



CATAPULT CENTRES

IMPACT AT THE HEART OF THE
UK'S INDUSTRIAL STRATEGY

CATAPULTS' IMPACT 2015/16

DELIVERED
636
ACADEMIC
COLLABORATIONS



"It is one of the hidden gems of UK engineering."

Toby Peters,
DEARMAN

"We wouldn't have been able to set up our own facility, we would have needed to invest tens of millions to access these kinds of technologies.... there are other centres but they are all abroad."

Richard Price,
PRAGMATIC PRINTING



WORKED
ACROSS **24** COUNTRIES
AROUND
THE WORLD

SUPPORTED
2851
SMEs



"The Catapult programme offers businesses from start-ups to Rolls-Royce the chance to develop technology in a world-class environment."

THE TIMES

"We have had some great input from the Catapult's technical experts that helped us solve some key blockers early on in our business development. We have also found some excellent strategic partners through introductions the Catapult has made."

Mish Gopaul,
CO-FOUNDER, FATMAP

"To innovate, we need open centres where academia and business can get together and drive forward great ideas into manufactured products. And that's what the Catapults are delivering for us."

Juergen Maier
CHIEF EXECUTIVE, SIEMENS UK

DELIVERED
2473
INDUSTRY COLLABORATIONS



"There is nowhere else we are aware of, which could have that kind of impact on an organisation."

Ian Goodman,
GOODWOLFE ENERGY

OPERATING
£850m

OF OPEN ACCESS
RESEARCH &
DEMONSTRATION
FACILITIES for the benefit
of UK industry and academia



CATAPULT CENTRES

IMPACT AT THE HEART OF THE UK'S INDUSTRIAL STRATEGY

- CELL AND GENE THERAPY
- DIGITAL
- ENERGY SYSTEMS
- FUTURE CITIES
- HIGH VALUE MANUFACTURING
- MEDICINES DISCOVERY
- OFFSHORE RENEWABLE ENERGY
- PRECISION MEDICINE
- SATELLITE APPLICATIONS
- TRANSPORT SYSTEMS

After less than five years of operations, the Catapult programme has already delivered extensively on the commitment “to transform the UK’s capability for innovation in specific areas and help drive future economic growth”.

Across digital, energy, life sciences, manufacturing, space, transport and the urban environment, Catapults have developed early stage research towards full commercialisation, forged closer links between academia and industry, provided support for innovation and growth for thousands of SMEs and large companies, and built strong global relationships that are growing the UK’s economic opportunity and industrial leadership.

And the network is going from strength to strength. The new Compound Semiconductor Applications Catapult builds on regional investments in South Wales, including the £80m Institute for Compound Semiconductors and the £40m Compound Semiconductor Centre, enabling UK companies to access global markets including power electronics, wifi and photonics, which are forecast to be worth £125bn by 2025.

This brochure provides a quick insight into a few of the many recent successes from across the Catapult network. Find out more about the impact being felt throughout the UK’s economy at catapult.org.uk



Increasing the scale and speed of commercialisation

With support of the HVM Catapult’s AMRC (part of the University of Sheffield), local SME Technicut partnered with Japanese owned Nikken to develop the TiTan X-Treme – a new tooling system that dramatically speeds up the cutting of tough alloys such as titanium.

The system is now sold and used worldwide.

As a result of the collaboration, Nikken opened their European R&D Centre in Rotherham in 2015.

The TiTan X-Treme was instrumental in helping the AMRC and Rolls Royce reduce the time it takes to manufacture a titanium fan disc by 50% while producing a step-change in component performance. The system is now used in the new £100m Rolls-Royce Advanced Aerospace Disc Manufacturing facility, which was opened in June 2014, creating many valuable jobs.

This is a good example of “sticky technology” – an SME enjoying global recognition, a major inward investment in R&D by a Japanese company and a major new manufacturing facility in this country.

