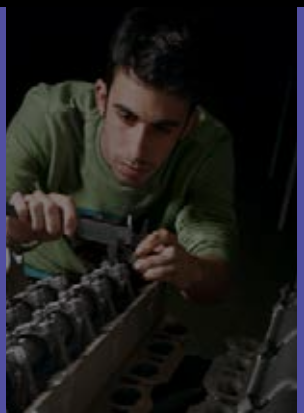
THE Manufacturer

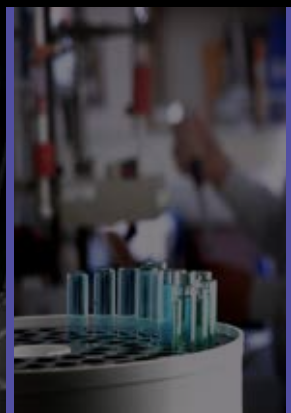
COLLABORATION

UNIVERSITY

EXPLORING THE WORKING POTENTIAL OF INDUSTRY AND ACADEMIA

JUNE 2014





What's in this report?

Editorial
This report was compiled for *The Manufacturer* magazine by:

Callum Bentley, Deputy Editor
c.bentley@sayonemedia.com

Ruari McCallion, Reporter
r.j.mccallion@btinternet.com

Design
Martin Mitchell, Art Editor
martin@opticjuice.co.uk

Sales
Henry Anson, Sales Director
h.anson@sayonemedia.com

In order to receive your copy of thec *The Manufacturer* kindly email g.gilling@sayonemedia.com, telephone 0207 4016033 or write to the address below. SayOne Media cannot accept responsibilty for omissions or errors.

sayonemedia
Elizabeth House, Block 2, Part 5th Floor,
39 York Road, London, SE1 7NQ
T +44 (0)207 401 6033 F + 44 (0)207 202 7488
www.sayonemedia.com.

INTRODUCTION

TOWN AND GOWN

The amount of money available for R&D in the UK is quite staggering: over £26bn, from public and private sources. The organisations involved from the public sector can begin to look like an alphabet soup, and just as confusing, but if businesses are serious about improving their product, it is worth spending the time to seek out the resources that are needed.

Apart from the Ancient universities, this country's older higher education institutions were mostly established by businesses – engineering and manufacturing particularly, as the industrialists of the 19th Century wanted to develop and extend technical and knowledge resources. The Polytechnics of the 1970s, which became universities in the reorganisation of higher education, were founded on the basis of vocational education and training, so the idea of collaboration between the halls of academe and the great mills of industry are nothing new; but it is fair to say that the relationship has been revived and given new urgency by the need for advanced techniques, technology and resources.

Some private sector funding is highly visible, whether from Microsoft in Cambridge, Boeing at Nottingham or in the science parks that have become part of the landscape. But these are all pretty high-level activities and may seem to exclude smaller enterprises. They shouldn't. Funding is also available for things like Knowledge Transfer Partnerships, which are tailor-made for smaller businesses and have been a great success in boosting sales and profitability. Most of them have offered their KTP student a full-time post.

There has been the perception that universities are more focused on original IP and creating spin-out companies. Not if they want to make money, they aren't. Even a global giant like MIT gets only a tiny fraction of its revenues from original IP. Universities want to work with industry as consultants and partners. All business has to do is select the right one. And get a share of that £25bn funding, of course.

> ***There has been the perception that universities are more focused on original IP and creating spin-out companies***

BACK TO THE FUTURE

Collaboration between universities and commerce has been going on for centuries but it has been given a new life over the past few years. ***Ruari McCallion*** *looks at the state of play.*

Back in the early 1970s the annual final year exhibition at what had been Brighton College of Art (now the University of Brighton) fascinated a young boy's eyes. Most people don't remember or never even knew about that 1971 exhibition but for the fascinated young eyes that saw it – mine, in case you were wondering – this was the foundation stone of the growth of a cluster that has been very much the driving force of Brighton's growth as a centre of innovation. Art and commerce met each other, found that they got on and went into business.

