DICE NETWORK+

DIGITAL INNOVATION & CIRCULAR ECONOMY

Feasibility Studies

Collaboration Opportunities

Please email DICE-Network@exeter.ac.uk to be introduced to any of the following partners. More details can be found here: dice-networkplus.org/get-funded

UKRI Engineering and Physical Sciences Research Council
University of Exeter
The University of Nottingham
The Open University
Queen's University Belfast
University of Salford Manchester
University of Sheffield
University of Southampton
University of Surrey
Swansea University Prifysgol Abertawe

RESEARCHERS

RESEARCHER #1

What are your fields of research?
AI, Digital Innovation, Climate

What are you interested in researching through the DICE Network+?
AI solutions for CE in Stadiums/Arenas (big events - sports, concerts...) to reduce/reuse packaging

Please provide a short overview of relevant experience.
I am a Research Impact Fellow in the Nature & Climate Impact Team at the University of Exeter, with expertise (PhD) in Computer Science and Artificial Intelligence focused on addressing global environmental challenges, such as climate misinformation, digital agriculture, agrometeorology, and weather prediction and monitoring. With over a decade of experience as an IT Analyst, I've successfully led and contributed to projects in digital innovation, startup incubation, and new business development, integrating technical expertise with strategic thinking. By fostering interdisciplinary collaboration, my focus is to advance Digital Technologies and AI-based solutions, ensuring that research translates into actionable strategies for climate resilience and nature conservation, generating real impact.

RESEARCHER #2

What are your fields of research?
Building Engineering Services, Sustainable technology, digital construction

What are you interested in researching through the DICE Network+?
Collaboration for funding application and knowledge exchange

Please provide a short overview of relevant experience.
Whole life cycle assessment of construction project. Embody and operational carbon elevation in the building services sector

RESEARCHER #3

What are your fields of research?

Sustainable Operations and Analytics
Circular Economy
Industrial Symbiosis
Digital Transformation
Supply Chain Digitalisation

What are you interested in researching through the DICE Network+?

I am interested in designing and developing a digitally enabled industrial symbiosis model to foster circular supply chains across the agriculture, textile, and construction sectors in the UK. It addresses the urgent need for sustainable resource management by transforming agricultural and textile waste into valuable materials for downstream industries, promoting a zero-waste, regenerative industrial ecosystem. By integrating Industry 4.0 technologies i.e., AI, Blockchain, and the IoT, the project idea aims to optimise material flows, enhance traceability, and enable real-time responsiveness. This cross-sectoral approach supports circular economy goals, reduces waste and emissions, and creates a resilient supply chain network that decouples economic growth from resource consumption.

Please provide a short overview of relevant experience.

I have relevant experience leading interdisciplinary research on sustainable supply chains, digital transformation, and circular economy innovation. My work explores how emerging technologies such as AI, Blockchain, and the IoT can enable regenerative and resilient supply chain ecosystems. My recent publications focus on digitally reimagining operations to accelerate climate-neutral business models, especially in SMEs and traditional industries.

What are your fields of research?

Sustainable Manufacturing, Circular Economy, Industrial Decarbonisation, Design for Sustainability, Resource Efficiency

What are you interested in researching through the DICE Network+?

Through the DICE Network+, I am interested in exploring how digital innovation can enable circular economy strategies in manufacturing, particularly through the integration of data-driven decision-making, life cycle assessment, and intelligent resource management. I aim to investigate digital solutions that support sustainable product design, predictive maintenance, and closed-loop manufacturing systems to reduce waste and carbon emissions. This includes developing frameworks and demonstrators that align with industrial needs while promoting circular value chains.

Please provide a short overview of relevant experience.

I am currently an MTC Manufacturing Futures Fellow and an academic at the University of Birmingham, with a strong background in sustainable manufacturing. My research focuses on circular economy, life cycle assessment (LCA), energy-efficient processes, and the integration of digital tools to enable sustainable industrial practices. I have led and contributed to multiple interdisciplinary projects involving industry and academia, focusing on sustainable materials, product design, and process optimisation.

I have published extensively in these areas and regularly collaborate with stakeholders across manufacturing, materials science, and digital innovation. My experience also includes working with the Manufacturing Technology Centre (MTC) on projects that connect industrial challenges with cutting-edge research. I am actively involved in initiatives that promote circular value chains and am committed to developing practical, scalable solutions that support net-zero and resource-efficient goals.

RESEARCHER #5

What are your fields of research?

Circular economy, circular design, circular business models, product-service Systems, Circular Metals, creation of tools, and systemic design

What are you interested in researching through the DICE Network+?

