Innovate UK

Results of Competition: Open Round 3 - 12 to 24 Months

Competition Code: 1706_EE_OPEN_R3_24M

Total available funding is £15M across all streams

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
HILIGHT SEMICONDUCTOR LIMITED	Meeting 100Gbps Network Requirements for 2km Fibre Optic Network links to Reduce Energy Use in Data Centres	£992,402	£684,757

Project description - provided by applicants
Data centres are increasing in size to be able to support an exponential increase in data usage which, in turn, is driving up energy consumption. In 2015, data centres consumed over 400TWh worldwide to power and cool server racks, with power consumption increasing at around 14% per year. An example data centre, NGD, based in Newport, UK, has its own primary sub-station connected to the grid and consumes 90MW of electricity (enough for 700,000 homes). Around 20% of data centre power is used to power data communications using lasers and fibre optics. Government attention is being focussed on data centre power consumption and there is a strong market need for solutions that can reduce consumption. Data centres round the world used 416 TWh of electricity costing £19billion in 2016\. At HiLight, we have developed world-leading CMOS technology solutions that reduce communication power but these are currently focussed on shorter optic fibre lengths of 100m. For large data centres, fibre lengths can be up to 2km, which require higher data rates driven by higher powered lasers. Our innovation is to develop methods of implementing the required laser drive functionality within a CMOS process using 28nm sized transistors rather than use a 180nm Bipolar process technology that operates at higher voltages consuming more energy. This will allow us to improve data centre costs by reducing energy use and reduce the 13% of the UK's annual electricity consumption that data centres use. This project will develop a 100Gbps CMOS chipset (4x25Gbps) that will speed up data transfer within data centres and replace existing power hungry BiPolar technology devices, reducing power usage by up to 25% while maintaining existing device functionality. Implementing CMOS circuits operating at 25Gbps per channel and driving high power requirement lasers is extremely difficult and requires a great deal of innovation in how we obtain the required performance using low power CMOS processes. However, we have already successfully implemented CMOS solutions for 10Gbps applications, exploiting 55nm CMOS technology developed previously with support from Innovate UK. This project will build on this platform, allowing us to capture a huge global market, currently dominated by US suppliers. Within 5 years of completing this project (2023) we expect to generate cumulative revenue and profit of £26.7m ($34.75m) and £22.7m ($29.5m) respectively, in turn creating 90 highly skilled, world-class jobs. We expect to save 4.5MWh per year per large data centre.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
OXFORD LASERS LIMITED	(PreciHol) Ultra high precision laser hole drilling	£499,479	£349,635

Project description - provided by applicants
PreciHol will develop novel ultra-precise laser micro-drilling processes for industrial applications. Laser drilling is fast gaining market share and becoming an enabling or critical process in the manufacture of goods ranging from cars to computers. The laser drilling process at the micron scales is highly complex and involves the optimization of the laser source, beam shaping optics, motion control system and software including complex process recipes and toolpaths. Oxford Lasers has 25 years' laser micro-machining experience and yet the challenges faced here are daunting and will require intense effort to overcome. The continuous miniaturisation trend driven by industrial needs puts pressure on laser technology to deliver millions of perfectly shaped, micron sized holes at ever decreasing cost as these features get incorporated in more consumer goods. Key issues remain: how to control 3D laser etching to achieve millions of identical uniform shaped holes when the laser induced physical processes at play are naturally highly non-linear and to deliver all this at industrial production timescales and with acceptable cost. We will develop new hardware prototypes and advanced laser drilling recipes to progress current state of art and demonstrate reduced hole size, increased aspect ratio and faster production rates at statistically significant levels so as to be production ready. Our activities will lift developments from TRL level 3 to 6\. The project will directly benefit Oxford Lasers by unlocking new and highly desirable technology potential for our customers and their end-users and by enhancing both our product and subcontract service in a highly competitive market that experiences fast paced growth. As these challenges continue we expect the number of suppliers who can meet them to dwindle. If Oxford Lasers can keep pace in this global rapidly changing market we should be able to grow significantly and gain market-share.