Cool Fusion

The importance of Brighton's creative, digital and IT (CDIT) cluster – dubbed 'Silicon Beach' – extends to media, electronics, IT (obviously) and engineering. Some products may seem quirky – contactless sliders for DJs' mixing desks, for example, but contactless technology is less prone to failure from repeated use so could have applications across a range of industries, from medicine to mining.

Arts and humanities are often dismissed as having little to do with science and engineering but the first report of the two-year Brighton Fuse project should disabuse them of those misapprehensions. It defines 'fused businesses' as those that combine creative art and design skills with technology expertise. The research identifies a new category of high growth firms within this cluster, that are 'fusing' and 'superfusing' to create an extraordinary competitive edge. Two-thirds of businesses within Brighton's CDIT are considered fused; Steve Jobs, co-founder of Apple Computers, also believed in the synergy that exists at what he described as "the intersection between technology and the liberal arts". His company seemed to do quite well out of the idea.

The 2013 National Institute for Economic and Social Research (NIESR) report found that the digital economy is larger than the construction, manufacturing and financial services sectors and it is found in highly concentrated clusters, like the one in Brighton. These digital clusters seem to be especially important to the economy because they feed the growth of other sectors. They also tend to be associated with universities and not necessarily in a formal way; people get involved in business with friends and colleagues and draw on the skills they see around them. But collaboration between university and industry is about far more than spin-outs and incubators.

The Value of Consultation

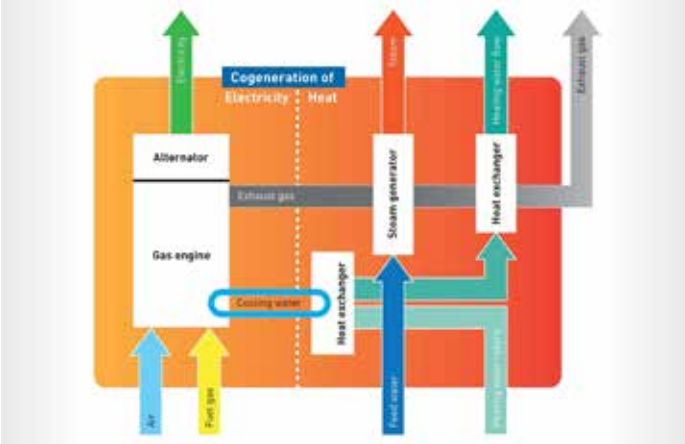
> "The universities of Liverpool, Manchester, Sheffield, Leeds, Birmingham, Nottingham and Derby all grew in the 19th Century out of the needs of industry for advanced skills and research expertise"

"Universities don't produce a massive amount of revenue from selling intellectual property (IP). Not even MIT," said David Docherty, CEO of the National Centre for Universities and Business, a co-sponsor of the Brighton Fuse project. "Their main source of revenue is from consulting."

The universities of Liverpool, Manchester, Sheffield, Leeds, Birmingham, Nottingham and

CASE**STUDY**

> The UK spends close to £26bn a year on private and publicly-funded R&D, including £3.3bn direct funding, £2.9bn through the research councils and £2.3bn through the Funding Councils



Derby all grew in the 19th Century out of the needs of industry for advanced skills and research expertise. Where Warwick and Coventry Universities end and the research centres for the auto industry and the Warwick Manufacturing Group begin is not at all clear; the boundaries have been eliminated. The universities in Wales are developing growing technical incubators jointly with the Welsh Assembly, through the Technium project.

Two-way Street

"There was never a distinction between academe and business outside the Ancient universities and any such distinction is unhelpful," Docherty said. Business bears some responsibility as well. It often has a reductive view, that it is looking for 'oven-ready' graduates but there is value to be gained from a two-way relationship, beyond the warm glow of charitable works or a nice photo in the corporate social responsibility section of the annual report. There are examples of success on the NCUB website, and schemes like Knowledge Transfer Partnerships (KTPs), which fund projects involving a business, university and a recent graduate, postgrad student or NVQ Level 4 apprentices. According to KTP figures, 52% of companies reported an increase in the overall value of the business and 62% recorded an increase in sales.

