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IfM | REVIEW

years of manufacturing education

UNIVERSITY OF CAMBRIDGE
Department of Engineering

IfM MANAGEMENT TECHNOLOGY POLICY

IfM | REVIEW

INSTITUTE FOR MANUFACTURING (IfM)

The IfM is part of the University of Cambridge's Department of Engineering. We are a dynamic body of researchers, educators, practitioners, professionals and technical experts contributing to world-leading research and education. With a focus on manufacturing industries, the IfM creates, develops and deploys new insights into technology, management and policy.

IfM ENGAGE

IfM Engage is an embedded knowledge transfer company within the Institute for Manufacturing (IfM). We combine research excellence and industry expertise to conduct bespoke strategic consultancy, talent and leadership development and company membership programmes. Our profits are gifted to the University of Cambridge to fund future research.

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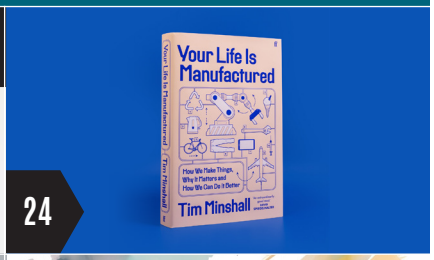

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WELCOME TO ISSUE 17

Welcome to the latest issue of the IfM Review. It is a pleasure, as always, to share the breadth and depth of work taking place across the Institute for Manufacturing – work that continues to address some of the most pressing challenges facing industry and society today.

We lead this issue with a feature on the UK–India Critical Mineral Supply Chain Observatory, an ambitious initiative tackling one of the defining challenges of modern manufacturing: visibility, resilience, and security in global supply chains. As demand for critical minerals accelerates – driven by the transition to clean energy, electrification, and advanced technologies – the ability to map and understand material flows is becoming essential, for industry competitiveness but also for national and economic security. This work exemplifies the Institute for Manufacturing's (IfM) systems approach, combining data science, policy insight, and industrial collaboration to build the digital infrastructure needed for more resilient and sustainable supply networks.

Resilience is a theme that runs throughout this issue. From new research on global value chains and industrial strategy to work exploring the UK's innovation system and the importance of business model coherence in digital transformation, we highlight how organisations are navigating increasing complexity, uncertainty, and technological change. Across these contributions, a consistent message emerges: success depends on not just adopting new technologies but aligning systems, capabilities, and decision-making.

Innovation and impact are also strongly reflected in this issue. We feature IfM spinouts securing significant investment to scale industrial AI solutions, alongside research advancing next-generation battery technologies and quantum computing ecosystems.

We also highlight the launch of the Institute for Biomedical Innovation (IBI), a major new initiative bringing together engineers, clinicians, and manufacturers to accelerate the translation of medical technologies from laboratory to clinic. By strengthening the pathway from research to real-world deployment, the IBI exemplifies the role manufacturing plays in delivering both economic value and tangible improvements in people's lives.

At the same time, people remain central to everything we do. This issue celebrates the achievements of our students, researchers, and alumni – from entrepreneurial ventures tackling circular economy challenges to global scholarship recipients driving sustainable development.

Education continues to be a cornerstone of the IfM's mission. As we mark 60 years of manufacturing engineering education at Cambridge, we reflect on a legacy of experiential, industry-engaged learning that has shaped generations of leaders – and we consider how education must continue to adapt in response to emerging challenges such as AI, sustainability, and geopolitical change.

Finally, this issue reinforces a theme I have spoken about often: the importance of making manufacturing visible. Whether through research, education, innovation, or storytelling, our goal is to deepen understanding of the complex systems that underpin modern life – and to improve them in ways that enable societies not just to function but to thrive.

We hope you find this issue insightful and inspiring.

Tim Minshall

Dr John C Taylor Professor of Innovation
Head of the Institute for Manufacturing

NEWS

IFM SPINOUTS SECURE MAJOR FUNDING TO SCALE INDUSTRIAL AI INNOVATION

Two spinout companies rooted in research at the IfM have secured significant new investment, highlighting the Institute's growing impact on the global industrial artificial intelligence (AI) landscape.

Matta, an industrial AI spinout from the IfM, has raised $14 million in seed funding to accelerate its mission to transform how products are designed, inspected, and manufactured. Matta's technology enables factories to see, understand, and improve their production lines in real time. Using advanced AI, the system can learn any production process within days, detect defects, trace root causes, and help teams resolve issues before they become costly.

Matta was founded on pioneering research at the IfM, where co-founders Douglas Brion (who completed a PhD in deep learning-enabled control) and Dr Sebastian Pattinson (Associate Professor of Engineering and leader of the IfM's Computer-Aided Manufacturing Group) first met. The seed round was led by Lakestar, alongside Giant Ventures, RedSeed VC, InMotion Ventures, 1st Kind (Peugeot Family), Unruly Capital, and Boost VC, with additional grant support from Innovate UK and the Royal Academy of Engineering.

