreneurship research, simultaneously shaping agendas and tackling contemporary challenges, whilst keeping our stakeholders appraised of cutting-edge knowledge and thinking from around the world. This has involved researching the impact of COVID-19 on the self-employed with the LSE's Centre for Economic Performance and working with the OECD on policy for minority entrepreneurship.

The Centre is at the core of entrepreneurship-related education across the University. The Centre is creating new programmes as part of our globally connected Management School, contributing to existing programmes across faculties, supporting students, graduates and academics and working with Careers and Employability. In 2023, the Centre will lead on delivering newly-designed undergraduate and post-graduate entrepreneurship modules across the University.

The Centre seeks to generate impact on a local, national and international level, at enterprise and policy levels. For businesses, we strive to help people use an entrepreneurial mindset to lead, innovate and manage start-ups and business development. This involves designing and delivering programmes for our students, graduates and existing business owners to help them negotiate the demands of business ownership, such as resource management, marketing, managing finances, working with investors, innovation and protecting intellectual property and employing people. In practice, the Centre's Growth Catalyst and Help to Grow Programmes are successfully demonstrating how research-informed enterprise education and mentoring can help raise the performance of small and medium-sized enterprises.

Spin-out companies and Investment

The University has the ambition to create more high-growth spin-outs from which the University can ultimately exit, generating a return on investment alongside the societal and economic impacts.

University companies do not spin-out in isolation - to some extent their trajectory tends to mirror the economy of the region in which they are incorporated. There are prospects for the development of a more mature innovation ecosystem in the Liverpool City Region (LCR): the launch of initiatives such as the Mayor's Future Innovation Fund, LYVA Labs, a new angel network and plans for a seed fund for LCR are hugely positive. These additional funding sources have already benefited University spin-out companies, along with other high-growth technology companies in the region.

The IP Commercialisation team continues to develop policies, procedures, best practice etc. to provide a transparent and consistent framework for academics, intended to accelerate the spin-out process. Although admittedly starting from a low base, the

Team has overseen a promising growth in formation of new spin-out companies.

The University's spin-out portfolio is significantly younger than its peer Universities - all active spin-outs are less than 4 years old. Over the next 5 years we aim to make progress in reducing the gap between Liverpool and our peers in KEF metrics such as spin-out investment, turnover and portfolio value.

Over the past four years the IP Commercialisation team have supported the foundation of fourteen new spin-outs, and managed two company exits (LiftUpp and Meta Additive) providing ~£4m income to the University. For more information about our spin-out companies, please see our website.



SPIN-OUT CASE STUDY I:

PHENUTEST

Tackling global antimicrobial resistance with rapid, point-of-care diagnostics

- Sector: Medical diagnostics/Antimicrobial resistance
- £1M Innovate UK Grant Funding
- £750K from investors matched by £260K from UoL EIF*
- 7 full time employees

Urinary tract infections (UTIs) impact over 200 million people worldwide every year and account for more than 20% of prescribed antibiotics. Current diagnostics are slow, taking at least 48 hours, frequently leading to the wrong antibiotic being prescribed and significantly contributing to the increasingly serious issue of antimicrobial resistance.

PhenUtest Diagnostics was spun out from the University of Liverpool in 2021, and with the support of the University's IP Commercialisation team is moving from strength to strength. Their 30-minute diagnostic can be used at point-of-care, a low-cost test that can accurately identify which bacteria is causing the infection, ensuring the correct antibiotic is prescribed. As the UK population continues to age there are increasing rates of UTIs, and yet the market for point-of-care UTI testing is young, with little competition for a technology-based diagnostic providing a large return on investment for PhenUtest.

Originally developed by Dr Srijan Jindal (now Chief Scientific Officer for PhenUtest) through his PhD and

Post-Doc research with Professor Douglas Kell at the Institute of Systems, Molecular and Integrative Biology, the company now has seven full-time employees based in the Institute of Systems, Molecular and Integrative Biology, adding new positions in microbiology, engineering and leadership since spin-out.