Money on the Table

The Caparo Innovation Centre at the University of Wolverhampton brings ideas and enterprises together, and provides funding and facilities for development. The universities of Leicester, Cambridge, Nottingham and King's College London all have major medical, biomed and electronic innovations to their names. Sheffield is a centre of excellence for metallurgy. Even the Isle of Man gets in on the act, working with the Northern Aerospace Cluster. The UK spends close to £26bn a year on private and publicly-funded R&D, including £3.3bn direct funding, £2.9bn through the research councils and £2.3bn through the Funding Councils. The UK universities will continue to undertake world-class research; if UK businesses aren't involved then they will be contracting for overseas competitors.

Most universities are not located in the middle of rolling green acres; they are in cities and towns, the same place as manufacturing and engineering businesses. Knowledge is on the doorstep and the doors are there to be knocked on.

WMG industry and the future

WMG, an academic department of the University of Warwick delivers research and education aimed at bridging the gap between academia and industry, enabling companies to gain competitive advantage on anything from a regional to global scale. Here WMG highlights its activities in transport, SME engagement and doctoral programmes.

WMG hosts one of the seven government-backed High Value Manufacturing Catapult centres in the UK. Its unique mix of academic and ex-industry engineering staff work collaboratively with businesses to incorporate university research into commercially successful products and services. Where necessary, WMG actively supports companies seeking development funding from a range of sources.

The main focus for the Catapult centre is applied research between Technology Readiness Levels four to seven, sometimes called the 'valley of death', reflecting the difficulty of translating a good research idea or new technology into commercially viable products.

Research is focused on the global challenge of Low Carbon Mobility with two priority themes of Lightweight Technologies and Energy Storage and Management.

Working in collaboration: Revolution Very Light Rail (VLR) consortium

Rail is a key sector for the WMG centre HVM Catapult. WMG is part of the Revolution VLR Consortium (other partners include Allectra, Transport Design International, Trelleborg, and Unipart Rail), which recently won funding from Future Railway to develop an affordable low carbon, Radical Train demonstrator. A key aim of the project is to facilitate low cost connectivity in suburban and rural areas.

The Radical Train will demonstrate a unique self-powered bogie (with integral, hybrid propulsion and kinetic energy recovery system) combined with a modular, lightweight body-shell design utilising advanced materials. It will employ technology transferred from the automotive sector to achieve low manufacturing and operating costs.

Working with SME's: John Oates Ltd

David Azpiroz, a University of Warwick student, completed a short study for local company John Oates Limited during the summer vacation of 2013. The company specialises in the design, development and manufacture of electric delivery vehicles. David used a Matlab model to simulate the range capability for a John Oates prototype electric delivery vehicle for a variety of conditions and using a standard drive cycle. Investigations were carried out into the effect of modifying the battery voltage and capacity, the motor and other system components, as well as different driving styles and routes.

At the conclusion of the simulations a number of recommendations were made to enable the vehicle to achieve the required range and the target top speed of 60mph as well as enhancing the battery performance.

Mike Haddock of John Oates Limited said: "we are extremely pleased and grateful for WMG's help. It will be beneficial to our project and we hope to continue with future projects. Our next priority is to refine the control system for regenerative braking".

CASE STUDY

International Institute for Product and Service Innovation

Through the International Institute for Product and Service Innovation (IIPSI), WMG works with SMEs to act as a bridge between academic research and practice in industry. Its innovation programme provides access to the latest technology and process for companies in the West Midlands region.

JSC Rotational Ltd: New materials, new processes

Rotational moulding company JSC Rotational Ltd has collaborated with the WMG SME Team on a range of projects looking at how the company's various processes can be improved. Initially the SME Team investigated the possibility of using JSC's manufacturing process to produce a casing for a product which requires very high impact resistance. WMG undertook mechanical testing of samples to the relevant ISO standards and were able to then interpret the results to guide JSC's manufacturing process and material choice for the new product.

