Insights: DICE N+ Transformation Pathways event

1 July 2026, The Science Museum, London

DICE Transformation Pathways: Reframing the Digital Revolution with Accountability and Convergence

The digital revolution and the transition to a sustainable future are the twin engines of modern industry. Yet historically, they have operated on a collision course. Frontier technologies; specifically, Artificial Intelligence (AI) and Advanced Connectivity Technologies (ACT) (such as terrestrial and space telecommunication networks and Internet of Things (IoT) devices), promise unprecedented efficiency, but their rapid expansion demands an energy-intensive infrastructure that relies heavily on volatile global supply chains for Critical Raw Materials (CRMs). To address this systemic friction point, the Digital Innovation & Circular Economy (DICE) Network+ convened its Transformation Pathways annual event at the Science Museum in London.

This one-day event brought together key researchers, start-ups, tech giants, and policymakers to answer a pivotal question: *How can we leverage the digital revolution to embed circularity into digital design and adopt enabling technologies?* Grounded in three operational pillars:

- Design for value retention
- Operate for maximum recovery
- Collaborate for systemic change

The arc of the day successfully bridged the gap between academic theory and industrial reality.

Why We Convened: The Core Mission and the Midpoint Milestone

Now at the midpoint of its three-year UKRI EPSRC funding cycle, the DICE Network+ operates as a vital 'network of networks', connecting over 380 partners across 20 existing research frameworks. In her opening welcome address, Professor Fiona Charnley outlined the deliberate focus of the initiative. Rather than trying to rebuild foundational knowledge from scratch, the network is channelling its extensive remit into two actionable challenges: *Embed* (integrating sustainability directly into new technology development) and *Enable* (using digital tools to drive circular practices across multiple sectors).

The network has already deployed £435,000 in seed funding for demonstrator projects and knowledge exchange, yielding high-impact achievements like a data centre circularity policy brief that has reached over 300 stakeholders. As the network concludes its deep dive into AI and data

centres, the Transformation Pathways event served to launch its next phase: expanding into advanced connectivity, specifically targeting the telecommunications and space sectors.

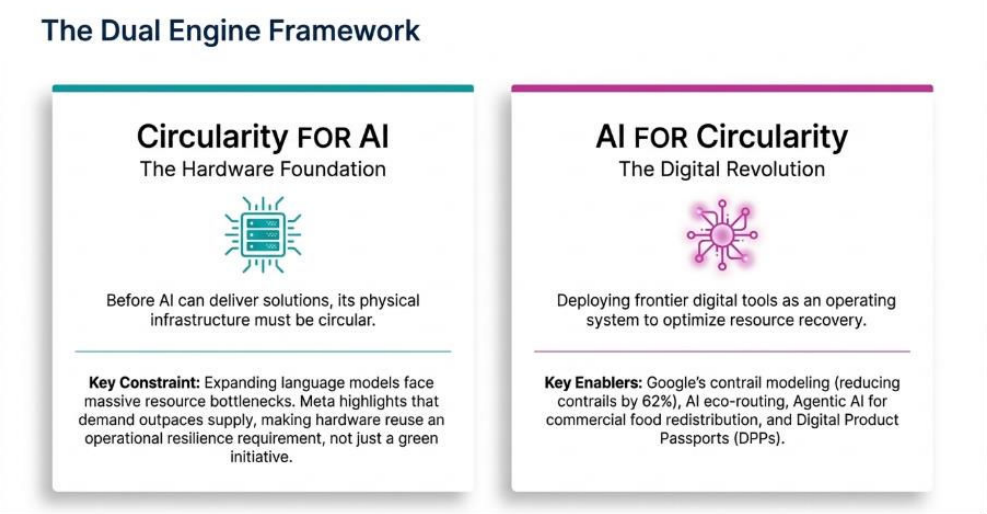
The Dual Engine: AI for Circularity vs. Circularity for AI

The morning and afternoon keynotes delivered by Adam Elman (Head of Sustainability EMEA, Google) and Lisa Rivalin (Senior Staff Engineer, Meta) highlighted the dual nature of frontier tech. AI is a massive tool for environmental optimisation, yet it remains an incredibly resource-dense consumer of energy and infrastructure.