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INTRAY LTD	Oli-Tec® Time and Temperature Responsive Labels for Food & Medical Applications	£221,825	£155,278
CENTRE FOR PROCESS INNOVATION LIMITED		£158,760	£158,760
MEXAR LIMITED		£159,080	£111,356

Project description - provided by applicants
The mitigation of food waste in the supply chain, from producers to retailers to consumers, is a key need today because of its many socio-economic and environmental impacts. Surveys show that consumers are often confused by Use-by/Sell-by dates. Intray has developed the underpinning proof-of-principal for an innovative Time Temperature Indicator (TTI) label (Oli-Tec) for food and medical applications. Oli-Tec labels use innovative patented technology to respond to both time and temperature changes and inform the consumers of the changes via an easy-to-understand Green-Amber-Red signalling mechanism. The proof of concept for the Oli-Tec labels has been established using innovative patented wet media formulations and label design. With the help of InnovateUK funding, Intray will address various technical and production risks related to commercialisation of this UK innovation and patented technology. For the industrial partners, participating in this project with CPI, leverages access to over £90m of UK government's investment in relevant equipment & expertise at CPI's National Formulation Centre. The development of Demonstrator labels with specific timings will allow Intray to sample to alpha-customers for evaluation and market trials. The project will allow Intray to leverage relevant UK skills/expertise and lower the developmental risks in taking this innovation to higher TRL levels. At the end of the project, Intray will be able to the leverage its innovation and commercialize the Oli-Tec label with its commercialisation partner, OLPL, bringing significant royalty fees from licensing opportunities in the UK/EU and US and also via manufacture and sale of optimised media formulations for various timing labels. Thus, the funding will have a net positive impact on the UK economy, bringing in not only royalty income back from global licenscing opportunities but also driving UK employment in wet media development and manufacture.

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MESH-NET LTD	BluMesh5 – Providing Two-way Wireless Sensor Communication Through A Bluetooth5 Mesh Network	£138,859	£97,201
Project description - provided by applicants			
Mesh-Net is an innovation led UK SME, having produced numerous innovative wireless and application solutions to a wide range of clients. This proposed project will see the development of an innovative and disruptive technology solution that meets the needs of Industrial organisations seeking to collect data from remote sensors, through the utilisation of a unique Mesh Network powered by Bluetooth5\.			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
AURELIUS ENVIRONMENTAL LTD University of Cambridge	NUOVOpb - A unique Lead Acid Battery (LAB) recycling technology to reduce CO2 emissions by 89%, reduce waste by 81%, and transform the battery recycling industry	£332,338 £139,054	£232,637 £139,054

Project description - provided by applicants
Lead Acid Batteries (LABs) are a vital and widely-used technology. Invented in 1859, LABs are the most mature rechargeable battery technology available, making up half the global demand for rechargeable batteries. To meet recycling targets, in developed economies, the lead metal from waste LABs is smelted in furnaces at 1,100C. This energy intensive pyrometallurgical" process is highly polluting and only economically viable at large-scale, resulting in hazardous waste shipment across borders. In developing countries, lead is recycled at very small scale, using crude, open furnaces, which is hazardous to human health and the environment. Globally, 26 million people are at risk of lead poisoning, with diseases leading to the loss of 9 million Disability Adjusted Life Years. The major cause of lead poisoning is unsafe battery recycling. The University of Cambridge has invented a new "hydrometallurgical" process that is highly energy efficient, clean, scalable and cost effective. Aurelius Environmental has the exclusive license to exploit this novel technology, "NUOVOpb", globally. NUOVOpb reduces the carbon footprint of LAB recycling by up to 89%, eliminates SOx and NOx pollutants, and is economically viable even at small scale (1,000 tonnes/yr). Crucially, it produces lead oxide directly (normally produced through a secondary process), and the unique nano crystalline structure of this lead oxide improves the energy density in new LABs by 30% and provides a 50% longer life. NUOVOpb will transform the growing, global battery recycling industry, which has an expected value of £8 billion in 2024\. The huge market opportunity for NUOVOpb is, however, restricted by the cost and availability of the primary reagent used. This project will develop reagent substitutes to enable us to meet global demand for our technology, contribute to sustainability and growing our business."