Since then JSC has collaborated with both WMG and plastics recycling company Boomerang Plastics to look at how they can integrate recycled plastic products into their rotational moulding process, as well as how they might re-use non-recyclable materials in their processes. The trials have indicated a number of ways that JSC Rotational can be more environmentally friendly and cost efficient.

The most recent project has resulted in the creation of an innovative solution to the problem of venting hot air from tooling during rotational moulding. The concept has now been proven, so the WMG SME Team and JSC will now work together to find a suitable medium to high volume manufacturing solution.

Managing Director, Karen Drinkwater said "I think it's really important for a progressive company to be at the forefront of any developments in an industry and working with WMG has given us that."

International Doctorate Centre

Combining research with education, WMG brings together doctoral researchers with companies who have an industry challenge to address. For the research student working towards their International Engineering Doctorate (EngD), the EPSRC-backed International Doctorate Centre combines academic and industrial expertise, offering industry-relevant research, taught courses, opportunities for networking and engagement and an international placement during a 4 year programme. For the sponsoring company it provides the opportunity to harness pioneering research in order to tackle a specific industry challenge, although the long-term benefits may extend well beyond single projects.

Limhi Sommerville: Battery system modelling and design

Limhi is a chemistry graduate working for his doctorate by researching battery system modelling and design for Jaguar Land Rover. Limhi says "battery technology could be vital for the automotive industry in the future. I'm looking at one of the fundamental areas in how batteries really age and how they behave over a lifetime and this has major implications on a hybrid's fuel economy, a plug-in hybrid electric vehicle's lifecycle or range, and how that changes over a vehicle's life. If there are root causes, we need to know how to stop those root causes. The models can show me how the different chemistries react and things that will change. My work inputs into the model, and the data that I'm able to collect tells the model what's important and what JLR need to consider."

Limhi is supervised by Professor Paul Jennings at WMG and by Chris Lyness, a Technical Specialist for Batteries at JLR. Chris says: "We're in a fairly unique situation with our tie-in with the company and the University. By the end of his course of study, Limhi will be telling us where we should be looking. Limhi will give us a real depth of expertise that we don't have represented at the moment.

Because of this unique collaboration we have here, we can look into areas that we wouldn't normally look at in an engineering environment. Because of the academic involvement, we can explore new theories or areas that might have not been applicable due to them not being deemed transferable. Now we're learning more than ever before. JLR and WMG are really starting to lead the industry in terms of new research and new findings."

For more information on how you can engage with and gain support from WMG's activities please visit our website ***www.wmg.warwick.ac.uk***

WOLFSON SCHOOL

OF MECHANICAL & MANUFACTURING ENGINEERING

Academically Challenging – Industrially Relevant

The Wolfson School of Mechanical & Manufacturing Engineering provides one of the country's best environments for academically challenging, industrially relevant, engineering teaching and research, with over 130 members of staff and approximately 1,200 undergraduate, postgraduate and research students.

Queen's Anniversary Prize

High Value Manufacturing (2013) - The School has been awarded its second Queen's Anniversary Prize for Higher and Further Education, recognising and reconfirming the strength and quality of Loughborough Engineering. The School's first Queen's Anniversary Prize was for Optical Engineering (2000).

Teaching Excellence

The School brings together expertise in engineering management, engineering science, manufacturing processes and technologies, product design, and sports technology, with the six full time accredited undergraduate degree programmes being regularly placed in the top of their relevant subject league tables, and six full time / part time postgraduate MSc degrees providing enhanced specialist knowledge.

Research Excellence

The School defines new engineering theories, techniques and technologies across a large array of industrial sectors. At the heart of these activities are key UK Government and Industry funded research centres, with three Innovative Manufacturing Centres, and a core founding partner of national engineering centres.

- EPSRC Centre for Innovative Manufacturing in Intelligent Automation
- EPSRC Centre for Innovative Manufacturing in Regenerative Medicine
- Innovative Electronics Manufacturing Research Centre
- The Manufacturing Technology Centre (MTC)
- High Value Manufacturing (HVM) Catapult.

