CONTENTS.

1 Introduction
a. CEO’s foreword - Sue Dunkerton OBE
b. Chairman’s foreword – Dr David Lawrence
c. Board Directors and Executive Management Team
d. Who We Are

2 KTN in Numbers

3 What We Do
a. Highlights
   i. Developing the UK chemical supply chain for Electric Vehicle Batteries
   ii. The UK Bioeconomy Strategy
   iii. Enabling Innovation in Mobility – Connected and Autonomous Vehicles

b. Projects and programmes
   i. Cyber Security Academic Start-up Accelerator Programme
   ii. Diversity and Inclusion in Innovation

iii. Knowledge Transfer Partnerships
iv. Industrial Strategy Challenge Fund
v. International
vi. UK5G
vii. Innovation Exchange
viii. Horizon 2020

4 Case Studies
a. Saturn Bioponics
b. Promethean Particles

c. Special Interest Groups -
   i. Sustainable Aviation Fuel
   ii. Materials for Composites
   iii. Robotics and Artificial Intelligence
   iv. Quantum Technologies
   v. Synthetic Biology
   vi. Additive Manufacturing

vii. Compound Semiconductors
viii. AI for Health
ix. Immerse UK

5 KTN Expenditure

6 Working in Partnership

7 Contact
INTRODUCTION

a. CEO's foreword –  
   Sue Dunkerton OBE
b. Chairman's foreword –  
   Dr David Lawrence
c. Board Directors  
   and Executive  
   Management Team
d. Who We Are
KTN had a momentous end of year, with the retirement of Chris Warkup, the CEO who has seen us through the past 5 years (2014-2019). It has been my privilege to step into his shoes for a few short months whilst we awaited our new CEO, Dr Alicia Greated.

We continue to operate within an ever-evolving landscape, with 2018 seeing the creation of UK Research & Innovation (UKRI): the biggest change in UK research and innovation funding in a generation. This change is hugely positive, bringing with it a wealth of opportunities to transform the way our businesses and universities work together, creating real value for our economy and society.

KTN, at its core, remains a business focused network. We exist to support the innovations around and across sectors, that will bring forth scalable and sustainable businesses. The case studies shared in this report offer a small sample of the unique insight and influence KTN has within and across sectors that help accelerate innovations to market.

The Knowledge Transfer Partnership (KTP) programme continues to build from strength to strength. At the time of writing, the Programme represents 5.5% of all UK Research and Innovation projects and is the UK’s largest graduate recruiter, with nearly 550 KTP Associates currently in post. Combining innovation, knowledge transfer and business relevant skills, the KTP Programme is a major UK asset generating up to £8 for every £1 invested by the government.

This year has seen the first phase roll out of our digital Innovation Canvas, which allows businesses to develop their own insight through redefining innovation plans and priorities. In doing so, it also highlights where KTN can best add value in signposting to people, organisations and funding.

Another flagship programme remains our Special Interest Groups (SIGs). The objective of these Groups is to build new communities around emerging technologies or new market opportunities. Our highlights over this year include helping to build a UK supply chain in Sustainable Aviation Fuel, the launch of the UK Synthetic Biology landscape map and publishing of the first ever UK Immersive Economy report.

A growing feature for Innovate UK and KTN, partly in response to our changing relationship with Europe, is the exploration and understanding of bi-lateral international opportunities through a programme of Global Expert Missions (GEMs). These seek to position the UK as an international partner of choice for science and innovation. In the last year, we have delivered 16 missions around the globe on topics including Advanced Materials, Energy, AI for Manufacturing and Healthy Ageing.

Finally, I would like to highlight our support for Diversity and Inclusion in innovation. The business benefits for a diverse workforce at all levels are well documented. KTN has long supported Innovate UK through its work on Women in Innovation and Young Innovators and these programmes have helped give visibility to the number of female and young business owners and leaders who can contribute to the UK’s success. It is beholden on all of us to attract and seek out diverse groups, ensuring that the widest possible pools of skill, experience and talent are brought to bear in resolving the challenges we are called on to address as an industrial society.

Sue Dunkerton OBE
Interim CEO
Knowledge Transfer Network
I’m delighted to introduce the Knowledge Transfer Network’s Annual Report 2018/19 in this, my fourth year as Chairman.

This year has seen KTN even further increase its support for UK innovative projects in business. When I’m given the opportunity to meet some of these innovators and business owners, I’m reminded of the unique impact we make as an organisation, through connecting, signposting and accelerating these ideas and innovations to market.

We have been working against a backdrop of the new UK Research and Innovation structure, and already recognise the advantage this new organisation is bringing in joined-up thinking and programme delivery. This is particularly true of the Industrial Strategy Challenge Fund, where KTN has been instrumental in ensuring the right individuals and business communities are brought together with research organisations and academia to collaborate and deliver solutions to some of the key intractable challenges affecting our industry, society and economy, both at a local and a global level.

This year has seen us extend our relationships with UK universities, building on our Knowledge Transfer Partnership connections. Increased government focus on impact through productivity means that KTN will continue to increase engagement across the breadth of universities, HEIs and business schools. We will work towards enabling adoption at scale, through understanding the market demands and directing business to these. I can think of no other organisation that is as experienced or as well placed as KTN to help make the most of this once in a generation opportunity for UK-based business innovation.