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
AJA.LA STUDIOS LTD	A Platform for Rapid Development of Speech Recognition & Speech Synthesis Software for Under-Resourced Languages	£357,428	£250,200

Project description - provided by applicants

This project proposes a large-scale platform of automatic voice recognition (AVR) and text-to-speech (TTS) for under-resourced languages, i.e. languages for which data required to build statistical models of speech are limited, and difficult to acquire. AVR applies a mathematical model to convert speech into information a computer can understand and manipulate. TTS applies a statistical model to digital text to synthesize intelligible speech. Commercial AVR and TTS are available for highly-resourced languages of Europe, the Americas, developed Asia and China. Globally, speech products represent a £17b industry, and are found in voice-enabled devices such as Siri and Alexa, and in call centres for financial services, health care and telecoms companies. Many emerging market languages are under-resourced. Growing regional economies, along with product relevance to an expanding consumer class and rural communities establish a significant market opportunity. This project focuses on under-resourced African languages. Key challenges associated with developing AVR and TTS for African languages include modelling tonality, ligatures in colloquial speech, and unique phonemic patterns. This project addresses innovations related to the development of acoustic models for AVR & TTS for under-resourced languages.

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DJS ANTIBODIES LTD	Improving cancer immunotherapies: Developing a novel antibody to CXCR2	£974,499	£682,149
Project description - provided by applicants			
DJS Antibodies has a novel technology which allows us to discover antibody therapeutics against previously intractable disease targets. We are utilising this technology to develop a new drug to treat colorectal and pancreatic cancers. In particular, our antibody will act alongside recently developed therapies which activate patients' immune systems to fight tumours. With over 16,000 deaths each year in the UK from colorectal cancer alone, there is a real need for the discovery of novel therapies, and this project directly addresses that need. The project details the work required to attain pre-clinical proof-of-concept, and show that an antibody against our target can reduce tumour growth in animal cancer models. To do this we must develop in parallel both our lead antibody, and a surrogate antibody which interacts specifically with model species' immune system. Over 24 months we will develop and test these antibodies directly contributing to the overall development of our lead drug. The output of the work will be a best-in-class therapeutic candidate and Innovate UK's support will expedite its progression toward the clinic and to having a positive impact on patients' lives.			

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NEWTEC VASCULAR PRODUCTS LIMITED	VascuLok – A novel, safe and secure vessel ligating system	£394,306	£177,438

Project description - provided by applicants
Clip devices are widely used in surgery where the occlusion/ligation of vessels is required. Mechanical ligation of the vessel using clip devices can offer major advantages including early ambulation and decreased hospital resource utilisation; however, they are also associated with incidences of bleeding through device failure and other more significant complications such as adhesion formation, erosion into surrounding structures and infection (minor complications in up to 7.2% of cases, major complications in up to 3%). Commonly used metal clips ('staples') have sharp, erosive ends and can cause tissue damage; their thin cross-sectional area promotes 'cheese-wiring' through vessels; the clips have no locking mechanism, are not secure and are easily dislodged. Current polymer-based clips have 'longitudinal' designs which still cause adhesion formation and problems with erosion into surrounding structures. Newtec Vascular Products seeks to advance their novel, patented, safe and secure vessel clip device 'VascuLok' suitable for use in surgery where vessel occlusion is required. VascuLok has a smooth 'rugby ball' profile shape with no 'edges', specifically designed to prevent adhesion formation/erosion in to nearby anatomical structures. VascuLok is manufactured from 'medical grade' polypropylene material (long history of safe use in man) which initiates an encapsulation response, further enhancing the locking mechanism by actively promoting the fibrous tissue capsule to form around the clip. The clip has a 'living' hinge, promoting a 'stand-off' from one clamp surface to another - giving an even clamp force over the entire clamp surface (provides security and prevents 'cheese-wiring' through clamped tissues), and a greater surface area for clamping. Its textured clamp surfaces allow better grip, and VascuLok clips are easy to remove if placed incorrectly. It causes no problems for subsequent MRI/CT scanning. This project will advance the technology from TRL5 to TRL7 through further development and prototype manufacturing, and demonstrate its clinical performance in a clinical study prior to regulatory certification and market launch initially into the vascular clip market from 2020\. Market need has been validated through extensive end-user consultation with Key Opinion Leading surgeons, and major interest shown. Strong transferability is envisaged in the cholecystectomy, male/female sterilisation markets and for neuro-surgery - targeted from 2022\. VascuLok will have a major impact =\> reducing serious complications during and after surgery, improving patient quality of life and reducing costs for the NHS. The project will deliver significant export led growth for Newtec, a substantial ROI, increased employment and further opportunity for R&D investment.