PhenUtest has so far gained funding through grant applications and rounds of investment, with over £997k secured for the academic 2021/2022 year alone. This has included over £250k through the Innovate UK, Innovation to Commercialisation of University Research (ICURE) 'follow on funding' competition and £750k from private investors with an additional £260k from the University of Liverpool's Enterprise Investment Fund.* The company maintains two active partnerships with large industry players who are supporting the development of PhenUtest's technology. PhenUtest has recently won the "Innovation Challenge" organised by TBAT Innovation, an independent consultancy who secure R&D Funding for UK Businesses of all sizes.

"Our technology will revolutionise the diagnosis and treatment of Urinary Tract Infections. We will provide cheaper, faster and more accurate antibiotic sensitivity results in under an hour at a point-of-care setting. This will massively decrease the number of samples reaching the overburdened and understaffed centralised testing facilities and help in combating the rising crisis of AMR."

Dr Srijan Jindal
Chief Scientific Officer for PhenUtest

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SPIN-OUT CASE STUDY 2:

RENEWVAX



Next-generation vaccines tackle bacterial infectious diseases

- **Sector: Vaccines**
- **Nearly £300K seed funding from Innovate UK matched by £300K University funding***

Bacterial infectious diseases are an ongoing global issue and are extremely serious. Streptococcus pneumoniae, commonly known as pneumococcus, is the cause of life-threatening diseases such as pneumonia, meningitis and sepsis that lead to over 1.9 million deaths every year. There are a hundred distinct variants of the bacterium, and they can be spread asymptotically. Current vaccines, such as Appexnar®, are only effective against 20% of the existing variants. A universal vaccine that can treat all variants is required to lower infection rates and will also contribute to minimising the development of antimicrobial resistance.

ReNewVax is a University of Liverpool spin-out established in 2022 with a new vaccine development platform with the potential to produce next-generation vaccines for a variety of diseases, beginning with a pneumococcal vaccine, for use around the world. The pneumococcal vaccine market was the largest pre-pandemic vaccine market and had an estimated value of £9.5 billion in 2022. The team are

developing a novel protein-based vaccine formulation that will provide a safe, easy-to-manufacture and affordable solution. In addition, their vaccine is effective against all types of the pneumococcal bacterium creating a more universal product compared to those already on the market, which target only specific strains.

ReNewVax was co-founded by Dr Marie Yang and Professor Aras Kadioglu, both from the Institute of Infection, Veterinary and Ecological Sciences. The company was awarded £299,578 in seed funding from Innovate UK's, Innovation to Commercialisation of University Research (ICURE), which was matched by £300,000 in funding from the University of Liverpool's Enterprise Investment Fund*. Their pneumococcal vaccine is expected to enter early phase clinical trials in 2025, and their contribution to the rising challenge of antimicrobial resistance is a key focus for the University of Liverpool and a strength for the Liverpool City Region. The company is expected to create at least five full time posts during its first 12 months.

“With the tremendous support of the IP Commercialisation team at the University of Liverpool (UoL) and seed funding from Innovate UK and UoL Enterprise board, we are now in a position to take our vaccine research beyond the bench and into the real world. ReNewVax represents an opportunity for us to foster innovation and make a difference. We have a very strong management and scientific team, and I cannot wait to see how far we will take this venture”.

Dr Marie Yang
Co-founder of ReNewVax

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SPIN-OUT CASE STUDY 3:

ROBOTIZ3D



Advanced robotics to improve road safety and save billions in repairs

- **Sector: Robotics and AI**
- **Financial and advisory support from CERN, Robotics Inspection and Maintenance Activities, and Innovate UK SMART grant**
- **£1.25M external investment in 18 months**

In the UK, the cost of repairing potholes hit £1bn for the last decade alone with over 18 million filled. The crisis is only expected to escalate as our roads age, numbers of road users increase and damage from climate extremes becomes more frequent. Current remediation methods are expensive and take time, and risk the safety of maintenance crews on busy roads.