Alongside Matta's progress, **Augmented Industries** has secured €4.5 million in pre-seed funding to expand its AI-driven platform supporting industrial technicians on the factory floor. The Munich-based startup was co-founded by Dr Elisa Roth and Dr Mirco Roth, both IfM PhD alumni, and is built on their research into industrial learning and workforce augmentation.

Augmented Industries' flagship product, Flow Tool, combines AI with learning-science principles to help technicians capture knowledge, create training materials, and troubleshoot complex equipment more effectively. Early adopters, including Siemens, Burger Group, and Mehnert, report faster time-to-productivity, improved machine availability, and reduced downtime.

The funding round was led by b2venture, with participation from 1st Kind by Peugeot Family, xdeck, DnA Ventures, and industry angel investors from BMW, Siemens, and the German Mittelstand, alongside support from the EU's highly competitive EIC Accelerator programme.

Together, these two funding rounds underscore the strength of the IfM's research-to-impact pathway, demonstrating how foundational academic research can translate into scalable technologies addressing some of manufacturing's most pressing challenges.

REPORT HIGHLIGHTS IMPORTANCE OF BUSINESS MODEL COHERENCE

A new report published by the IfM and The Conference Board highlights the critical role of business model coherence in unlocking value amid rapid digital transformation.

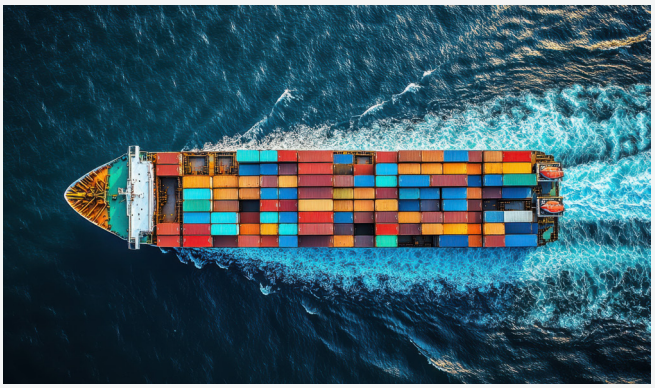
"How to Address the Incoherence of Business Model Innovation in Digital Transformation", explores how alignment between business and operating models is essential for organisations navigating technological disruption, particularly as they integrate AI and other advanced digital tools.

Based on interviews and workshops with more than a dozen multinational firms across sectors including manufacturing, logistics, healthcare, and finance, the research identifies five common sources of business model incoherence: decision rights, performance metrics, resource and material flows, information flow, and partner engagement. Misalignment in any of these areas, the report finds, can significantly hinder value creation and organisational adaptability.

The report, co-authored by Professor Chander Velu, Senior Fellow at The Conference Board and Professor of Innovation and Economics at the IfM (with Chen Ye, IfM, Fathiro Putra, Institute of Technology Bandung, and Charles Popper, The Conference Board), introduces the Business Model Coherence Scorecard, a practical framework designed to help organisations diagnose misalignment and guide strategic decision-making during digital transformation. The scorecard enables firms to assess how digital technologies affect internal operations and external business relationships – and whether those changes create cohesion or fragmentation.

"Business model innovation is not just about adding digital tools; it's about ensuring that all elements of the enterprise – strategy, operations, and financial models – work in harmony," said Chander. "Coherence is what makes innovation sustainable."

With actionable recommendations, the report positions the Business Model Coherence Scorecard as both a diagnostic tool and an early-warning system to help organisations ensure that digital transformation delivers sustainable, enterprise-wide value.



WEF REPORT EXPLORES FUTURE OF GLOBAL VALUE CHAINS

A report has been published by the World Economic Forum's Council on Advanced Manufacturing Value Chains, formerly co-chaired by Jagjit Srai, Professor of Research in the Department of Engineering and Head of the Centre for International Manufacturing at the IfM.

Drawing on extensive engagement with C-suite executives, "From Shock to Strategy: Building Value Chains for the Next 30 Years" – developed by the Global Future Council on Advanced Manufacturing and Value Chains – identifies and examines eight key forces reshaping global manufacturing over the coming 3 decades.

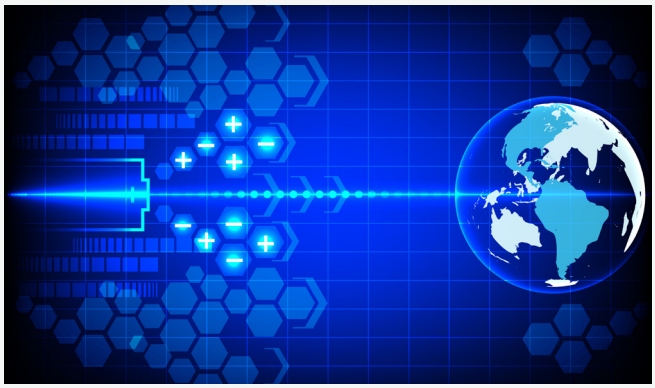
The white paper presents a strategic framework across three critical time horizons – 2030, 2040, and 2050 – providing manufacturers with a roadmap to build resilience while maintaining competitiveness in an increasingly complex global environment.