“... we have won new business and grown our workforce as a result of the collaborative research and networking opportunities here.”
Mark Kirby, CEO, Technicut



Spin out supported to scale up

Cambridge University spin-out company PragmatIC develops imprinted ultra-thin flexible microcircuits which are cost-effective enough to be incorporated into disposable items, ranging from intelligent packaging to wirelessly traceable documents.

Working and co-locating with CPI enabled the company to access dedicated engineering support, a controlled operating environment, access to collaboration partners and instant credibility with customers and investors.

“... the public access facility provided by CPI was perfect for us. We needed to scale up, and we were not in a position to do this on our own. ... [The] de-risking element, the access to world class facilities without huge capital investment, is a crucial part of the journey from concept to commercialisation.”
Scott White, CEO, PragmatIC.

In January 2015, the company announced a £5.4m investment from ARM, venture capital business Cambridge Innovation Capital (CIC), and existing PragmatIC investors. The funding will be available immediately and will enable the company to scale up its manufacturing of flexible electronic logic to 100 million later this year.



Future power system architecture project

Our electricity system is undergoing a period of transformative change. Consumers no longer want it only for switching the lights on and powering household devices, they now increasingly use it for things like heat and powering vehicles. Combined with the prospect of smart cities and community energy schemes, the future of our electricity system looks very different to the present.



The Future Power System Architecture (FPSA) project was commissioned by the Department of Energy & Climate Change (DECC) to assist ministers, officials and industry professionals to anticipate these developments and assess their impact. Anything other than taking a proactive approach to these changes could lead to an expensive and inadequate future power system, affecting all aspects of society and industry.

The findings call on the power industry and government to focus urgently on delivering new capabilities to transform GB's power system architecture by 2030- making it fit to respond to the challenges presented by the energy trilemma: decarbonisation; security of supply and; affordability. The project was undertaken through a collaboration between the Energy Systems Catapult and the Institution of Engineering and Technology (IET).

The next phase of the project is currently being developed.

Local area energy planning



Over the next decade the UK must prepare to deliver on national energy targets. This transition to low carbon requires substantial upgrades to local network infrastructure through collaboration across multiple parties.

To enable a cost effective low carbon transition, more advanced local area energy planning is needed to identify the right technologies in the right place, at the right time.

In response to this challenge, the Energy Technologies Institute's (ETI) Smart Systems and Heat programme (currently being delivered by the Energy Systems Catapult) has developed the UK's most advanced local area energy planning tool - EnergyPath Networks.

EnergyPath Networks enables the gathering and analysis of a wide range of data to create a local representation of all energy demand and supply for a local area. It maps the impact of future growth on local energy systems and develops pathways for a cost effective, local, low carbon energy transition.

These pathways reflect the unique priorities of individual Local Authorities, and in collaboration with electricity, gas and heat network operators, identifies which energy options are most appropriate for a local area and in what order they should be prioritised.

SME trade mission to Brazil



As part of its international programme, Future Cities Catapult has been working with the Brazilian cities of Belo Horizonte and Recife to improve their knowledge on smart cities, building on best practice, insights, and innovation from Future Cities Catapult's projects in the UK. As part of this work, the Catapult published a report identifying the common challenges facing British and Brazilian cities, and UK innovations that could be applied as solutions.

Following the report, Future Cities Catapult ran a competition with UKTI to give UK SMEs the opportunity to go on a UK Government trade delegation to Brazil. On this five-day mission the SMEs were introduced to city planners, city mayors, Brazilian businesses and other stakeholders with an interest in the development of Brazilian cities, and attended a Smart Cities Americas Summit in Curitiba.

The successful SMEs were all from the Northern Powerhouse region, and were selected as a result of their work in the fields of Traffic and Urban Mobility, Citizen Safety, and Digital Infrastructure – which are the three key challenges facing Brazilian cities. Since the delegation, two of the SMEs (Legion and Living PlanIt) are progressing their business opportunities in Brazil.

Bringing together cities, businesses, academia and innovators



A collaboration between Future Cities Catapult and the British Standards Institution is accelerating the development of standards for smart cities in the UK and across the world.