Google's sustainability framework approaches this through two distinct lenses: *Circularity for AI* and *AI for Circularity*. Elman showcased real-world optimisation examples, such as an AI contrail-mapping model that demonstrated a 62% reduction in aviation contrails at virtually no cost. Furthermore, Google's open-source CircularNet computer-vision model is actively achieving an 85% sorting accuracy rate at recycling facilities, lifting local operator revenues.

Yet, the infrastructure powering these models faces physical limits. Meta's Lisa Rivalin highlighted an engineering reality: the infrastructure demands of the AI boom mean that supply chains cannot scale quickly enough to keep pace with demand. Consequently, component reuse has shifted from a pure corporate social responsibility (CSR) target to a core operational resilience requirement.

However, circular scaling is throttled by front-loaded carbon accounting rules. Under standard protocols, companies must log the full manufacturing carbon footprint (Scope 3, Category 1) at the immediate moment of purchase. Lisa noted that this framework actively disincentivises the secondary market: if a company invests in the energy and logistics required to sanitise and prepare a processor for a second life, current Greenhouse Gas (GHG) Protocols force them to "own" the processing carbon while granting zero formal credit for extending the component's lifespan.



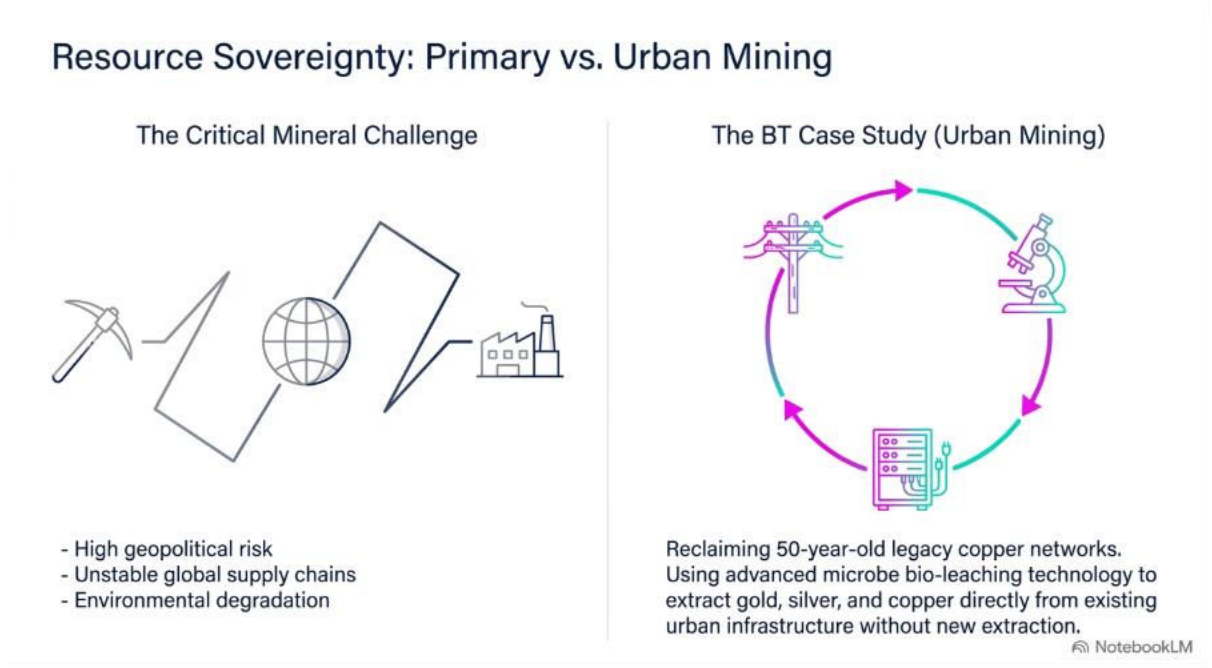
Breaking the First-Mover Bottleneck: Insights from the Panel Debates

The interactive panel sessions explored the systemic gridlocks holding back widespread adoption. A key recurring theme was the "chicken-and-egg" dilemma between governance and commercial sectors: industry waits for the government to mandate sustainability criteria, while the government waits for industry to demonstrate capability before regulating it.