Going forward, our ambition is to ensure that our approach remains innovative; that we will have a peerless understanding of the UK innovation landscape; and that we will be viewed as an independent, honest and trustworthy broker by the organisations and communities we serve. The plans are in place to ensure we remain leaders in connecting people to accelerate innovation.

Finally, it is once again my pleasure to offer my thanks to the entire team at KTN. The organisation continues to thrive because of their experience, expertise and commitment.

Dr David Lawrence
Chairman
Knowledge Transfer Network
BOARDS DIRECTORS AND EXECUTIVE MANAGEMENT TEAM 2018/19

BOARD DIRECTORS/ OFFICERS

Dr David Lawrence
Chairman
Sue Dunkerton OBE
Interim Chief Executive
Catherine Callow
Company Secretary
Julia Brown
Dr. Peter Finan
Prof. Nick Lieven
Dr. David Prest
Dr. Iain Roche
Timothy Sawyer
Dr. Ruth Mallors-Ray

EXECUTIVE TEAM

Sue Dunkerton OBE
Interim Chief Executive
Catherine Callow
Director of Finance and Operations
Dr. Iain McGregor
Director
Fran McIntyre
Director of Communications
Dr. Colin Tattam
Director
Dr. Steve Welch
Director
The Knowledge Transfer Network (KTN) is the UK’s innovation network, established to drive economic growth for the UK.

KTN connects people to accelerate innovation, solve problems and find markets for new ideas. We bring together businesses, entrepreneurs, academics and funders to develop new products, processes and services to create value and benefit society.

KTN is a partnership of people who, together, form an unrivalled network of deep technical knowledge, breadth of expertise, and a firm understanding of how innovation works in business.

KTN’s specialist teams work across key sectors of the economy, from defence and aerospace to the creative industries, and from agri-food to materials and transport.

We work closely with other members of the Innovate UK wider family, helping businesses to access the right expertise in the research base and the specialist facilities of Catapults and other Research and Technology Organisations. We also work with Enterprise Europe Network to ensure a streamlined network offer to businesses spanning business support, innovation, and UK and global collaboration.

KTN’s expertise in connecting sectors and disciplines through the right collaborations and business approach can unlock tremendous potential value in people and companies.
**KTN IN NUMBERS**

- **953** new business to business (B2B) and business to research (B2R) collaborations in 2018/19
- **38,895** organisations in our network
- **£13.50** Investment Multiplier - For every £1 invested in KTN, more than £13.50 is generated for the UK economy
- **421** events held in 2018/19
- **32,867** delegates attended our events (up 17% on previous year)
- **55,613** active newsletter subscribers

We have 55,613 active newsletter subscribers
KTN IN SECTORS

MATERIALS
(including polymers, metals, composites, nanomaterials and other advanced materials)

HEALTH
(including medtech, medicines and advanced therapeutics, digital health and care)

CHEMISTRY AND INDUSTRIAL BIO-TECHNOLOGY
(including raw materials, process manufacturing, materials chemistry, bioeconomy, synthetic biology)

AGRIFOOD
(including crops, livestock and aquaculture, food processing and manufacture)
**KTN IN SECTORS**

**TRANSPORT**
(including rail, marine, aerospace and aviation, automotive, transport systems and mobility, connected and autonomous vehicles)

**INFRASTRUCTURE**
(including energy, more sustainable energy, water, construction, nuclear, urban living, buildings and infrastructure systems)

**ENABLING TECHNOLOGIES**
(including electronics, ICT, sensors, photonics, and electronic systems)

**EMERGING TECHNOLOGIES**
(working with new ideas emerging from the research base including neurotechnology and the application of the quantum sciences)
KTN IN SECTORS

**COMPLEX SYSTEMS**
(including robotics and autonomous systems, space, industrial mathematics, security and defence, artificial intelligence, and geospatial)

**DIGITAL ECONOMY AND CREATIVE INDUSTRIES**
(including Internet of Things, Cyber Security, VR/AR, Immersive and Fintech)

**ACCESS TO FUNDING AND FINANCE**
(including loans, private investment, pitch support)

**MANUFACTURING**
(helping manufacturers to innovate and innovators to manufacture)
KTN IN SECTORS

INTERNATIONAL
(including Global Expert Missions and Official Development Assistance support)

EUROPEAN PROGRAMMES
(including Horizon 2020 opportunities, Eureka/Eurostars)

DESIGN AND INNOVATION EFFECTIVENESS
(providing tools and guidance for companies to appreciate people’s needs, challenges and opportunities and to use these insights to craft a better new product or service)

KNOWLEDGE TRANSFER PARTNERSHIPS
(helping businesses to improve their competitiveness and productivity through the better use of knowledge, technology and skills that reside within the UK Knowledge Base)
WHAT WE DO

a. Highlights
i. Developing UK chemical supply chain for Electric Vehicle Batteries
ii. The UK Bioeconomy Strategy
iii. Enabling Innovation in Mobility – Connected and Autonomous Vehicles

b. Projects and programmes
i. Cyber Security Academic Start-up Accelerator Programme
ii. Diversity and Inclusion in innovation
iii. Knowledge Transfer Partnerships
iv. Industrial Strategy Challenge Fund
v. International
vi. UK5G
vii. Innovation Exchange
viii. Horizon 2020

c. Special Interest Groups
i. Sustainable Aviation Fuel
ii. Materials for Composites
iii. Robotics and Artificial Intelligence
iv. Quantum Technologies
v. Synthetic Biology
vi. Additive Manufacturing
vii. Compound Semiconductors
viii. AI for Health
ix. Immerse UK
WHAT WE DO