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NETTITUDE LTD	ThreatReceivers - Cyber Deception Technology	£650,722	£227,753
Project description - provided by applicants			
The Nettitude ThreatReceivers (Cyber Deception Technology) project is designed to develop a cutting edge solution in detecting threat actors seeking to compromise critical assets and systems within financial services organisations and high threat environments. Deploying technology that will act as a decoy away from critical assets and systems and provide credible simulated environments for attackers to focus their time and effort on, whilst giving up valuable intelligence about their capabilities and methods.			

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QUALITY MILK MANAGEMENT SERVICES LIMITED	Reducing, Refining and Monitoring Antibiotic Use in Dairy Production	£275,395	£192,777
University of Nottingham		£107,547	£107,547

Project description - provided by applicants

Mastitis is a major reason for antibiotic use is dairy cows and the health, welfare, economic and environmental impacts of mastitis in dairy cows are considerable. For mastitis control to be effective and to minimise antibiotic use, it is necessary to identify and prevent new infections from occurring. It has become clear in recent years that there is large variation in how pathogenic strains of bacteria that cause mastitis behave on farm. These variations occur within each species and are known as sub-species or strain variations. Understanding how different strains of pathogenic bacteria behave is the key to preventing mastitis; it informs both treatment and preventive strategies and allows us to refine and reduce antibiotic use. As well as reducing and refining antibiotic use, there is also a need to monitor the impact of antibiotic use on farms. In this research we aim to create a fast throughput biological system, to differentiate strains of mastitis pathogens so that the use of antibiotics can be minimised. For different groups, we will predict behaviour and hence optimal methods of treatment and prevention. We will create, for the first time, a fast throughput system that identifies mastitis pathogens at sub-species level and predicts antimicrobial resistance properties and likelihood of success of different therapeutic strategies. In addition, we will use the same technology to develop a method of monitoring the impact of antibiotic use on dairy farms thereby proving a means of safeguarding human and animal health and enhancing consumer confidence.

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MOM INCUBATORS LTD.	Development of a novel, affordable neonate/infant transport incubator	£202,600	£141,820
Cranfield University		£102,429	£102,429
MORGAN INNOVATION & TECHNOLOGY LTD		£97,824	£68,477