A powerful counter-narrative emerged from the public sector and SME collaborations. Lydia Tabbron highlighted that the UK public sector spends £26 billion annually on ICT services, giving it massive purchasing power to break this deadlock. DEFRA successfully piloted an end-user device contract alongside Steve Haskew of Circular Computing, procuring 34,000 remanufactured laptops. This initiative yielded a 40% cost saving alongside significant material reductions, proving that circular options can look and perform like new. Steve Haskew noted a vital truth for innovators:

"You can build a perfect circular solution, but it will stall without market trust. Large-scale validation gives corporations the confidence to move away from linear procurement."

Furthermore, the physical reality of material scarcity was brought into sharp focus by Professor Frances Wall (Critical Minerals Challenge Centre). Global critical mineral supply chains are highly concentrated and volatile, necessitating a massive domestic push toward "urban mining"; recovering valuable materials from existing built environments and end-of-life electronics. Dede Tavares illustrated this in action, revealing that BT is actively extracting half-a-century-old copper from its legacy networks exploring advanced academic bio-leaching innovations to cleanly recover precious metals like gold and silver at less than half the cost of sourcing raw materials.



The Path to 2030: Messages for Funders and Policymakers

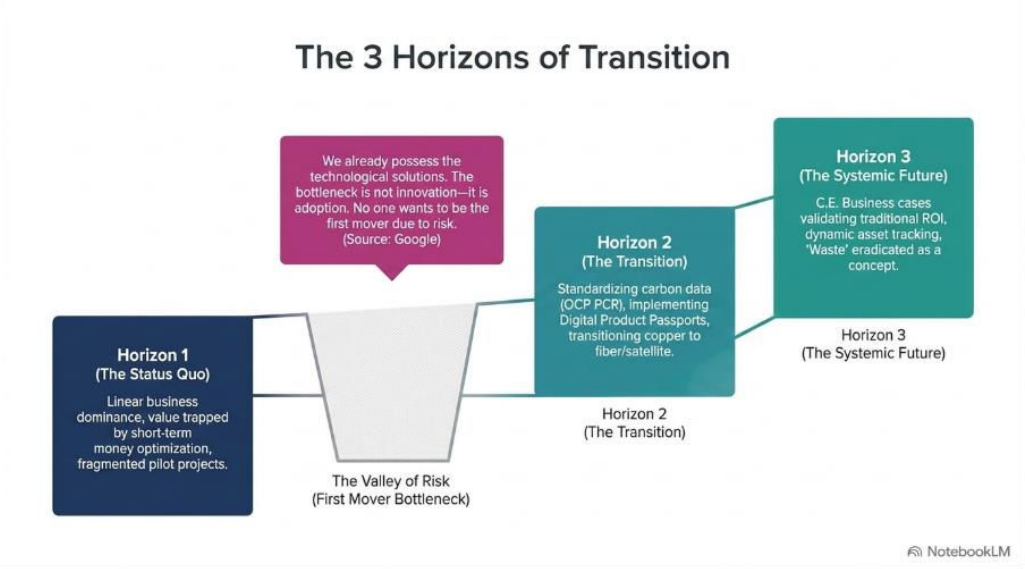
During registration, attendees were asked to envision an event in 2030 celebrating their achievements. The consensus was clear: the community envisions a future in which circularity is fully embedded as Business-As-Usual (BAU), where the concept of "waste" is erased and replaced by continuous material loops, and where organisations act as short-term stewards of long-term assets.