Called the Cities Standards Institute (CSI), the initiative is bringing together cities, businesses, academia and innovators to identify common challenges that cities face and introduce standards to overcome them to create the market for smart cities.

There are over 40 members of CSI, who jointly prioritise urban challenges to be addressed by the new standards and ensure that the standards developed for the sector are commercially and technically viable for global cities. This fast-track method has most recently seen the publication of standards on Smart City Frameworks and Smart City Concept Models. The new standards for 2016/17 are in development, and include guidelines for establishing a decision-making framework for sharing data and information services, and for developing project proposals for delivering smart city solutions.

The CSI has become a world-class think tank on city standards, helping put the UK at the forefront of this fast growing international market.

Bridging the gap

One of the biggest successes of the Transport Systems Catapult has been the Departure Planning Information (DPI) project. Before the TSC became involved with DPI, only two airports in the UK were able to provide the airspace network with information about when airplanes actually take off. This made it difficult to manage airspace effectively and to reduce delays.

Rolling out a new system was not straightforward. The benefit was divorced from the investment and there was no incentive for the airports because the benefits are with the carriers and the overall network.

Using Department for Transport funding, the TSC was able to bridge the gap, creating a very successful solution for seven airports, later rolled out to a further four.

The TSC will now continue the work using commercial funding, with carriers having agreed to fund the next 20 airports using their Future Airspace Strategy fund. It will make UK airports the most advanced in the world. Meanwhile, studies show that, from a £1m government investment, it is estimated that DPI will generate £42m-worth of benefits by 2029.



LUTZ Pathfinder

LUTZ Pathfinder is a pioneering research and development project carrying out the UK's first trials in public pedestrianised areas of self-driving vehicles. Overseen by the Transport Systems Catapult, the project involves electric-powered 2-seater 'pods' that operate in designated areas of Milton Keynes.

Following an OJEU tender process managed by the TSC, the vehicles were designed and manufactured by Coventry-based automotive firm RDM. They are equipped with an autonomous control system developed by the University of Oxford's world-leading Mobile Robotics Group (MRG).

Milton Keynes Council has also provided invaluable support, both hosting the trial and assisting with the regulatory framework for the project.

As a result of the LUTZ Pathfinder programme, MRG have successfully spun out 'Oxbotica', which was singled-out by the Wall Street Journal as one of the top ten EMEA technology start-ups in 2015. Meanwhile, RDM have become a high profile player in the global autonomous vehicle scene. They are now using experience gained designing the LUTZ Pathfinder pods to work on a wider range of vehicles.

Finally, the 'Great' branded prototype pod has been credited as the single most successful asset in the 'Great' campaign by the FCO, from its media and event appearances.



Blade test service

Wind turbine blades need to be tested statically for extreme loads, and fatigue tested to prove that they will survive for the designed lifetime. Longer blades require tests that can last for many months, significantly increasing costs and time to market.

Dual Axis began as a co-funded PhD with Durham University, continued as a KTP project and then as core ORE Catapult research utilising our blade test facilities. The research has developed software and a test methodology that enables blades to undergo flapwise and edgewise fatigue testing simultaneously, more realistically creating real-world operating conditions and significantly reducing the time and cost of such tests. This breakthrough could help to reduce overall blade test times by up to 25%.

The fatigue analysis software has received independent accredited certification.

The project has attracted considerable industry interest, including a major collaboration with leading international blade manufacturer LM Wind Power and its customer, wind turbine manufacturer Adwen. LM Wind Power has provided extensive data and a 40.3m blade for initial testing prior to an LM 88.4m blade for on-going development as part of a €13.2m European project.

The research is now being used in teaching and to develop further academic papers by Durham University, as well as providing a case study for how academic research leads to real industry impact.