Combining artificial intelligence (AI) and robotics provides the answer. Robotiz3d, a spin-out established in 2020, is developing autonomous robotic platforms that can detect damage to the road and perform repairs and maintenance rapidly, at low cost, and without the need to endanger maintenance crews.

Robotiz3d was founded by a team from the School of Engineering along

with company partner and investor a2e Industries. In the last two years, they secured a variety of further funding and support, including Horizon Europe initiative Robotics Inspection and Maintenance Activities and from CERN, the European Organisation for Nuclear Research. In their 2022 round of funding, Robotiz3d has successfully attracted £1.25m in external funding.

The team have released their first product for trial and have relocated to the CERN Business Incubator Centre at STFC Daresbury, which provides subsidised space, safe storage and testing of the autonomous vehicle. Robotiz3d has also partnered with Autoware Foundations and NVIDIA as technology partners.

“It is extremely exciting to see an idea becoming a successful PhD and then a company. The mindset shift from academic to technical director is challenging, but also very rewarding.”

Dr Sebastiano Fichera
Co-founder and Lecturer in Aerospace Engineering at the University of Liverpool.

Contact details

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SPIN-OUT CASE STUDY 4:

META ADDITIVE



Manipulating materials at the molecular level to create truly bespoke components

- Sector: Additive manufacturing
- £1.2M Innovate UK Smart grant in 2020
- Acquired by Desktop Metal in 2021 for \$15M

Additive manufacturing also known as 3D printing, is becoming an integral part of industrial production. It enables us to create bespoke components rapidly, often more sustainably and inexpensively, and has significant applications in many key sectors. New smarter printing technologies and processes are needed to maintain and expand future production solutions.

Meta Additive spun out from the University of Liverpool in 2019 and is based on research from Professor Kate Black in the School of Engineering. In 2020, the team secured a £1.2M Innovate UK Smart grant, allowing the team to continue to develop their novel printing technology. They focus on using a chemical approach to additively manufacture metal and ceramic components for mass manufacturing. The team have developed a new binder process that means whole components are printed

from multiple materials, allowing for complete customisation of the material's mechanical and structural characteristics, helping to maintain and expand future production solutions.

In 2021, Meta Additive was acquired by US company Desktop Metal and the University received \$4.7m for the sale. This has provided an opportunity for Meta Additive to further develop its technology portfolio, begin higher-volume manufacturing and take its technology to a wider market.

“It is amazing to be able to take my research which started life in a laboratory at the University and then translate it into the real-world, helping to create jobs and providing industry with smart manufacturing solutions”

Professor Kate Black
Co-founder and Professor
of Additive Manufacturing in
Additive Manufacturing at the
University of Liverpool.

Contact details

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STUDENT ENTERPRISE CASE STUDY

MOISES BARBERA RAMOS – DRILL SURGERIES



- Sector: Medical Devices
- Innovate UK Smart Grant 2022 Awardee
- Winner of the National Healthcare Business Award 2022
- Provided 10 job and career development opportunities in the LCR*
- Enterprising Funding awarded to date over £120k

Moises Barbera Ramos is our University of Liverpool award-winning entrepreneur, enterprise fund recipient and founder of Drill Surgeries, a vibrant start-up in the medical device industry driven to improve Intramedullary Nailing surgeries worldwide.

Moises and his team have developed a fully working prototype of their non-invasive medical device powered through Artificial Intelligence to guide surgeons during trauma surgeries accurately and without radiation. The prototype has been successfully tested on mannequins by international surgeons.

Moises has shown uninterrupted passion on the field of entrepreneurship, founding Drill Surgeries whilst studying at the University in 2019. Moises overcame the barriers of studying a complex degree programme (Masters in

Physics) while striving to grow his start-up developing non-invasive medical devices powered through Artificial Intelligence in one of the most diverse and innovative sectors.