<u>Core Workshop Takeaway:</u> Advanced digital technologies (AI, IoT, RL) are currently trapped within legal, economic, and political architectures built entirely for a short-term, linear economy.

To bridge the gap between today's linear realities and that 2030 horizon, the day concluded with a cross-sector mandate directed at funders and policymakers. Funding bodies such as EPSRC and Innovate UK were encouraged to expand their risk appetite, investing heavily in fundamental, upstream design innovations (Technology Readiness Levels (TRL) 1 to 4) rather than downstream end-of-life waste management. Simultaneously, policymakers were recommended to drive market stabilisation through targeted economic enablers, such as publishing a definitive Circular Economy Growth Plan and implementing VAT reductions for refurbished and remanufactured devices.

Crucially, both groups have opportunity to enforce a unified mandate for multi-industry infrastructure planning. Instead of approving isolated data hubs, future policies must dictate an ecosystem approach where data centre heat and infrastructure are shared with local communities and grid networks, turning data centres from resource liabilities into civic assets. As the day closed, Prof. Fiona Charnley cited Google's Adam Elman, to provide one of the main takeaways:

"We already possess many of the technological solutions discussed today. The ultimate bottleneck is not innovation; it is adoption."



Strategic Stakeholder Roadmap: Insights & Calls to Action

Moving forward, the event highlighted the key challenge to dismantle corporate risk aversion through *shared data standards, robust trust architectures,* and *systemic transdisciplinary partnerships*.

To achieve this, specific calls to action are required across industry, policymakers, and researchers:

- **Industry (Tech Giants, Infrastructure Operators, & Enterprise Procurement):** Rapid AI growth and the cost-efficiency of urban mining make component harvesting and critical raw material (CRM) recovery vital for operational resilience. To overcome B2B secondary market barriers such as data security fears and proprietary metrics, industry leaders must adopt open standards and certified data-erasure software. Furthermore, operators should cascade ageing hardware across lighter workloads and integrate digital infrastructure into local communities through grid balancing and industrial symbiosis.

- **Policymakers & Government Funders:** To overcome short-term governance cycles and flawed carbon metrics that penalise hardware life extension, regulators and funders must modernise policy frameworks. Priorities should include leveraging public procurement power, publishing a national Circular Economy Growth Plan, and reducing VAT on refurbished devices. Additionally, governments should mandate Digital Product Passports (DPPs), reform GHG accounting protocols, enforce multi-industry infrastructure planning for new digital developments, and establish strict AI guardrails.

- **Researchers & Academic Institutions:** Recognising that circularity must be engineered from first principles in technology from the design phases (i.e., TRLs 1–4) through systems engineering and materials science, researchers should prioritise modular hardware design, "Responsible & Frugal AI," and predictive tracking tools. Academics can accelerate impact by releasing open-source carbon accounting and asset-grading software, while actively supporting Early Career Researchers (ECRs) through cross-disciplinary collaboration.