HIGHLIGHTS

Developing UK chemical supply chain for Electric Vehicle Batteries

Dr Peter Clark
Knowledge Transfer Manager
Raw Materials

The demand for batteries is huge, with the market estimated to be worth £5 billion to the UK and £50 billion to Europe by 2025. In the UK this market demand is driven in part by the Government’s plan to ban new conventional petrol and diesel vehicles by 2040, replacing them with Electric Vehicles (EVs) and/or other zero emission vehicles.

In 2018, KTN - working collaboratively with Warwick Manufacturing Group at the University of Warwick, the Advanced Propulsion Centre (APC), Chemistry Council, the Centre for Process Innovation and consultants E4tech - kicked off a project to understand what this shift to EVs would mean for the UK chemicals sector.

KTN’s key role in this initial project was to utilise our deep sector knowledge and cross-sector network to engage and convene companies in the chemical and battery sector, with the aim of developing an understanding of current capabilities, level of knowledge and appetite to develop a UK supply chain for EV batteries. KTN engaged with more than 120 individuals from over 60 organisations across the chemicals-through-automotive supply chain, via workshops or interviews with senior technical/commercial managers. Our partners at WMG and APC provided intelligence on the demand side from their connections within the automotive sector and their in-depth knowledge of battery technology.

The output from this project is summarised in the report ‘The UK chemicals and process supply chain for battery manufacture - An analysis of strengths and opportunities’ (written by consultant E4tech). The Report highlights that this opportunity could be worth £2.7bn per year to the UK chemical industry just for UK-built cars, with export potential to Europe of ten times that potential. The report also makes a range of observations and recommendations that would be key to ensuring that the UK can capitalise on this significant opportunity.

KTN has been at the fore of the second phase of this project, commissioned in August 2018 by Innovate UK and APC, again in collaboration with WMG and supported by key stakeholders at the Faraday Challenge and Chemistry Council. This second phase of work involved much deeper engagement with the chemical and automotive sector to find out what it would take to enable the growth in the UK’s existing chemical supply chain capability and to understand where new inward investment is required. This activity culminated in an event where latest findings were shared with a number of senior figures from Government and industry. As a result of these activities, the chemicals and automotive sector are now working together at a strategic level to take action to unlock these supply chain opportunities.

“Through this initiative we have helped to create not only new collaborations between individual businesses and researchers, but also a new strategic collaboration between two major UK industry sectors, chemicals & automotive. I am also excited that we have been able to shine a light on the capability that exists within the UK chemical sector in this area and look forward to continuing to work with these companies to help them develop further collaborations and access funding that will help to realise this massive clean growth market opportunity. This activity is a fantastic example of KTN’s ability to utilise its deep sector knowledge within and across sectors - in this case the chemicals and battery sector - to create impact.”

Dr Peter Clark
Knowledge Transfer Manager
Raw Materials
WHAT WE DO

The National Bioeconomy Strategy to 2030 was launched in December 2018 as an Industrial Strategy Product. It is not just a government strategy, but an industry-government strategy, being led by five sector leadership councils: Industrial Biotechnology, Synthetic Biology, Food and Drink, Chemistry and Medicines Manufacturing, together with BEIS. Also involved in its production are Department for International Trade, Biotechnology and Biological Sciences Research Council on behalf of Research Councils UK, Innovate UK and KTN.

In 2016 the UK bioeconomy was estimated to be worth £220bn GVA to the UK economy, with an ambitious strategy target to double this by 2030.

The bioeconomy is considered essential, not only in increasing productivity across the UK, but also in mitigating climate change and reducing our reliance on fossil fuels through new economically and environmentally sustainable solutions. It is key to delivering the government’s clean growth strategy and 25-year environment plan.

Throughout development of the Strategy, KTN has been key, both to providing technical expertise and also to ensuring that business, research and investment communities understood its relevance and were given the opportunity to contribute or challenge. KTN also drafted the response to the call for evidence on the bioeconomy on behalf of the five Councils involved.

Now the strategy is in delivery phase, KTN is a member of the Strategy Governance Board which takes responsibility for overseeing all facets of the delivery. KTN’s Bioeconomy Specialist, Yvonne Armitage, is chairing one of six groups set up to deliver the strategy, working towards a set of actions to deliver with BEIS and funders in collaboration with industry and academia.

Our insight and connections to industry mean that we are ideally placed to ensure that this Bioeconomy Strategy delivers genuine economic growth opportunity, while also promoting UK’s excellence in this area that is now so important to the UK economy.

“In 2016 the UK bioeconomy was estimated to be worth £220bn GVA to the UK economy..."
The potentially significant economic, health and social benefits of Connected and Autonomous Vehicles (CAV) have been well documented. These vehicles are described by the Department for Transport’s (DfT) Code of Practice as vehicles in which “a driver is not necessary”, with the driving task being conducted by the onboard system.