Since 2021, with the support of Liverpool Interns and The Enterprise Fund, Moises has offered work experience for a full month to a team of students from the School of Life Sciences coming from underrepresented backgrounds to support their accessibility to this competitive job market. Moises has also worked with other organizations like Liverpool John Moores University, Made Smarter, Agent Academy and the Liverpool City Council to provide job opportunities to young individuals, offering one full-time position, three internships and two work experiences (one for a student of the Agent Academy initiative and another work experience to a group of

five BAME students from the School of Life Sciences as part of the Enterprise Challenge initiative). In total, Moises has directly and positively impacted the lives and career development of at least 10 individuals in the Liverpool City Region (LCR)*.

Moises has participated in panel talks and keynote speeches about MedTech and attended careers fairs providing first-hand insights to hundreds of students about his work and entrepreneurial experiences in healthcare and the medical technology industry.

As part of the pay-it-forward ethos in our entrepreneurial community at University of Liverpool, Moises also delivers a session on pitching and presenting as a guest speaker for the HEAR-credited Design Your Future 10-week business development programme, which has now been successfully running for two years.

Contact details

www.drillsurgeries.com

contact@drillsurgeries.com

Creating Investable Ventures

The University's ambitions and targets for the next 5 years are:

1

To found at least 5 investable spin-out companies per annum², whilst the new team embeds. Thereafter numbers of new ventures should increase to around 7+ per annum. A number of spin-outs will either fail or be acquired, however over the next 5 years the University could potentially generate a portfolio of 30 new companies³, hence over the next 1-2 years post-spin-out management and equity portfolio management is likely to become a full-time role within the team.

2

Move towards a friction-free model: the direction of travel for many Universities over the past few years has been to reduce their founding equity stake in new ventures. This has happened for many reasons: a new breed of Venture Capitalists (VCs) who will not accept high University stakes in companies; public opinion and media pressure; US investors who are unaccustomed to 'high' University shareholdings. A revised equity model is under discussion, along the lines of the new Oxford spin-out model, which is both founder-friendly and investor-friendly.

3

Increase in numbers and size of external investment into University ventures. The spin-out teams collectively have plans to raise at least two Series A investments in 2022/2023 - if successful these would be the first Series A raises for a University of Liverpool spin-out company in decades, and therefore a mark of success for the current model.

Licensing strategy

In terms of overall licensing income the University of Liverpool's performance has significantly improved in recent years and the team has reported £4.1m IP-related income to Higher Education Business and Community Interaction Survey (HE-BCI) in 2021/22 (not including any equity realisation). This is largely due to income from the Stryker licence, however this royalty stream will terminate in 2024. Reliance on a single successful licence is not unusual - many Universities with significant licence income derive their IP revenues from a sole large licence at peak sales, however we continue to build our licensing pipeline.

A successful licensing strategy relies on building a healthy pipeline of technologies, which are both applicable and marketable. Given the early stage of University research, all Universities are dependent on securing large translational grants, usually alongside industry engagement and the commitment of academic inventors to

support the licensing and development activities. Licensing success generally requires a robust data package, either to secure the interest of a joint development partner, or to be licensed into investment-ready spin-out companies. The IP Commercialisation Team has supported translational grant funding awards with total value of £16.9m in 2021/22.

IP Commercialisation's newly formed Health & Life Sciences (HLS) team is expected to further increase the success rate of significant translational awards direct to the University. The HLS team will target MRC Developmental Funding Pathway Scheme (DPFS), Wellcome Trust and NIHR funds to secure funding to de-risk technologies in the commercialisation pipeline for licensing. In addition to recruiting a team with more specialist skillsets and expertise, we will continue to build networks with external regulatory experts and sector-specific advisors.

Science & Engineering (S&E) requires a different model, with Commercialisation Managers connecting with external domain experts, usually ex-industry, to assist in evaluating and marketing technologies. This model also has the advantage of leveraging existing industry networks and building relations with joint development partners and corporate Venture Capitalist funds.