I am interested in exploring how digital enablers, such as AI, IoT, and blockchain, can support system change within specific material flows or industrial sectors. My focus is on feasibility studies that address technical materials like metals, construction materials, or industries such as semiconductor manufacturing and solar panel production. Specifically, I aim to understand how digital tools can facilitate circular business model innovation and improve supply chain transparency, traceability, and performance within these sectors.

Please provide a short overview of relevant experience.

I am a design researcher and educator specialising in circular design, product-service systems, and system-level innovation for the circular economy. I currently serve as Assistant Professor at the Royal College of Art, contributing to the Design Futures and Service Design programmes.

Previously, I was a Research Fellow at Brunel University London for the £22.5M UKRI CircularMetal project, where I led the development of a circular business model toolkit and a circular design tool for the metal sector, in collaboration with three UK-based SMEs. My work focused on enabling a fully circular metal economy by 2050 through visioning exercises, scenario building, and the mapping of over 100 trends to inform UK policy and industrial strategy.

I have collaborated with industry and NGO partners across the metal, fashion, and construction sectors, co-authoring multiple reports and peer-reviewed publications. As agenda manager of the Circular Design Forum, I coordinate knowledge exchange activities with a network of over 30 international companies. I bring extensive experience in stakeholder engagement, feasibility analysis, and transition-orientated scenario planning.

What are your fields of research?
Hydrogen, Fuel Cell Technology, Integrated Sustainable Energy System

What are you interested in researching through the DICE Network+?
Would like to collaborate with digital technology researchers in:

- Artificial Intelligence (AI) – for predictive maintenance, resource optimization, and supply chain efficiency.
- Internet of Things (IoT) – enabling real-time monitoring of energy and materials in production cycles.
- Digital Twins – simulating physical systems to optimize performance and reduce waste.
- Big Data & Cloud Computing – for lifecycle analysis and circular resource planning.
- Smart Grids – to dynamically manage renewable energy distribution and consumption.

Example: Decentralized renewable microgrids managed by smart contracts ensure local energy resilience. Excess solar energy is stored or shared via peer-to-peer blockchain networks, enabling energy circularity.

Please provide a short overview of relevant experience.
A Senior Lecturer at Queen's University Belfast's School of Chemistry and Chemical Engineering, with a strong track record in sustainable energy research. Her work spans hydrogen production, fuel cell technologies, and advanced green energy system modeling and optimization for real-world deployment. She conducts techno-economic assessments of emerging energy systems, helping guide industry and policymakers on the most efficient, cost-effective paths toward net-zero. Her research blends rigorous engineering analysis with system-level insights, positioning her as a leading voice in the transition to clean, renewable energy.

RESEARCHER #7

What are your fields of research?

I focus on Digital Manufacturing, integrating AI, IoT connectivity and blockchain to create intelligent production environments that optimise scheduling, quality control, asset utilisation and overall business efficiency while also strengthening supply-chain through real-time visibility, and end-to-end product traceability that supports and sustainability goals.

What are you interested in researching through the DICE Network+?

I am interested in exploring:
(1) interoperable ontologies and open standards that keep design, process and usage data machine-readable as it moves between tools and organisations;
(2) edge-to-cloud architectures that stream high-frequency IoT signals into lifecycle digital twins, enabling closed-loop control and condition-based decision-making; and
(3) distributed-ledger "product passports" that carry immutable provenance and condition history far beyond the first life of a part, unlocking predictive remanufacture, regulatory compliance and reliable carbon-footprint accounting.

Please provide a short overview of relevant experience.

I have nearly five years of experience at the Advanced Manufacturing Research Centre (AMRC), University of Sheffield, where I lead digital transformation initiatives focused on Industry 4.0 enablement across both high-value manufacturing and SME sectors. My work involves designing and deploying intelligent systems that integrate AI, IoT, and blockchain to optimise production, improve supply chain resilience, and deliver end-to-end traceability

What are your fields of research?

Smart and advanced technologies for Circular Economy. Digital Technology enabled recycling and remanufacturing ecosystems. Application of Digital technologies in Circular product (re)design.

What are you interested in researching through the DICE Network+?

Digital-Twin enabled Circular Design of EV batteries (DigiLoopEV)

Please provide a short overview of relevant experience.