Development of Atlantis' AR1500 1.5MW tidal turbine

Atlantis Resources Limited (Atlantis) first came to ORE Catapult's National Renewable Energy Centre in Blyth in 2012 to test its AR1000 1MW tidal current power device. The Catapult's 3MW drive train test facility provided a dry and controlled environment in which they were able to prove their innovative technology, reduce risk associated with the installation process and provide vital investor confidence.

Following the success of that initial test, ORE Catapult worked with Atlantis to secure €1.3m Eurostars funding to support the development and testing of the 1.5MW AR1500 turbine, due to be installed at MeyGen, the world's undisputed flagship tidal stream power project in the Pentland Firth off the Scottish coast, in late 2016.

The Catapult worked closely with Atlantis to design the rig required for the new device and to develop and deliver a six week test programme in summer 2016 that has significantly derisked the AR1500's deployment by proving its reliability and validating the performance of its power train system.

This pre-installation testing program is an important stage in the turbine quality assurance and acceptance procedures conducted by the project prior to deployment and electricity generation.



Leading personal data ecosystems

Digi.me first came across Digital Catapult when they held a personal data networking event to bring all the different players in the personal data ecosystem together. Digi.me joined the Personal Data and Trust Network – a network that builds and nurtures a community to support the UK in becoming the global leader in trust and responsible innovation with personal data. More recently digi.me attended the Visa Pit Stop, this Pit Stop focused on the emerging ecosystem of Alternative Finance (Alt-Fi) and challenger banks, aiming to identify new impactful technologies, data value chains and explored how the industry can continue to grow in the future.

The interactions between digi.me and Digital Catapult have helped significantly, leading to digi.me’s recent £4.2m Series A investment round. Digi.me was introduced to people who moved within their marketplace, thought leadership discussions, and the IoT Showcase which allowed digi.me to refine their messaging and optimise their implementation to market. A combination of all these activities helped clarify their Internet of Me vision, which puts users at the centre of, and in control of, their own connected world.



Emerging technology and disruptive innovations

The support mechanisms and services Digital Catapult provide for Golden Egg are wide reaching. They first worked together as part of an Environmental Data Exchange hack weekend. Since that initial interaction with the team they have integrated themselves fully with the projects and all of the support tools available from Digital Catapult, engaging at every level. This has enabled Golden Egg to accelerate their business and products and helped them to maximize their potential. Because of Digital Catapult’s input, Golden Egg were extremely fast to market. Golden Egg’s working partnership with Digital Catapult includes being involved with:

- Digital Catapult Barclays National Business Challenge
- IoTUK Pit Stop enhancing retail innovation
- Nissan Social Media Data Challenge
- Working with local centres
- Key business introductions
- Spin-out pitch-off event
- Networking and coffee mornings



Images represent the Adidas 'Better Player' campaign

Using satellite data for life sciences and healthcare

In 2014, the Satellite Applications Catapult signed a Memorandum of Understanding with the Highlands & Islands Enterprise (HIE) looking to identify where satellite technology could benefit rural areas. Life Sciences and Healthcare were two identified areas.

One successful project which has now been tested and approved, is the Satellite Ultrasound for Rural Stroke (SURS). Developed by the HIE, Tactical Wireless (an SME in Scotland) and the Catapult, this portable technology which can be moved around in any vehicle, takes a stream of images which can be sent back from remote areas to a clinician in a hospital or GP surgery for assessment. The SURS project was carried out in partnership with the University of Aberdeen, clinicians at Raigmore and a number of commercial organisations, and demonstrates how satellites can be a reliable backup in critical and emergency situations.

This initiative is now being rolled out to a wider UK community, initially Cornwall, Devon, Oxford, Manchester and the Isles of Scilly, and has located Tactical Wireless in the Highlands, where it is forecast to generate 50 new jobs in the area. Other projects are currently being scoped to work using the same technology.

The HIE joined with our Scottish Centre of Excellence in May 2016.