The University is in a good position to use the new harmonised IAA funding awards as a vehicle to support more commercialisation-oriented activities arising from social sciences research with an expected focus on copyright works such as software, films and educational materials.

2. The Universities in Liverpool's KEF cluster (excluding Manchester) reported an average of 4.4 spin-outs in 2021/22 via HEBCIS.

3. Current spin-out portfolio sizes in peer universities are as follows: Leeds 35; Sheffield 30; Nottingham 28, Newcastle 29, Birmingham 31

Enterprise Investment Fund

Since its re-launch in August 2018, the University's Enterprise Investment Fund (EIF) has been used to de-risk technology projects in our pipeline. We have used the fund flexibly, e.g. supporting animal model studies for large translational grants with industry partners and making equity investments into new spin-outs.

In recent years we have invested EIF via convertible loans to provide start-up capital, alongside Innovate UK Innovation to Commercialisation of

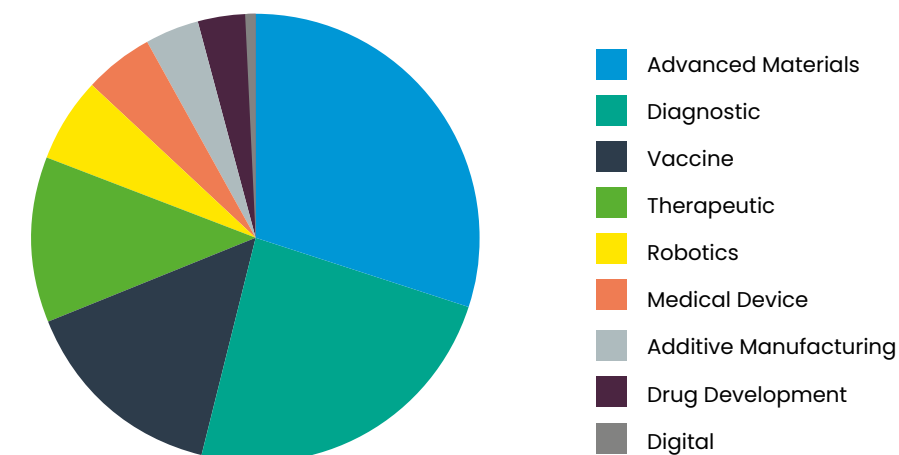
University Research (ICURE) follow-on-funds (up to £300k of non-dilutive grant funding at 100% intervention rate, available following successful completion of ICURE and a pitch to investors via the ICURE Options Roundabout). EIF investment of ~£750k has matched Innovate UK funding of ~£1.3m, to provide start-up capital and cash-flow for our new spin-outs.

£2.8m has been committed from the EIF since its re-launch, to date this fund has leveraged a total of ~£14 million

of investment, industry and grant funding into our spin-out companies, or directly into the University. Technology transfer is (in many sectors) a long game, requiring patient capital based on lengthy timeframes to demonstrate return on investment.

Figure 1

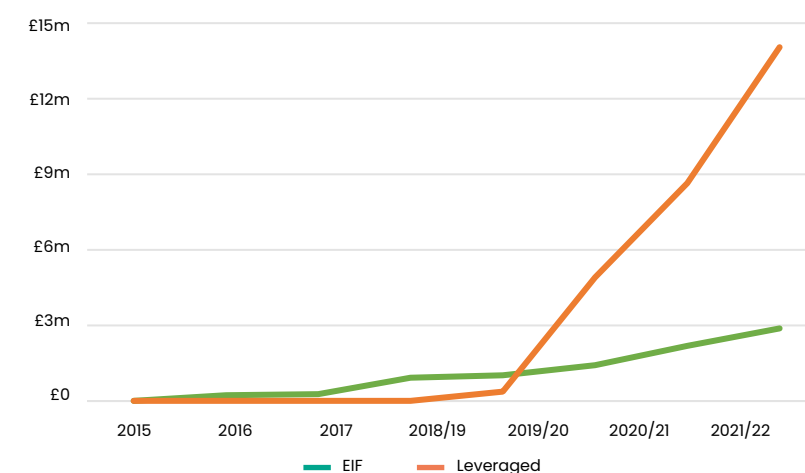
Enterprise Investment Fund (by Industry Sector)



The EIF mirrors some of the research themes of the University (advanced materials, infectious diseases, personalised health). The sector analysis also demonstrates where the team might focus future efforts (climate futures and digital).