DICE NETWORK+ DIGITAL INNOVATION & CIRCULAR ECONOMY

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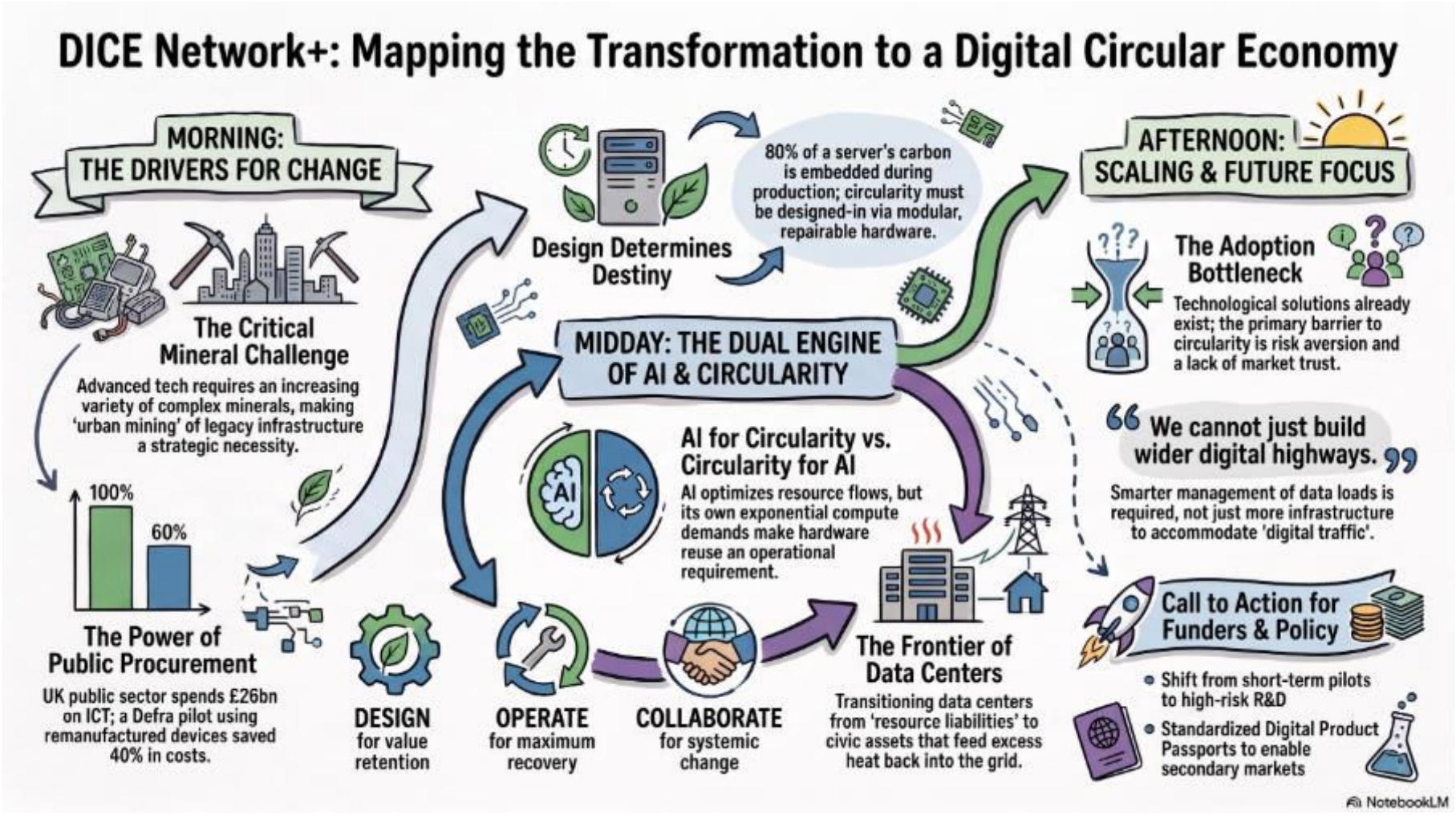

The DICE Network+

The DICE Network+ is a three-year UKRI EPSRC funded programme that seeks to leverage the power of the digital revolution to drive a circular economy across sectors and value chains. Led by the University of Exeter, our expert academic team comprises eleven investigators from nine UK universities. We are creating an inclusive, connected community harnessing interdisciplinary collaboration and research to guide industry partners, government bodies and policy makers towards a digitally enabled sustainable and circular economy.

Our work is focused on two key challenge areas:

- **EMBED:** Embedding sustainability and circularity within the design and development of digital and communication technologies.
- **ENABLE:** Realising the potential of the digital revolution to enable a circular economy across sectors.

By adopting a network of networks approach, harnessing interdisciplinary collaboration, research, and technological innovation, our network is a beacon for change, inspiring and guiding industries, policymakers, and communities towards a digitally enabled sustainable and circular economy.

We welcome engagement from policymakers, industry & academic partners DICE-Network@exeter.ac.uk