Illegal, unreported and unregulated fishing

The Illegal, Unreported and Unregulated (IUU) fishing project - Eyes on the Seas – is a joint collaboration with The Pew Charitable Trusts. This multi-million-pound project has grown from a demonstration of capability to a fully-fledged service offering, providing monitoring support services to governments and risk identification services to the seafood supply chain.

A new separate business unit has been set up with eight staff within the Catapult in order to deliver Eyes on the Seas services to customers. These services are provided by expert fisheries analysts supported by state-of-the-art technology that highlights and prioritises vessel behaviour in order to enhance the analysts’ efficiency. We have delivered services to seven governments to-date, including the UK, and are in advanced negotiations with six major international retailers and wholesalers.

In addition to helping combat illegal fishing, this project is opening a potential new market, offering retailers in the supply chain consumer confidence in the buying of goods and delivering actionable insights to all customers.





“We are delighted with the progress of this clinical trial in acute myeloid leukaemia. This is an important area of unmet medical need.”

Emma Morris,
PROFESSOR OF CLINICAL
CELL AND GENE THERAPY,
UNIVERSITY COLLEGE LONDON

Breaking down industry barriers – clinical oncology programme

Together with UCLB and Imperial Innovations the Cell and Gene Therapy Catapult (CGT Catapult) is progressing an immunotherapy that involves gene modification of a patient’s T Cells to treat certain blood cancers. A company called Catapult Therapy TCR Ltd has been set up to capture the IP and know-how from the project.

The project is addressing the need to demonstrate these types of therapy can advance to clinical trial and gain regulatory approvals as well as being a case study for process development and reduction in cost of goods.

So far, the set up and conduct of clinical trials in the UK have been accelerated and interim safety results were also achieved. CGT Catapult also set up a second trial with sites both in the UK and selected other European countries. This both demonstrated and expanded the experience and expertise of the regulatory and clinical operations teams as the trial progressed through the approval process for Gene Modified Organisms and Clinical Trial Application and clinical trial setup in the UK, Belgium, Germany and France.

In addition, the future cost of goods has been reduced by 60 percent and the number of steps in the manufacturing process has gone from 978 to 188. The manufacture of the product has also been successfully transferred to a UK SME.



“Important support for the financing was provided by the validation of the Cell and Gene Therapy Catapult collaboration.”

Michael Hunt,
CFO REEURON

Supporting SMEs - ReNeuron

ReNeuron, a leading UK-based cell therapy company and the CGT Catapult started working together in 2013, focussing on ReNeuron’s lead CTX neuronal stem cell line. The CTX cell line is used in ReNeuron’s therapeutic candidates for stroke and critical limb ischaemia.

The initial collaboration with ReNeuron focused on the development of a robust manufacturing process and associated analytical tests for the proposed clinical and early commercial supply of this particular cell therapy cell line.

The CGT Catapult team worked to ensure that the manufacturing processes for the CTX stem cell line were commercially ready by bringing in analytical, process development and manufacturing expertise. Activities included technology transfer, developing an alternative identity assay based on biomarker expression, and re-engineering and automating the manufacturing process for the cryopreserved CTX product.

The partnership resulted in novel processing technologies from the biologics industry being applied to create a one-step cell therapy process. Following the start of this collaboration to develop their next-generation manufacturing process, ReNeuron has successfully secured an initial £33m in financing and more recently was awarded a further £68m in financial backing from institutional investors.

Driving a radical transition in healthcare

The Precision Medicine Catapult (PMC) has the ambition to accelerate precision medicine to become a ‘mainstream’ healthcare solution in the UK. It will achieve this by helping to fast track precision medicine therapy and technology innovation adoption into routine care, for the benefit of patients, life sciences, industry and the UK economy.

Headquartered in Cambridge, with seven Centres of Excellence across the UK, the PMC is already working with companies, charities, academia, policy makers, hospitals, patient groups and healthcare authorities in the UK and globally, to provide the leadership needed to fast-track precision medicine technology adoption into routine patient care. Its main objectives include:

- Providing strategic industry leadership, bringing together health, research and industry leaders to shape direct national international strategy which will attract investment and promote growth
- Building networking communities of practice for precision medicine
- Providing access to infrastructure for prototyping and test-best capabilities
- Fast-tracking the development path for precision medicine clinical trials
- Enabling faster update of precision medicine within the healthcare system.