According to a recent report published by the Society of Motor Manufacturers and Traders (SMMT) and Frost & Sullivan, the UK is the world’s number one location for mass-market potential of Connected and Autonomous Vehicles, with £62bn annual economic opportunity by 2030. This is an immensely important sector and KTN is playing a crucial role in its development.

In 2018, KTN helped leverage more than £50m of government grants for UK companies to carry out R&D in this space, to which more than £30m industry contributions have been added.

The areas of innovation on which these projects focus span a broad series of topics including modelling and simulation, generating value from data, connectivity, and validation of sensor systems, as well as publicly trialling services of CAV across London and the Forth Bridge.

Furthermore, we have mapped out more than 300 organisations involved in the CAV scene in the UK. The resulting database is a work-in-progress and it offers an overview of how and why the UK is considered one of the global leaders in the development of driverless vehicles and why, as mentioned in the SMMT report, it is the place to conduct CAV research and development.

Included in this database is the organisations’ areas of expertise and resources, and the relationships between them have been mapped into a SharpCloud story, creating a map of the UK CAV ecosystem. It is a particularly useful resource for those from the UK or abroad looking for specific capabilities.
Cyber Security Academic Start-up Accelerator Programme (CyberASAP)

Cyber Security Academic Start-up Accelerator Programme (CyberASAP) is funded by the Department for Digital, Culture, Media and Sport (DCMS) and is delivered through Innovate UK and the Knowledge Transfer Network (KTN).

Now in its third year, it is a programme of sector-specific commercialisation support to develop academics’ entrepreneurial skills and translate their research into products and services. The programme contributes to a core DCMS objective, to develop and sustain a security sector that meets the national security demands. CyberASAP supports this ecosystem by helping UK universities to commercialise their cyber security ideas.

With the support of industry experts, UK cyber security researchers and their teams are encouraged to develop their innovative ideas into products and services with a clear route to market and scope for further development.

Graduates of the programme have been encouraged to progress their projects and have gone on to achieve a range of successes including; joining other accelerator programmes, securing Government grants, receiving seed funding, being acquired by technology firms, partnering with commercial enterprises, exhibiting at nationally recognised showcases and winning Cyber start-up awards.
Diversity and Inclusion in innovation

In the UK we are considered to be one of the most diverse nations in the world. We also recognise that there are further opportunities to turn that diversity into an economic opportunity. In 2016, KTN started working closely with Innovate UK to help identify and overcome the barriers to innovation for underrepresented groups of people by taking positive action.

Over the 2018/19 period, KTN supported women innovators and young entrepreneurs as part of our delivery of Diversity and Inclusion.

Young Innovators

Between Summer 2017 and early 2019, a new partnership was launched with The Prince’s Trust to support young innovators from diverse backgrounds. The Young Innovators’ programme was a new opportunity for young peoples’ ideas to be sought out, supported and given the potential to be turned into viable businesses.

The programme was launched in December 2017, with huge media interest. On offer were 24 Awards which would provide each winner with a £5,000 grant, an allowance, an Innovation Champion to work alongside the award holder for 1 day a week for 6 months, and training workshops.

Early 2019 saw the programme come to a close with some fantastic success stories, including a number of award holders going on to win large grants to continue developing their businesses, in addition to a number of collaborations with other organisations and winning national awards.

Women in Innovation

The Women in Innovation awards run prior to 2018/19 had a significant impact: not only on those who won the awards, but also on the numbers of those applying for Innovate UK funding. Since the completion of the Awards, the number of applications for funding to Innovate UK with a woman as a lead applicant had risen from 14% to 24%.

To continue to see this rise, Innovate UK therefore launched their second competition aimed at Women innovators in 2018. This time, the competition was aligned to the 4 Industrial Strategy Grand Challenges of Healthy Ageing, Clean Growth, Future of Mobility, and AI and Data.

KTN is committed to developing, maintaining and supporting a culture of equality, diversity and inclusion in its workforce and in the planning, design, and delivery of all of its services. We recognise the importance of equality, diversity and inclusion and have a strong policy which not only tackles our internal perspective in embracing a truly diverse workforce, but also addresses the external perspective in how we work with suppliers, stakeholders, partners and customers.
Innovation requires knowledge, ideas, technology and skills – and Knowledge Transfer Partnerships (KTPs) bring these together.

In so doing, KTPs continue to address UK Government policy, aligning with its Industrial Strategy, driving business innovation and supporting world-class talent initiatives tackling low productivity in the UK.

KTPs play a distinct role in generating growth through innovation: we create a unique three-way partnership between a business, an academic team, and a suitably qualified graduate. Together, this KTP team collaborates on a strategic innovation project promoting change and growth while also embedding knowledge.

Everyone benefits in this scenario: businesses improve competitiveness, knowledge and performance; academic bodies improve their industry links and draw on real-world experience to enrich their teaching and research; and talented graduates kick-start their careers working as the project manager (Associate) in a KTP.

In the period from 2015 to 2019 grant funding of £218m supported 798 businesses to deliver £1.7bn of added value to the UK economy. Currently, 810 UK organisations are in KTPs, connecting over 100 Knowledge Bases (universities or research organisations) with 851 Associates - this makes KTP one of the biggest graduate recruitment opportunities in the UK. Delivering £8 for every £1 invested, KTP continues to provide outstanding value and benefit to all three parties in these unique collaborative partnerships.