Project description - provided by applicants
mOm Incubators is an award winning social enterprise seeking to enable patient access to high-quality healthcare through affordable technology solutions. There are over 16,000 newborn infants transferred between hospitals in transport incubators every year in the UK. Incubators provide a warm environment for neonates so that their energy can be spent on development rather than producing heat. Market available neonate and infant transport incubators are either bulky and expensive, or low-cost but stripped of functionality, such as thermoregulation or humidity control. The alternative to a transport incubator is to wrap the baby to the mother on a stretcher inside an ambulance, which is technically illegal and places the baby at high risk of injury in the event of a crash. Perhaps more concerning, recent research has indicated a link between neonatal transport and risk of respiratory distress syndrome and brain injury. Researchers believe this is due to impact and vibrations transferred through the vehicle to the patient. mOm makes the world's only inflatable neonate and infant incubator (www.momincubators.com). Numerous enquiries from within the UK and abroad have indicated significant market demand for a transport-approved version of our innovative incubator. However, stringent standards must be met for use in both road and air ambulances. [][0] We are collaborating with the Aerospace Department at Cranfield University and Morgan Innovation and Technology (MIAT) to redesign the mOm incubator to meet transport safety standards whilst maintaining our low price point and key differentiating advantages (collapsible, infection control, modular). Our consortium brings together leading experts in design (Global Sir James Dyson award winner James Roberts, mOm), electronic and mechanical engineering and innovation (MIAT), impact simulation and crash evaluation (Cranfield). The UK's second largest neonatal transfer service, Embrace, will evaluate the outputs in preliminary field-testing towards the end of the project. We have invested heavily in building an international network of medical device suppliers. Successful project delivery will cement our reputation as leading innovators within the industry and is the first step in an ambitious commercial strategy to disrupt the neonatal incubator market. [0]: http://www.momincubators.com/

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PRISM NOVA LIMITED	Scalable Machinery Health Monitoring	£76,211	£53,348
SENSEYE LIMITED		£20,162	£14,113
Project description - provided by applicants			
Integrated Vehicle Health Management (IVHM) and Health and Usage Monitoring Systems (HUMS) have been extensively utilised and proven for Helicopters over the last 25+ years. Condition Monitoring (CM) is becoming increasingly more in demand for a wide range of complex machines in many market sectors, as a means to increase operational efficiency, yet current solutions are expensive and can struggle to support a realistic business case, particularly for smaller installations and applications where no regulatory requirements (for monitoring) are in place. Innovative new systems and capabilities, based on utilisation of technology from the emergent 'Internet of Things', combined with service delivery models, will set a new benchmark in 'state of the art' technological solutions for affordable IVHM/HUMS applications. The objective is to create a scalable and configurable new product, suitable for direct deployment across a range of different vehicles and machine applications, which offers and extends the key benefits of existing high end IVHM/HUMS products at an affordable price, enabling the full potential of this ground breaking technology to be achieved.			

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PROLABS (UK) LIMITED	ProLabs Optical transceiver prototype	£567,079	£317,564
Project description - provided by applicants			
ProLabs provides end-to-end services for optical networking, including sourcing, coding, testing, customisation, responsive support and ongoing expertise. The company has significant R&D capabilities and is now at the forefront of technology development. Current practice in optical networking is to stock transceivers that are pre-coded for particular vendors, resulting in many combinations and large inventories. This project aims to create a disruptive technical approach which will enable us to rapidly produce customised optical transceivers used in fibre networks, flawlessly and cost effectively. Through the innovations in this proposal, inventories can be reduced while increasing typical time-to-service from 4 weeks to same day while providing remote addressability, eliminating costly site visits.			

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SPRINT ELECTRIC LIMITED	Variable Speed Drive Project	£686,424	£480,497
University of Nottingham		£285,155	£285,155
Project description - provided by applicants			
This project is to develop a new range of Industrial VSDs (Variable Speed Drives) for use by general industry. It will provide the ultimate end users with a more efficient control of electric motors which will enable industrial processes to use less energy in rotating loads than is currently the norm. Approximately 28% of the electrical energy generated in the world is consumed by electric motors and savings in this will greatly benefit global society. Sprint Electric is a well established British Company in the field of VSD development and manufacture. The Company was given a Queen's Award for International Trade in 2009 and if successful this project will (a) create a significant number of new jobs, (b) improve our export potential and (c) facilitate the UK becoming a global-leader in advanced VSD technology.			