Cytosponge – pioneering medical tests to detect Barrett’s Oesophagus

Developed by Dr Rebecca Ferguson at the University of Cambridge, the Cytosponge is a pioneering medical test that can detect Barrett’s Oesophagus (BE). Three to six per cent of individuals with reflux-predominant symptoms may have BE, but only 20-25 per cent of patients are diagnosed.

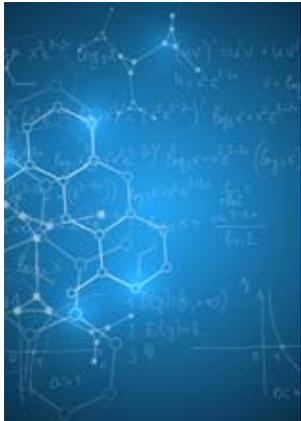
PMC is a collaborative partner for Cytosponge and is working with the team to help develop the health economics case, expand the agenda nationally and provide support for the third and final clinical trial, BEST3. This will consist of randomised trials with 4,000 patients in the NHS.

The PMC identified the Cytosponge as a new precision diagnostic tool that will help achieve its vision to get better medicines developed, moving them quickly from trials to adoption into routine patient care.

This case study is a great example of how PMC can add value - by helping precision medicine innovations reach clinical adoption and avoid common points of failure in the UK. We will help address the clinical adoption process through one of the PMC’s Centres of Excellence and provide regulatory and commissioning support to get the test into a National Institute for Health and Care Excellence (NICE) approved pathway for BE, ultimately helping patients.

“New tools are critical for selecting the right treatment for the right patient. Being able to precisely target a treatment means maximum benefit for the patient – they receive a treatment that works for them and with fewer unpleasant side-effects. But it also delivers economic benefit because money and time are not wasted on ineffective treatments.”

Professor Sir John Savill
CHIEF EXECUTIVE AT THE MRC,



Enabling the UK to become a world-leader in the discovery and development of new drugs

Established in 2016, the Medicines Discovery Catapult's objective is to develop new approaches to the discovery and early development of new medicines. It will help transform UK ideas into globally successful commercial products, making the UK the number one place in the world for drug discovery and development.

The MDC is the first Catapult to support drug R&D in the UK. Since its inception, it has established a highly experienced Board and set up facilities at Alderley Park in the North West, a location chosen as a hub for life sciences and clinical research expertise. The Board, that is chaired by life sciences businessman and academic, Professor Graham Boulnois, has recently appointed a founding CEO, Chris Molloy. Chris has more than 25 years of senior level experience across pharmaceuticals, biotechnology, informatics and in start-up life science businesses.

The MDC's vision, is to encourage innovation in drug discovery and to harness existing talent and experience, to ensure the UK remains a world-leader in drug R&D innovation. This includes using new techniques and technologies that will drastically improve the success rate of clinically tested medicines and reduce the huge costs and time involved. The Catapult will act as a collaborative 'hub' of national expertise, bringing together entrepreneurs, academia, industry and regulators. It will develop new intellectual property that will add value to the UK and stimulate investment in the sector.

Chairman of the MDC, Professor Graham Boulnois says: "today it can take anything up to 15 years to develop a new medicine. This is an extremely expensive process for all those involved, costing the industry around £1.2 billion. Even then, the chance that these medicines make it to the market is remarkably low. Most fail because of safety and efficacy problems."

He continues: "this is where we hope to make a difference. By building a centre of national expertise, we will bring together the brightest minds in the life science field to use new science, big data and technology to really pinpoint the best way to discover medicines. This will improve success rates and reduce the costs involved, with the UK leading the world in this space."

CATAPULTS
WHERE THEY ARE