This year saw the return of the KTP Best of the Best Awards – a celebration of exceptional KTP projects, outcomes and teams. It also offered an opportunity to reflect on the continuing value of KTPs which, over the course of the last 40+ years, have helped over 12,000 forward thinking organisations innovate for growth by partnering with the UK’s world class knowledge base.

This year’s awards reflected the diversity of companies and projects transformed by KTP. In driving collaborative innovation output between business and academia, KTP continues to provide lasting, transformational change to organisations of all sizes and in all sectors across the UK.

“Positive KTP impacts continue to deliver at scale for both businesses and academia, and we are excited to see KTP continuing to play a vital role in improving UK competitiveness and productivity”

Gerry Black
Senior Knowledge Transfer Adviser
Industrial Strategy Challenge Fund

The Industrial Strategy Challenge Fund (ISCF) is a key mechanism of the government’s Industrial Strategy to drive up UK investment in R&D and improve UK productivity. This year saw KTN ramp up and amplify its ISCF work across even more sector teams, in concert with UKRI formation and the scale up of delivery. Six Wave 1 Challenges are now in delivery, and emphasis has shifted in terms of how these projects are supported to more business as usual functions to connect and grow these sectors. With eight Wave 2 areas scoped in the year, KTN continued to work across the breadth of the newly formed UKRI to engage business, academia and government stakeholders to enable the delivery of these challenges which continues into 2019.

KTN has worked to shape the calls and engage the right businesses where the appetite to co-invest with government is clear and the need to address the challenges set is paramount to societal and business growth. In the last 12 months the KTN has helped to launch competitions, convene communities and enable collaborations in the following areas: Audience of the Future; Next Generation Services; Quantum; Transforming Food Production; Transforming Construction; Prospering from the Energy Revolution; Healthy Ageing; and Data to Early Diagnosis and Precision Medicine. In parallel with maturation of UKRI operations, a formal expression of interest (EOI) process was set up for Wave 3 Challenges. KTN delivered 60 events and engaged across all sectors in this bottom up approach. With hundreds of EOIs submitted, the final 10 shortlisted are currently being progressed through to business case sign-off and into delivery as we go to print.

KTN, with the experience of Wave 1 and 2 under our belts, has been on the front foot to advise and support UKRI in engaging externally to anchor co-investment and engage with communities in a time of exceptional change and uncertainty.
WHAT WE DO
PROJECTS AND PROGRAMMES

International

KTN’s International & Development team lead on KTN’s international activities across all sectors with two primary goals of: (1) building bilateral research and innovation partnerships for the UK with strategic countries around the world to grow the economy; and (2) facilitating the deployment of UK research and innovation in tackling international development challenges for greater societal impacts.

Our programmes strongly align with Innovate UK’s Delivery Plan as well as the UK Aid Strategy working across key government departments, including Department for Business, Energy & Industrial Strategy, Department for International Development, Foreign & Commonwealth Office and Department for Digital Culture Media & Sport.

Since 2017, KTN has been leading Innovate UK’s Global Expert Mission (GEM) programme – supporting the UK’s Industrial Strategy ambition for the UK to be the international partner of choice for science and innovation.
WHAT WE DO

PROJECTS AND PROGRAMMES

UK5G

KTN, in partnership with Cambridge Wireless and TM Forum, runs the UK5G Innovation Network, funded by the Department for Digital, Culture, Media and Sport (DCMS).

This national business network has the mission to accelerate the industrial adoption of and investment in 5G technologies in the UK. UK5G is run by an industry-led Advisory Board and supports innovation by bringing businesses together across the supply and demand side of 5G. It publishes information around 5G use cases, runs networking events and supports the Government in identifying potential areas for public investment.

In the past year, UK5G has:

- managed a £2.4m competition to undertake UK/South Korea collaboration around 5G on metro systems in Seoul and UK
- worked with industry and the Department for Digital, Culture, Media & Sport to develop the £30m 5G Connected Communities Rural competition
- ran industry briefing events for £40m 5G competitions in Manufacturing and Logistics
- enabled collaboration in the fields of spectrum sharing, security and the development of new business models for 5G
- ran more than 60 industry events covering all aspects of 5G technologies

UK5G is expected to run until 2021.
WHAT WE DO
PROJECTS AND PROGRAMMES

Innovation Exchange

Building on the success of the Offshore Wind Innovation Exchange (OWiX), KTN has developed the Energy Innovation Exchange (iX) which spans offshore wind, nuclear and energy systems. The iX approach remains one of identifying ‘here and now’ industrial challenges which, by definition, have yet to be solved by the existing supply chain or research base. Through a structured 5-step process, the challenges are translated to be accessible to a wider audience and then, using the unique cross-sectoral reach of KTN, competitions are run to connect solution providers from a range of sectors to the challenge holder.

While the offshore wind and nuclear threads to iX have a distinctly energy sector flavour, the energy systems challenges can come from any industry with examples forming around heavy lifting, marine fleet management and high-performance cooling for enclosed spaces. All iX challenges present an unprecedented opportunity for agile, innovative SMEs to directly pitch their solutions to the technical experts and challenge holders in major industry organisations.