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DEMURIS LIMITED	New molecular methods for global activation of cryptic biosynthetic gene clusters	£291,998	£204,399
Project description - provided by applicants			
Actinobacterial Natural Products are an important source of commercially used compounds, including many clinically used antibiotic, antifungal and anticancer compounds. The genes required to produce these compounds are encoded by Biosynthetic Gene Clusters (BGCs). Genomic sequence data have revealed the presence of a large fraction of putatively silent biosynthetic gene clusters in the genomes of actinomycetes that encode for secondary metabolites, which are not detected under standard fermentation conditions. We have developed a system that can boost the weak production from these clusters and has application for the discovery of new antibiotics and antifungal compounds. This project will allow the methods to be optimised and applied to other BGCs of known or unknown function. In addition we will further develop this method and combine the system with a transposon which can then be inserted randomly into the genomes of actinomycetes boosting the production of natural products in this area. The system has application for boosting compound titre from known BGCs and will be used for the identification of otherwise undetectable antibiotic and antifungal compounds. The system will be used on a variety of rare actinomycetes and induced novel antibiotic and antifungal compounds will be characterised.			

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FILIGREE TECHNOLOGIES LIMITED	Flowsheets	£540,384	£378,269
Imperial College London		£213,118	£213,118

Project description - provided by applicants
Flowsheets is an eighteen-month project to research and develop tools that let business professionals make and explore complex, robust, numerical models of financial, logistical, workforce and other business operations. It will create, test and demonstrate novel ways of formulating and analysing numerical models built on explicit high performance processing flow graphs of structured data. Accurate, timely, data modelling and analysis is increasingly important to an organisation's success. Such models allow the business to plan for the future, explore shifting market dynamics, as well as map and optimise their internal processes. Business professionals have the domain expertise that drives the demand for data modelling, and are the ones who apply any insight gained. They lack the skills and appropriate tools, however, that would allow them to model and analyse data effectively, forcing them down one of two avenues; either stretch the limited, error-prone, functionality of spreadsheets to breaking point, creating unsophisticated models; or rely on data scientists to create sophisticated data modelling and analysis. As a result demand for data scientists is outstripping supply, at the same time as the increasing scale of data collected is making model performance ever more important. Filigree will develop a disruptive software tool that empowers business professionals to model and analyse data without recourse to data scientists, while only requiring from them the technical skills of a competent spreadsheet user. _Flowsheets_ will use a novel high performance flow based data processing architecture to bring robust modelling and analytical techniques to ordinary business professionals. Filigree's founders have experience from the Visual Effects post-production industry of building packages that deal with complex data processing and scale issues which can be applied to the world of numerical modelling. Filigree will exploit the results by subscription income to all versions of their application, as well as technology licensing to OEMs. Imperial will benefit from their involvement in developing technologies in a new field, thus raising their international reputation.

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VIVOBAREFOOT LIMITED University of Liverpool	Preventing falls in older people by an innovative connected shoe: development & biomechanics study	£538,152 £207,524	£376,706 £207,524

Project description - provided by applicants
Older people falls are the most common cause of death from injury in the over 60s and cost the NHS over £2bn a year. Shoes directly influence balance and gait and subsequent risk of slips, trips and falls by altering somatosensory feedback to the foot and ankle. Barefoot (also known as minimalist) shoes are intended to closely mimic an unshod condition. They have reduced cushioning, thin soles, and are of lighter weight than conventional shoes, allowing for more sensory contact of the foot on the ground while simultaneously providing the feet with some protection from ground hazards and conditions. Research suggests benefits of barefoot shoes in strengthening muscles and restoring gait and balance as compared to conventional shoes but most papers focus on running and young people. In this project, Vivobarefoot, the UK leader in barefoot technology has teamed up with University of Liverpool (the Department of Musculoskeletal Biology at the Institute of Ageing and Chronic Disease to bring an efficient and affordable solution to older people falls by development of a highly innovative barefoot minimalist shoe specifically targeted for the over 60s. This shoe will integrate innovative materials and use optimal design for best mechanical properties allowing to improve gait and balance in older people. A version of this shoe will be equipped with high end pressure sensors that will collect data on the user's foot biomechanics and feed them into walking coach" app that generates simple instructions or prompts on to how to improve walking. This project comprises an important research study that will consist of an in-depth analysis of biomechanical properties of the foot/ankle in people wearing the newly developed shoe. This study will be performed by the UoL and will involve 35-40 over 60s volunteers. The aim is to provide robust foot biomechanics evidence on the effects of barefoot vs. conventionally shod walking on older people's balance & gait"