Figure 2

Cumulative EIF & Leveraged Funding



£2.8m EIF Investment
£14m Leveraged Funding

FUTURE PLANS

There is an opportunity to further build on this success, improve our Knowledge Exchange Framework performance and deliver on our KE strategy with expansion of activities and further investment in this area.

The maintenance of a stable model and the development of robust processes, alongside ring-fenced funding for projects in the IP Commercialisation pipeline from the Enterprise Investment Fund (EIF) is starting to yield results. Over the next few years the additional investment in the team and an increased EIF budget will enable us to support growth ambitions and expand EIF activities.

Our recently appointed Enterprise Manager will oversee and monitor fund activities and funded projects, horizon scan for funding schemes, accelerator programmes and build strong links and networks across the Entrepreneurship landscape.

Investment in our IP commercialisation capabilities will provide the means to scale-up activity and team capacity rapidly in order to deliver and compete on a level playing field with peers. The additional resource will enable us to build a new, high profile Life Sciences Commercialisation team, headed up by a new Head of Life Sciences (HLS) post with support from an additional full-time Manager post for Health and Life Sciences. Perhaps most importantly, the newly formed Life Sciences Commercialisation team is expected to increase success rates for significant translational grants direct to the University, targeting UKRI's Development Pathway Funding Scheme, Wellcome Trust and NIHR funds to de-risk technologies in our pipeline.

Planned expansion of activities include:

- 1) Additional funding to EIF to provide a longer cash runway for our spin-out companies and enable them to secure experienced management teams for longer term success;
- 2) More detailed monitoring of the fund and the growing portfolio of funded projects;
- 3) More sophisticated management of the spin-out portfolio and equity investments;
- 4) Proactive leveraging of match funding from external sources, particularly EIS/SEIS investment funds;
- 5) Active promotion and marketing of the EIF within the academic community, alongside training, case studies and workshops/bootcamps to further encourage the development of the University's entrepreneurial ecosystem.

Spin-outs

The team will continue to grow the numbers of spin-outs formed. The focus for the next five years will be around steady growth in numbers and increasing focus on creating investible spin-outs, equity portfolio management and a robust pipeline.

External investment

In order to further broaden reach and impact of our commercialisation activities, it is important to establish greater links with venture capitalists/high net worth individuals to provide investment to University start-up companies which have the potential for high growth. Discussions with the Alumni Office have begun around the creation of a network of mentors, who can provide social capital to spin-outs in our portfolio, alongside the possibility of private investment.



Enterprise Board Members

Chair	Professor Anthony Hollander
Faculty Academic Lead Health and Life Sciences	Professor Rachel Williams
Faculty Academic Lead Humanities and Social Sciences	Professor Robert Blackburn
Faculty Academic Lead Science and Engineering	Professor Steve Rannard
Member of Council	Norman Molyneux
External Lay member	Dr Paul Ewing
External Lay member	Dr Mark Wyatt
Member of Council	Dr Kashmir Gill
External Lay member	Lisa Layzell
Director of Legal Compliance (Professional Services)	Kevan Ryan
Commercial Accountant (Professional Services)	Roger Bickerstaff
Assistant Director of Research Partnerships and Innovation	Lynsey Keig
Head of IP Commercialisation	Emma Nolan
Development and Alumni Relations Representative	Michaela Riches

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Enterprise Programme

liverpool.ac.uk/careers/programmes/enterprise/

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