Since the iX programme was launched it has fielded 22 challenges with more than 180 applications received. This has so far resulted in 13 trials and 4 contracts between challenge owners and solution providers.
WHAT WE DO
PROJECTS AND PROGRAMMES

Horizon 2020 – Providing access to funding and encouraging collaboration with European markets

The European Union represents the world’s largest international market, with more than 500 million people generating over €14 trillion in economic activity – approximately 22% of global nominal GDP. Although we are due to leave the EU, the UK is still a key player in this market.

With a budget of approximately €80bn over a seven-year period (2014-2020), Horizon 2020, the European Commission research and innovation programme, represents a significant opportunity for UK companies to access finance for research and development and innovation. It’s also an opportunity to form collaborations in new supply chains, for SMEs to build relationships with multinational partners, and gives a route for businesses to reach new markets, facilitating uptake of new technologies by end users and customers.

In partnership with the National Contact Points and Enterprise Europe Network, KTN helps UK businesses to access European programmes and informs the funding priorities to match UK business need. This increases the rate of delivery of new or improved products, processes or services that can grow the UK economy through innovation.

In 2018/19, KTN organised seven thematic collaboration building events. This activity led to expressions of interest from 650 organisations, 400 organisations attending events and a further 250+ people benefitting from online material to help improve proposal quality. More than 450 connections between organisations were made.

In light of the uncertainties caused by Brexit, there is an increasing need for UK organisations to be proactive about identifying and connecting with potential European project partners. In 2018, Innovate UK and KTN piloted offering coaching support to UK SMEs to attend EU brokerage events alongside travel awards of up to £500 per company.
Our Special Interest Groups (SIGs) are projects that focus KTN activity and accelerate innovation in cross-disciplinary topics of strategic importance.

SIGs are time-bound activities across a wide range of specialist areas to connect and catalyse people and activities to achieve specific knowledge transfer and innovation outcomes. They typically create impact very quickly and are then replaced by new higher-priority areas of focus.

The 2018/19 portfolio of SIGs included:

- Sustainable Aviation Fuel
- Materials for Composites
- Robotics and Artificial Intelligence
- Quantum Technologies
- Synthetic Biology
- Additive Manufacturing
- Compound Semiconductors
- AI for Health and Care
- Immerse UK
Sustainable Aviation Fuel

Sponsored by Innovate UK, Department for Transport and Sustainable Aviation, the Sustainable Aviation Fuels (SAF) SIG was a two-year initiative delivered by KTN to help build the UK SAF supply chain and provide a forum for knowledge exchange. Between 2017 and 2019, the SIG built and convened an active network, brokered collaborations and created resources to support the aviation fuel community.

Highlights:

• Created a guide for producers on what airlines are looking for in a sustainable fuel.

• Launched an interactive tool to help users find technology, expertise and resources across the supply chain.

• Supported and accompanied 5 companies on a mission to the USA.
Materials for Composites

The Materials for Composites SIG aims to engage with the whole materials supply chain for composites, to stimulate innovation within the UK upstream supply chain and connect the supply chain to end users of composite materials. The SIG is working in partnership with the Composites Leadership Forum (CLF), the Chemistry Council, Composites UK and the High Value Manufacturing Catapult.

Highlight:

- In collaboration with the Sustainability Working Group (SusWG), the SIG hosted the Sustainable Materials for Composites Collaboration Building event. This built on *A Vision and Roadmap for Sustainable Composites*. The report published by the SusWG details the 2040 vision for sustainable composites from which the SIG event developed 12 project areas in detail.

Robotics and Artificial Intelligence

Robotics and Artificial Intelligence are significant globalised technologies applicable to every sector. The UK’s extensive industrial and academic research base has immense potential to impact on home and global markets. The Robotics & Artificial Intelligence Special Interest Group (RAI SIG) addresses this opportunity enabling UK RAI innovators to connect, access markets and showcase their capability.

Highlight:

- In March 2019, the RAI SIG ran the Robotics and Artificial Intelligence Industry Showcase, an industry focused showcase designed to bring businesses together with a common interest: to learn about robotics and AI, establish meaningful connections and increase business productivity. The event attracted over 500 delegates across a range of sectors. Over 250 new connections were established, and 154 face-to-face meetings were held on the day.
The Quantum Technologies (QT) SIG was formed to support the UK National Quantum Technology Programme. This £300m 5-year programme was launched in 2015 - the largest ever UK government investment in a disruptive technology. The Government recently announced that the Programme will be continued for another 6 years, eventually taking the total investment to approximately £1bn. The QT SIG has an active role in connecting supply chains and supporting various programme committees, as well as holding events either initiated by KTN or suggested by members of the quantum community or UKRI.

Highlight:
- Delivery of successful events on quantum for maritime, clocks and drug design.
- The SIG supported the annual QT Showcase in November and the now annual 2-day European Space Agency meeting on quantum for space, originally initiated by KTN.

Future plans include events on high performance computing and follow-ups on quantum for automotive, and on quantum technology for secure communication in space.

The Compound Semiconductors (CoS) SIG was set up by KTN in May 2017 for the purposes of supporting the establishment of the Compound Semiconductor Applications Catapult by Innovate UK. Compound Semiconductor (CS) markets are forecast to grow at a Compound Annual Growth Rate of 10-20% to a global value of £75-£125bn by 2025. The UK has a strong legacy and current investment in the development of compound semiconductors for applications in healthcare, the digital economy, energy, transport, defence and security, and space sectors.