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Innovate UK

Results of Competition: **Open Round 3 - 12 to 24 Months**

Competition Code: **1706_EE_OPEN_R3_24M**

Total available funding is £15M across all streams

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
CLAYTON EQUIPMENT LIMITED	A Novel, High-Performance, Reconfigurable, Next Generation Locomotive to Disrupt the Construction Industry and Deliver Major Export Led Growth (Atom)	£626,228	£419,573

Project description - provided by applicants
Clayton Equipment Limited provides specialist rail manufacturing and engineering services. This project exploits our expertise in specialist locomotives to better meet the market need for the tunnelling and construction sectors where productivity, efficiency and safety are of critical importance. We will create a new class of compact, electric locomotive offering the highest level of tractive effort for its mass. The design will be optimised for use in demanding construction environments where physically smaller locomotives provide advantages with space, operational flexibility and lower inertial mass. Additional benefits include lower lifetime running costs, zero emissions and easy adaptation for subsequent re-deployment between construction projects. Clayton's standards of engineering excellence are already globally recognised, delivering highly durable and reliable solutions capable of operating in the most demanding of environments. The tunneling sector has been enjoying typical CAGR of 6-7% in recent years and now is the ideal time to deliver better products, allowing the industry to become even more competitive. Tunnel construction is used to serve the needs of road, rail, sewer and water construction projects. The industry utilises heavy engineering equipment in confined spaces, where skilled staff, raw materials and waste must be transported safely and efficiently in and out of a hazardous environment. With larger projects taking years to complete, waste haulage rates play a vital role in maintaining the rate at which a tunneling project can progress. The locomotive determines how much load the train can carry, how fast it can travel and how quickly it can stop. In turn, this determines the efficiency of construction and the overall cost of the project. Clayton will develop a truly novel locomotive design specifically tailored to the tunneling sector, offering best-in-class performance for tractive effort, reliability, acceleration and braking power. These features will be optimised to reduce wear and lifetime operating costs. The new locomotive will be electrically powered, providing clean and efficient operation, reducing the need for tunnel ventilation and the energy associated with this activity. This project will ensure that Clayton can meet stakeholder expectations for years to come, with class-leading locomotives suitable for exploitation in global markets. This will deliver export opportunities and having previously delivered complex, demanding and prestigious projects, Clayton is well placed to ensure that further investments in the business will deliver growth and job creation. This project will further develop UK engineering capability, support business diversification and provide excellent opportunities for economic growth.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
PET TECHNOLOGY LIMITED	Felcana: Experimental Development	£609,285	£274,178
Project description - provided by applicants			
Felcana is developing cutting-edge devices and software to better manage pet healthcare and enable the early detection of disease in cats and dogs. It is a 360° approach to pet healthcare providing innovative, smart, connected 'consumer clinical' devices for pets which monitor and analyse pet health and behavioural patterns, alerting owners to early indicators of unusual behaviour and potential illness. Additionally, it enables veterinarians to use the more reliable collected data to quickly and accurately diagnose health problems. This disease detection platform will improve animal welfare as well as reduce associated costs for pet-owners. Innovate UK awarded Felcana the initial Smart Grant for Proof of Concept in 2015, enabling us to develop our product up to the present stage of miniaturisation. We are now ready to move from Beta test prototypes to production. Today, smart connected technology for animals is nascent. Only bulky rudimentary GPS devices with limited battery-life are already available. Both the Royal College of Veterinary Surgeons and the British Veterinary Association recognise that continued digital innovation is imperative to improve veterinary care. Felcana is developing state-of-the-art products which will be at the global forefront of digital veterinary innovation.			

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