Loughborough University

For more information go to:
www.lboro.ac.uk/departments/mechman

The Wolfson School of Mechanical & Manufacturing Engineering provides a rich environment for industrially relevant, academically challenging, Learning, Research and Knowledge Transfer, in Engineering and Technology. The School is a vibrant and talented community of technical development, providing high value professional career opportunities.

Study full-time at Undergraduate Level:

- Engineering Management (BSc)
- Bosch, Coca-Cola, Cooper Bussman, GSK, IMI, Johnson Matthey, Moog, Nestlé)
- Manufacturing Engineering (BEng)
- Mechanical Engineering (MEng/BEng)
- Product Design Engineering (MEng/BEng)
- Sports Technology (BSc)
- Diploma of Industrial Studies (DIS)
- Diploma of Professional Studies (DPS)

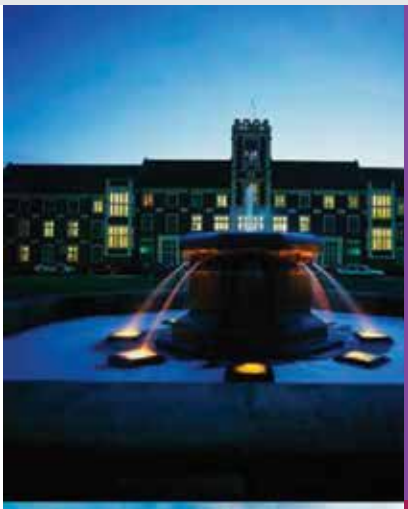
Study full-time and part-time at Postgraduate Level (MSc):

- Advanced Engineering
- Advanced Manufacturing Engineering and Management
- Engineering Design
- Engineering Design and Manufacture
- Mechanical Engineering
- Sustainable Engineering

Research and Knowledge Transfer with our multidisciplinary Research Groups (PhD/EngDoc/MPhil):

- Additive Manufacturing
- Biological Engineering
- Control and Reliability
- Dynamics
- Electronics Manufacturing
- Healthcare Engineering
- Intelligent Automation
- Interconnection & Electronics Manufacture
- Low Carbon Technology
- Mechanics of Advanced Materials
- Optical Engineering
- Sports Technology
- Structural Mechanics and Acoustics
- Sustainable Manufacture
- Thermofluids & Combustion

For more information go to:
www.lboro.ac.uk/departments/mechman



Loughborough University

UNIVERSITY OF STRATHCLYDE
MANUFACTURING

Working towards the future growth and success of manufacturing in the UK

A leading University and its industrial partners are finding solutions to global challenges – while driving economic growth.

Manufacturing remains an important sector in the UK economy with growth increasing steadily. Academics at the University of Strathclyde in Glasgow are working side-by-side with partners in industry to develop a new generation of products, processes and services, and set new standards in manufacturing design.

Specialising in high value manufacturing, the University's approach ensures technology development is relevant to global industrial challenges – from design, rapid prototyping, fabrication, operational deployment and business excellence through to management and optimisation.

It is this ethos of partnership working that secured the award of Times Higher Education UK University of the Year 2012/13, and more recently, Entrepreneurial University of the Year 2013/14.

Much of the University's focus on collaborating with industry will take place within the Technology and Innovation Centre, a £90 million capital investment in research capability. The Centre will allow the University to concentrate on four key sectors— Health, Energy, Future Cities and Manufacturing.

Archie MacPherson, CEO of the University's Advanced Forming Research Centre, a world-class research facility to support design and manufacture in industries from aviation to energy, said: "Strathclyde's unique research facilities enable business and academia to work together to tackle the challenges and to exploit opportunities for

University of Strathclyde Glasgow

innovation. Ultimately, it's about revitalising manufacturing in the UK."