Highlight:
- In April 2018, CoSSIG ran an Automotive Power Electronics Machines and Drives Workshop attended by a wide range of stakeholders, from Tier 1 automotive companies to RTOs and Academia. This enabled the community to validate the concept of an expression of interest into ISCF Wave 3, subsequently known as Driving the Electric Revolution (DER). In November 2018, the Government allocated £80m in the Budget, subject to the development of the business case.
The Synthetic Biology (SynBio) SIG was a two-year programme running from March 2017 - March 2019, funded by Innovate UK and the Biotechnology and Biological Sciences Research Council (BBSRC), which aimed to support commercialisation from synthetic biology through network building and engagement with the industry and research base. The SIG delivered networking events attended by over 100 delegates, supported 64 companies, built a network of 875 interested people and made 24 introductions.

**Highlights:**
- Launch of the SynBio Landscape Map, which provides an overview of current UK capabilities and activities in the field.
- An event called ‘Synthetic Biology for Bioprocessing of Next Generation Biologics’ was organised in collaboration with the Centre of Excellence in Biopharmaceuticals (CoEBP), where participants discussed the needs and challenges in the design of next generation biologics.

The Additive Manufacturing (AM) SIG was a two-year project closely aligned with the development and implementation of the National Strategy in Additive Manufacturing. The SIG specifically focussed on three areas of the strategy: Increasing awareness of Additive Manufacturing, enabling knowledge transfer across academia, RTOs and SMEs and providing information for companies to stimulate new ideas.

**Highlights:**
- Delivery of 20 business briefings across the UK, attracting nearly 200 businesses.
- Production and publication of case studies, designed to show how Additive Manufacturing, within various or combined stages of an organisation’s workflow, can be used to accelerate business growth and improve product flexibility/quality.
The AI for Health & Care SIG convenes communities of interest around the commercial application of artificial intelligence to health and care. The work to date includes a mapping of the public investment into the area and understanding where funding concentration and gaps exist. Upcoming activities will focus on the application of AI to mental health in the emergency and security services, in addition to nutrition. Frameworks for preparing and implementing AI solutions in a clinical setting are being created in collaboration with health trusts and AI companies, while commercial case studies are being developed through SMEs & large organisations engaging with UK academic experts in the application of AI.

**Highlight:**

- An example of the activity was AstraZeneca’s involvement in a Study Group looking at Improved Drug Discovery Through Better Machine Learning Models. Ola Engkvist, Associate Director of Discovery Sciences Computational Chemistry R&D at AstraZeneca, brought the challenge to a group of eager mathematical and statistical research scientists at the University of Warwick. The researchers explored novel descriptors to describe the candidate chemical structures and a comparison between a number of machine learning algorithms. Dr Engkvist said of the activity: “It was a great experience and we were exposed to a lot of new and interesting ideas”.

**“It was a great experience and we were exposed to a lot of new and interesting ideas.”**

Dr Ola Engkvist,
Astra Zeneca
SPECIAL INTEREST GROUPS

Immerse UK

The Immerse UK SIG is a cross-sector network for businesses and research organisations across all parts of the UK economy that are interested in the ways that augmented and virtual reality can help drive productivity, social and economic growth. The SIG supports members by helping to connect people with each other and exploring collaborations, signposting to funding and finance opportunities, reducing barriers to innovation and identifying the opportunities for growth in the emerging marketplace.

Highlights:

- Published the first ever UK Immersive Economy Report in May 2018.
- Reached over 3000 members.
- Delivered over 40 events across the UK.
- Was a delivery partner with the ISCF Audience of the Future Challenge (AoTF) and Innovation Lead on the AoTF Investment Accelerator.
CASE STUDIES

a. Saturn Bioponics
b. Promethean Particles
Saturn Bioponics have developed a commercial 3D growing system for resource efficient and sustainable crop production with KTN support and Innovate UK funding.

The need
A key challenge facing agriculture is the need to produce 70% more food by 2050. Hydroponic growing systems involve growing plants without soil, using nutrient solutions in a water solvent. Hydroponics can reduce pressures on land, decrease chemical use, and support urban farming, helping to boost UK food security and economic growth. The global market for hydroponics is projected to reach £325m by 2020 (Markets and Markets, 2016).

When developing a commercial hydroponic system, key parameters for plant growth, nutrient supply, as well as flavour and post-harvest characteristics need to be optimised for individual crops and varieties in order to reduce costs and maximise yields. Saturn Bioponics needed help to understand these key parameters to enable them to develop a new modular 3D system that can grow leafy salads, vegetables, herbs and soft fruit.

The results
The new modular 3D system developed and patented by Saturn Bioponics combines hydroponic methods and vertical crop production. This system provides a step change in agricultural practice by enabling a yield increase of up to 350% per unit of land and reducing labour costs. Other benefits include clean crop harvesting, reduced environmental impact from pesticide usage and soil erosion, no water waste or polluting run-off, and elimination of fungal disease in root zones. The 3D growing system is ‘price competitive’ compared with horizontal growing systems and offers a significantly shorter payback period. It can be installed in new or existing polytunnels, glasshouses, and other covered areas, to a height and planting density of the grower’s choice.