Electric Vehicles (EV) batteries contribute to the decarbonisation agenda. However, their current design and Life Cycle Management is linear and opaque. Batteries lack modularity, are difficult to repair or repurpose, and have limited traceability across use and end-of-life (EoL) stages. Digital Twin (DT) provides a novel opportunity to embed real-time, Life Cycle intelligence into battery systems, however, till date the use of DT has focused on health monitoring while neglecting circularity-enhanced design.

In the first instance, the DIGILoopEV project aims to develop, demonstrate, and validate a novel digital twin-enabled circular design framework for EV batteries that:

- Integrates circularity KPIs (repairability, reuse potential, material recovery) into digital twin platforms.
- Supports modular, upgradeable, and recyclable battery designs.
- Assesses system-wide impacts via LCA, circularity metrics, and techno-economic analysis.

The approach includes mapping the battery lifecycle and digital points, developing a modular DT framework and integrate battery health, disassembly data, material consumption etc. using real-time data to inform redesign scenarios and feedback loops, utilising the DT-CE feedback loop for redesign of partner OEM's battery pack series

DigiLoopEV will accelerate the partner OEM's leadership in sustainable electromobility by embedding circularity-by-design into digital twin platforms for their EV batteries.

RESEARCHER #9

What are your fields of research?
Digital technologies enabled circular economy, Digital recycling and remanufacturing ecosystems, Design for Circularity.

What are you interested in researching through the DICE Network+?
The design, configuration, and testing of smart technology enabled identification, disassembly, and cleaning for recycling systems (STiDeC-ReS)

Please provide a short overview of relevant experience.
The increasing volume of electronic, plastic, and mechanical waste poses significant environmental and logistical challenges. Recyclers report the difficulties they encounter in sorting large waste streams which impact time, cost, and resources. There have been significant improvements in developing solutions to tackle these issues and industry appears to be in the fore. For instance, the development of technologies with the capability to identify and sort waste streams by integrating vision systems into sieving methods. However, these systems fall short of autonomous, real-time disassembly capabilities and identifying contaminations in wastes, which present a huge challenge in recycling. A smart, integrated system could address these issues by enabling the development of an integrated advanced sensing technology and robotic system for rapid recognition, autonomous disassembly, and adaptive cleaning procedures based on material type and contamination level. Moreover, recently developed technologies operate independently, leading to higher capital costs and greater resource demands for recycling operations. The STiDeC-ReS project aims to develop an integrated smart technology enabled identification, sorting, disassembly, and cleaning systems for the recycling process.

The objectives include to design a smart technology-enabled system for identifying, sorting, disassembling, and cleaning recyclable products. Configure and integrate advanced sensing and robotic system into a cohesive recycling framework. Develop and test control algorithms that manage automated workflows for different product categories. Evaluate the system's performance in terms of accuracy, speed, energy efficiency, and recyclability outcomes.

RESEARCHER #10

What are your fields of research?
Data Science, Statistics, Geospatial analysis

What are you interested in researching through the DICE Network+?
I'm currently working with a circular economy digital platform

Please provide a short overview of relevant experience.
I have worked with the platform Freegle through the a volunteering scheme; the case study is here: bit.ly/s4s-freegle. Through the project, I provided insights into their data and quantified the effect of distance and user interaction on successful exchanges. I am well-versed in the data science pipeline, in particular statistical modelling and data visualisation.

NON-ACADEMIC PARTNERS

PARTNER #1

If you have a specific challenge you would like to address, please share a brief overview.

We are open and seek potential academic partners to exchange knowledge and conceptualise an idea and form a partnership to apply to the feasibility funding. Our core offering is critical minerals' (battery & digital tech inputs - all on UK Critical Minerals List) geological, mining, refining (upstream extractives), global supply & demand, market intelligence and future demand& price forecasts.

Please provide any further information that could be useful to a prospective researcher looking to collaborate.

We would love to investigate the primary vs secondary critical minerals input in digital techs (e.g currently working on semiconductor supply chains) and circularity applications in supply including but not limited to recycling, upcycling (e.g we have been covering PGMs recycling market for the last 20 yrs), substitution etc.

If you have a specific challenge you would like to address, please share a brief overview.

DPP-IS (Digital Product Passport for the Infrastructure Sector):
Feasibility study to explore adaptation of Digital Product Passport for construction materials tracking to enable transparency of supply chain and support circular economy.

Please provide any further information that could be useful to a prospective researcher looking to collaborate.

The idea is to explore through the feasibility study how to integrate supplier-specific carbon and impact data into our systems, in other words implementing a Digital Product Passport (DPP) for supply chain tracking would enable a shift from generic assumptions to targeted insights directly from the suppliers and in a systematic way.