The Advanced Forming Research Centre is one of 7 elite technology and innovation centres that form the UK High Value Manufacturing Catapult. The success of the Centre is such that it has more than doubled in size to meet demand. This collaborative venture between the University, High Value Manufacturing Catapult , Technology Strategy Board, Scottish Enterprise and leading multinational firms including Boeing, Rolls-Royce, TIMET, Aubert & Duval and Barnes, has already seen more than £30 million of investment in its bespoke building and facilities near Glasgow airport.

Meanwhile, scientists at the University's EPSRC Centre for Innovative Manufacturing in Continuous Manufacturing (CMAC) are working closely with companies including GlaxoSmithKline, Novartis and AstraZeneca to enable a step change from current batch manufacturing methods, towards the development of high-quality pharmaceuticals at a lower cost, more quickly and in a more sustainable way.

CMAC Director Professor Alastair Florence said: "For centuries, many chemical products – including medicines – have been manufactured using traditional processes, whereby they are produced in large batches and stored in expensive warehouses. We are leading a revolution in the way such medicines will be produced in the future.

"Allowing drug companies to tailor medicine production to reflect patient demand reduces the need for firms to stockpile supplies – meaning they can make significant savings and reinvest in the research and development of new treatments."
In the oil and gas, mining and power sectors, a partnership between the Weir Group and the University is making a significant contribution to existing and new design concepts, product design, and development. The Weir Advanced Research Centre offers a crucial opportunity to develop innovative technologies and equipment for Weir's served market. Senior company engineers are working together with leading engineering academics to develop equipment and services in the company's three main markets.

With nearly 1,000 of Strathclyde's alumni working around the world in the oil and gas industry, the University is also a major provider of skilled undergraduate and postgraduate students to the sector. Its new Oil and Gas Institute focuses on addressing the industry's key business drivers of reducing costs, increasing production efficiency and continually improving safety and environmental performance.

Dr Simon Puttock, Business Development Director for the Institute, said: "Our partnership with industry enables the transfer of advanced research outcomes and staff skills from Strathclyde into industry design and manufacture; in return, Strathclyde gains valuable insight into industry best practice.

"We are taking partnership to a new level and helping Scotland's industries compete on the world stage. Available for either ad-hoc testing or consultancy work or for larger more extended development work, we aim to ensure that manufacturing remains an important sector in the UK economy."

For more information on the University of Strathclyde's partnerships with industry please contact the Technology and Innovation Centre on tic@strath.ac.uk.

www.strath.ac.uk/manufacturing

CASE**STUDY**

Joining Forces

Today's global business environment is a challenging one, with companies facing difficult decisions on how to maximise their investment in future products and manufacturing techniques. The ***University of Edinburgh*** *explains how companies are turning to universities to make use of the skills, expertise and facilities available, either on a short term basis, or as part of a longer term strategic alliance.*

As one of the world's top research universities, The University of Edinburgh is well placed to support industry's challenges. The university is home to world-class centres of excellence, involved in innovative physical science and engineering. It supports a diverse range of sectors, such as healthcare, security, automotive, food and drink, life science and high value manufacturing. The university's centres are home to some of the most sophisticated analytical and testing facilities in the world and are available for industry use, alongside the opportunity to innovate through working with some of the world's leading scientists and engineers.

Within the university's School of Chemistry researchers are designing catalysts and small molecules that aid the production of speciality chemicals. These novel materials can significantly reduce energy costs for industrial production as well as reducing manufacturing steps. Taking a slightly different approach, the university's biotechnology experts fuse engineering and biology for the production of materials including new polymers to enable the production of sustainable and biodegradable plastics from renewable sources.

Production optimisation and product formulation is also an area of strength. The university has vast expertise in the use and application of robotics, autonomous processes and software engineering through the School of Informatics. This is boosted by the operations knowledge in the School of Mathematics. Facilities within the School of Physics provide solutions for soft matter characterisation, giving industrial partners an insight into how their fluid systems behave and can be controlled in the most efficient manner. The University of Edinburgh is also home to facilities for design and rapid prototyping, involving the College of Art and the School of Engineering's FabLab with advanced 3D printing capabilities.