Saturn Bioponics has also won numerous awards for their technology, including the Innovate UK SME Innovation Award 2016.

How did KTN and Innovate UK help?
KTN has helped Saturn Bioponics build relationships with key collaborators (the Universities of Lancaster, Nottingham, Birmingham and Manchester) and has provided key support to help Saturn Bioponics win over £780k in R&D funding from Defra, Innovate UK, BBSRC and the Small Business Research Initiative. These collaborations and the R&D funding have helped Saturn Bioponics develop a detailed understanding of key production variables and have allowed them to optimise their 3D modular system and build and test prototypes expanding from preliminary experiments to commercial trials in glasshouses and polytunnels. As a result, Saturn Bioponics have been able to develop a commercialisation “package” of final products and variety-specific “instruction manuals”. The support provided by KTN and by Innovate UK grants have enabled Saturn Bioponics to grow from one employee in 2012, to 5 permanent staff in 2017.
SATURN
BIOPONICS

Increased crop yield, quality and sustainability through collaborative innovation in hydroponics

Where next?
Saturn Bioponics have successfully demonstrated this system to a number of growers resulting in the sale and installation of commercial systems for oriental vegetables, strawberries, specialist herbs and ornamentals. Currently, ca. 45 growers have expressed an interest in the system, with sales of £3-4 million forecast for 2017/18. Saturn Bioponics are also developing international links with growers in South America, USA, and China. They are creating an additional service offering to deliver their hydroponics expertise through consultancy and sale of consumables to growers of any crop type worldwide.
Promethean Particles is a growing spinout from The University of Nottingham that began trading in 2008. It has developed a low-cost, scalable continuous flow process for producing nanoparticle materials. In 2012, Promethean was part of a consortium which secured €10m under the EU FP7 funding programme for project SHYMAN to scale-up Promethean’s proprietary technology from pilot-scale to a commercial-scale plant capable of producing over 1000 tonnes per year. This helped establish Promethean as a leading large-scale global provider of nanomaterials. The challenge now is to exploit this potentially disruptive platform technology across a range of specialist markets.

KTN alerted Promethean to the open funding topics available through Horizon 2020 and worked with them to develop a clear, concise pitch to communicate the value Promethean had to offer to topics aiming to develop market uses of Metal-Organic Frameworks. In their role as secretariat for the Sustainable Chemistry National Technology Platform (SusChem), KTN subsequently presented Promethean’s offering to an audience including several of Europe’s leading Research and Technology Organisations. As a result of the pitch, a number of requests were received for an introduction to Promethean and included amongst them was the Spanish Plastics Technology Centre, AIMPLAS.

As a result of the introduction, AIMPLAS came to visit Promethean’s facility in Nottingham and subsequently collaborated with Promethean Particles to form two consortia to apply for Horizon 2020 funding. Both proposals were successful and will enable Promethean to explore two potential markets for Metal-Organic Frameworks – the first exploring their use for carbon capture in power plants and the second as absorbents in packaging to help protect cultural artefacts such as photographs and films. Inclusion of end users in the consortia such as PETKIM PETROKIMYA from Turkey and Titan Cement company from Greece provide a valuable opportunity for Promethean to develop new relationships with potential customers.

**Outcomes to date:**
Participant in two collaborative projects with a total value of €14.6m that will see investment of €800k over 4 years directly into the business. Development of a new market area and new collaborations with several potential customers. Recruitment of two additional employees.
The majority of KTN’s expenditure is spent on our people – we are a people-based business, with substantial knowledge and experience among us. Occasionally, there is a need to supplement our in-house skills with additional specialist consultants or subcontractors for fixed periods of time. Other elements of cost relate to our external engagement activities, such as events and visits to companies across the UK.

<table>
<thead>
<tr>
<th>2018/19</th>
<th>£ in 000s</th>
</tr>
</thead>
<tbody>
<tr>
<td>People</td>
<td>11,238</td>
</tr>
<tr>
<td>Travel and subsistence</td>
<td>1,850</td>
</tr>
<tr>
<td>Events</td>
<td>2,145</td>
</tr>
<tr>
<td>Consultants</td>
<td>1,337</td>
</tr>
<tr>
<td>Accommodation</td>
<td>739</td>
</tr>
<tr>
<td>ICT</td>
<td>729</td>
</tr>
<tr>
<td>Communications</td>
<td>156</td>
</tr>
<tr>
<td>Governance</td>
<td>65</td>
</tr>
<tr>
<td>Subcontractors</td>
<td>105</td>
</tr>
<tr>
<td>Total</td>
<td>18,364</td>
</tr>
</tbody>
</table>
KTN works on collaborative projects with a number of other organisations across the UK, continually driving towards increasing the value of the UK economy through innovation. These include:

- The Infrastructure Industry Innovation Platform (industry funded)
- Cybersecurity academic start-ups for DCMS and Innovate UK
- The Food Innovation Network for Defra
- 4Manufacturing with the Welsh Government and others
- Smart Specialisation Hub (England) for DCLG and BEIS
- Various Research Council Industry Clubs (BBSRC and NERC)
- Newton Fund missions (ODA)
- Bridging for Innovators Programme with STFC
- Accelerating Innovation in Rail for DfT
- CRM Recovery for the European Commission
- UK5G Network for Cambridge Wireless