We are looking for academic partner/s to explore the idea. Their expertise should include Digital Product Passport, Supply chain tracking, Data architecture and data-driven business models, and, eventually, Block chain systems and Circular Business model.

Costain contribution would be in in-kind founding the case study to examine and support the academic expert with industrial experts. This would be done by: Identify high-impact materials, relevant to Costain with potential for reuse or recycling; select and engage a sample supplier; Define the key data points to track for each selected material; support work and report writing, and assess benefits of the resulting plan.

The aim is to define and test a standard DPP process that can be scared across different businesses operating in the infrastructure sector.

PARTNER #3

If you have a specific challenge you would like to address, please share a brief overview.

Overview of Proposed Challenge for Feasibility Study:

At present, there is no dedicated infrastructure supported by AI that specifically facilitates carbon mobility — meaning the coordinated measurement, tracking, and optimisation of carbon reductions and transfers — in a way that effectively supports both the UK and Global South countries.

Such an infrastructure could play a critical role in accelerating a just transition, meeting net zero commitments, delivering on Nationally Determined Contributions (NDCs), and advancing the Sustainable Development Goals (SDGs). The absence of this kind of integrated, AI-enabled system limits our collective ability to:

- Identify and unlock carbon reduction opportunities across diverse local contexts
- Mobilise and share best practices and technologies between the UK and Global South
- Enhance transparency, traceability, and credibility in carbon accounting
- Align local actions with global targets in a measurable and equitable way

A feasibility study could therefore explore how to design and implement such an AI-supported carbon mobility infrastructure, ensuring it is context-sensitive, inclusive, and capable of bridging regional gaps, while supporting national and global sustainability agendas.

Please provide any further information that could be useful to a prospective researcher looking to collaborate.

Prospective researchers could bring expertise in AI, carbon accounting, policy analysis, data governance, or participatory design, and would join a transdisciplinary effort to create an infrastructure that is globally informed yet locally relevant. This study welcomes collaboration that bridges research, practice, and policy to shape a fairer and more effective climate response.

If you have a specific challenge you would like to address, please share a brief overview.

Challenge Area 1 identifies a gap in the research into DT applications for phase 1 (smarter product use and manufacturing) especially for Refuse and Redesign.

FullCircle.eco has developed a digital tool (mobile app + AI-powered document extraction) to help consumers, professionals, and small businesses take practical steps toward a circular economy. By enabling seamless capture and anytime-anywhere access to receipts, warranties, and service records, we help extend product lifespans and encourage repair over replacement.

Our core hypothesis: empowering people to easily track and use warranties will reduce or delay new purchases - cutting emissions, conserving water, protecting biodiversity, and minimizing waste and pollution.

We are currently exploring B2B use cases across several sectors, including e-waste, real estate, end of life tyres, and medical waste.

The app also supports Digital Product Passport capabilities for brands and OEMs, offering a direct channel to stay connected with customers throughout the product lifecycle - not just when something breaks.

Please provide any further information that could be useful to a prospective researcher looking to collaborate.

We are happy to explore embedding the DT in specific areas/situations as per the research requirement.

Our website is at https://fullcircle.eco/

The free version of the app is available globally:
(1) Android: https://play.google.com/store/apps/details?id=app.fullcircle.eco
(2) iOS: https://apps.apple.com/in/app/fullcircle-eco/id6476343855

PARTNER #5

If you have a specific challenge you would like to address, please share a brief overview.

Our interest is in research around blending the bio-fuel to the appropriate standards to form marine / sustainable aviation fuel, so as to enable upcycling into valuable products. These could be machine learning based.

PARTNER #6

If you have a specific challenge you would like to address, please share a brief overview.

Project & Challenge: Optimization of Semiconductor Fabrication Facility Operations by Advanced Data Analytics and Monitoring

Opportunity & Scope: The Centre for Integrative Semiconductor Materials at Swansea University is an advanced pilot manufacturing facility for semiconductors. The facility has been heavily instrumented to monitor the electrical power flows and quality in all main circuits down to individual equipment and plant. Over the past 12 months the monitoring systems have acquired 90 billion data points – a rich vein of data containing a wealth of information on (for example) the health and operational status of tools, activities and systems with scope for efficiency optimization, etc. This data set is unique in the semiconductor sector. The challenge is to create analytical frameworks through for example Machine Learning, to identify patterns, organise data sets, tease out anomalies, set up interrogation protocols, establish monitoring protocols. The ultimate goal would be to create the world's first intelligent semiconductor facility real-time operational optimization platform.

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