The University of Edinburgh has expertise not only in science but also in how to apply this knowledge to benefit companies locally, nationally and internationally. It has successfully enabled partners to gain a real competitive advantage in their marketplace. As Ian Sharp, commercial relations manager explains:

"With over 3,000 academics undertaking research in a wide range of disciplines, the University of Edinburgh is well placed to offer access to skills, knowledge, problem-solving experts and technologically advanced facilities that are complementary to many companies' in-house expertise. Companies can often have many individual links with a university, be it through the careers team, alumni or links with individual academics, without the potential for strategic collaboration being fully maximised. At the University of Edinburgh we work to establish and develop strong links between academics and industry partners, both from large and small companies to ensure that knowledge is transferred successfully and, ultimately, both partners benefit from the impact of the relationship."

With continuous investment in the latest scientific research, facilities and equipment, the university is uniquely positioned to assist companies to devise solutions for today's business issues.

For more information on how your business could work with the ***University of Edinburgh*** on an exciting new future contact Edinburgh Research and Innovation **www.research-innovation.co.uk** or email **crm@ed.ac.uk.**

On track for REINVENTION

Laser based track inspection trolley at the University of Birmingham.

***The University of Birmingham** has been involved in railway research and development projects in Britain and around the world for decades and is working extensively with industry on the challenges of the sector.*

For the past ten years, The University of Birmingham's delivery of activity with British railway projects has been performed through the Birmingham Centre for Railway Research and Education (BCRRE).

BCRRE is a leading interdisciplinary centre, with expertise and facilities that allow it to conduct research into most aspects of railway technology and performance. Within this, students and academics are currently investigating data architecture and models for future European train control systems and are supporting Network Rail with traffic management investment decisions. In addition they are working closely with the UK Department for Transport on improved methods for analysing railway capacity and novel technologies.

THE TIMES
THE SUNDAY TIMES
University of the Year
2013-14
UNIVERSITY OF BIRMINGHAM

The Centre is also working in collaboration with industry to address the energy concerns of main line and metro railway networks, investigating alternative power and traction systems and optimising efficient operations in all parts of railways through the use of advanced simulation technology, for both existing systems and proposed new generation systems.

BCRRE offers a wide range of short courses and postgraduate programmes, including taught Masters and doctoral studies. The postgraduate programmes are available on both a full-time and distance learning basis. Recently, the Centre has developed undergraduate programmes in Civil and Railway Engineering and in Electrical and Railway Engineering and are looking for industry support to sponsor students enrolling on these programmes.

Train of thought – Sharing knowledge with Cogitare Ltd

Cogitare Ltd is a niche consultancy serving many clients in the rail sector. Its core business is the development of solutions for the optimisation of rail infrastructure and operations. Cogitare's Systems Optimisation Process helped London Underground reduce whole-life system costs by almost £0.5 billion and saved 5bn kWh of energy.

The costs associated with the building of new rail infrastructure are vast and to remain competitive, Cogitare wanted to develop better and more economical methods to measure and model real rail capacity and to validate and improve capacity simulations and simulators. The Company looked to researchers at the University of Birmingham's Centre for Railway Research and Education, led by Professor Clive Roberts and Dr. Stuart Hillmansen, for help in exploring this opportunity. Cogitare has now embarked on a Knowledge Transfer Partnership (KTP) project with the university that will seek to develop a more sophisticated and accurate measurement and modelling solution.

Successful delivery of the partnership will significantly enhance both partners' reputation as technological leaders in the field. It will give Cogitare access to the University of Birmingham's knowledge, knowhow and skills in rail capacity simulation and traffic management and, in turn, the university's

CASE STUDY

researchers will benefit from applying their research to a real life situation.

In addition, Cogitare will be introduced to a number of international partners through working in collaboration with the university in its newly formed Chinese Railway Research Institute, the Anhui-Birmingham International Research Institute in Rail Transportation. This will help the company to develop an international network to enhance the sales and marketing of its new products.

Larry Fawkner, optimisation director for Cogitare Ltd, said: "By combining the knowledge of our company with that of the Centre for Railway Research and Education at the University of Birmingham, we believe that we will be able to develop a product that will give us a clear competitive advantage in the UK market. It will also allow us to expand into the Chinese Market."

Chinese rail partnership is just the ticket

The creation of a new railway research institute in Hefei, Anhui Province, marked a major milestone in the University of Birmingham's rapidly evolving relationship with China and its hopes for future research capability in the region.

The Anhui-Birmingham International Research Institute in Rail Transportation brought together Anglo-Chinese expertise, with initial research focusing on metro developments in the province and in major Chinese cities.

Clive Roberts, director of the Anhui-Birmingham project and director (research) of the Birmingham Centre for Railway Research and Education said: "Working in China gives us the opportunity to support and influence railway development in a country with 10,000km of high-speed lines, and with 25 cities that are building or extending their metro services.

"As the Institute grows and develops its significant research capabilities, it will act as a base for our railway research across Asia and will reinforce our growing portfolio of activities in China."

> As the Institute grows and develops its significant research capabilities, it will act as a base for our railway research across Asia and will reinforce our growing portfolio of activities in China
>
> *Professor Clive Roberts*
> *University of Birmingham*

Tapping into rail expertise at the University of Birmingham

The Centre's Rail expertise covers research in aerodynamics; asset management; condition monitoring; environmental change; geotechnical engineering; materials and metallurgy; modelling and computing; network capacity engineering; non-destructive testing; power and traction; risk and safety management; signalling and train control and systems engineering.

If you are interested in working with the Birmingham Centre for Railway Research and Education contact our Business Engagement Team. They can help you to navigate your way through the funding opportunities that may be available for your organisation.

The ABIA project (Accelerating Business/ Knowledge Base Innovation Activity) is one such funding mechanism and will support a comprehensive and flexible service to regional SMEs.

Working across a range of science and technology disciplines, the project will provide:

- Research and consultancy support to explore and define the R&D and innovation needs of your company
- Free research assistance of up to two days with a piece of research to advance your company's technology or plans to develop a product or service with options for more extended projects
- Support to companies to develop collaborative funding proposals with the University

For more information please contact
Mr Richard Fox
Business Engagement Partner
College of Engineering and Physical Sciences
University of Birmingham
T: **0121 414 8921**

Business with Birmingham

WMG
Innovative Solutions

Shaping the Future

WMG is a world-leading global provider of innovative solutions to industry and business. At the forefront of innovative technology, we work collaboratively with partners through interdisciplinary research in the fields of energy efficiency, lightweighting, sustainability, healthcare, innovative manufacturing and new business models. We address major real-world challenges, making a significant impact both on economic growth and society.

Knowledge Exchange

Working collaboratively with companies of all sizes and across many sectors, we have created and developed major new processes, products and services. We can support you through:

- Research projects with access to our experts to carry out testing, measurement, verification and related market studies
- Helping businesses identify and leverage collaborative research funding when opportunities arise; supporting the application process and research studies
- Providing research knowledge to help bring to life new innovations

Education

We are a world leading centre for management studies and through our strong links with industry we create programmes that are research and impact driven.

Our part-time Professional and Executive Programmes offer courses at all levels, from a Bachelor's in Engineering for those in apprenticeships, to a Master's degree in a range of engineering and technology management streams. We also offer shorter custom programmes designed to meet the education needs of your company.

Our International Doctorate Centre takes a more in-depth look at solving real industry challenges through applied research, bringing together a doctoral student with a sponsor company over a 4 year period. The doctoral student will work with the sponsor company on a challenge, or a number of challenges, that the company has identified. Students divide their time between the University, where they can access our cutting edge technology and research expertise, and the company where they are able to apply the work directly.

For more information or to talk about a collaboration:

W www.wmg.warwick.ac.uk
E wmgbusiness@warwick.ac.uk
T +44 (0)24 7657 5935

THE UNIVERSITY OF WARWICK