"Once a landscape dominated by the principles of globalisation, industry is now shifting towards strategies of regionalisation and dual sourcing," says Jag. "As headlines highlight geostrategic competition, regional conflicts, cybersecurity threats, and intensifying climate events, decision-makers are navigating a far more complex operational environment where strategic agility and resilience have become non-negotiable foundations of competitiveness.

"We hope that the driving forces and scenarios outlined in this paper can help public- and private-sector stakeholders to inform decision-making and identify appropriate strategies and policies to ensure the manufacturing sector delivers responsible growth," he adds.

The Global Future Council on Advanced Manufacturing and Value Chains is a think tank comprising industry experts, leading academics, civil society representatives, and public officials.

Join the 30th Cambridge International Manufacturing Symposium to connect with global industry leaders and academics shaping the future of manufacturing and supply chain management. Find out more at: https://engage-events.ifm.eng.cam.ac.uk/CIMsymposium2026



THE GLOBAL RACE FOR FUTURE BATTERY TECHNOLOGIES

A new study on global competition in next-generation battery technologies for electric vehicles (EVs) has been published by an international research team including Frank Tietze, Head of the IfM's Innovation and Intellectual Property Management (IIPM) Laboratory, and colleagues from the University of Münster and Fraunhofer FFB. The study compares patent activity and innovation strategies across China, Japan, South Korea, Europe, and the United States.

Next-generation battery technologies are critical to the global energy and mobility transition. As economies move towards electrification, innovation is becoming a key driver of environmental progress and economic competitiveness. But geopolitical tensions, resource availability, and industrial policy are contributing to an uneven global distribution of innovation capabilities.

Titled "The geostrategic race for leadership in future electric vehicle battery technologies" and published in leading journal *Energy and Environmental Sciences*, the study introduces a novel framework for analysing international competition in battery innovation. By combining patent analytics with policy analysis, the researchers assess how regions are positioning themselves in the race to develop breakthrough battery technologies. The study goes beyond today's conventional lithium-ion batteries, which face limitations such as restricted range, performance degradation, safety concerns, and reliance on critical raw materials.

"It was a fantastic collaboration with the German colleagues, who complemented our expertise on patent analytics with their expertise in battery technologies," says Frank.

One key finding is a widening innovation gap between Asian and Western countries. The researchers warn that this gap could threaten the technological autonomy and long-term competitiveness of Western economies.

MANUFACTURING INNOVATORS TALK SERIES

At the beginning of 2026, the IfM launched the new Manufacturing Innovators series, a programme of monthly, free evening talks exploring the delivery of real-world manufacturing innovation.

Held at the IfM and open to all, the series brought together staff, students from across the University's departments, and members of the local innovation ecosystem. Each session featured a 40-minute presentation from an IfM alum, followed by a lively 20-minute Q&A and informal drinks, creating space for discussion and new connections. The inaugural programme showcased an inspiring line-up of speakers who shared first-hand experience of translating cutting-edge science and technology into tangible products and scalable ventures.

Doug Brion (Matta.ai) reflected on applying AI to manufacturing challenges, while Jean de La Verpillière (Echion Technologies) discussed commercialising advanced battery materials. Dan Summerbell (Carbon Re) highlighted the decarbonisation of energy-intensive industries through digital optimisation, and Pippa Horton (Reclinker) outlined innovations in low-carbon cement. The series also welcomed Clennell Collingwood (Cellular Origins), who explored the industrialisation of cell and gene therapy manufacturing.

Across the sessions, a common theme emerged: the critical importance of bridging the gap between developing clever science and successfully making products from it. Speakers emphasised the value of close integration between research, engineering, and production – areas that too often operate separately – and demonstrated how strong overlaps between these activities can accelerate impact.

The series has already sparked new conversations and collaborations, reinforcing the IfM's commitment to strengthening the links between innovation and manufacturing practice.

IFM ALUMNI REUNITE IN CAMBRIDGE

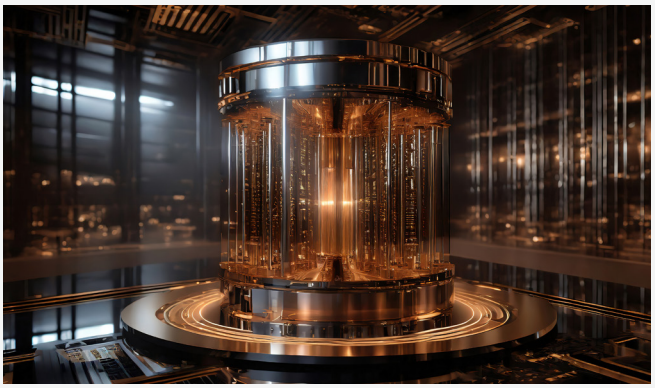
Last summer the IfM welcomed to Cambridge alumni from across 6 decades of its 1-year manufacturing engineering programmes for a day of networking, discussion, and inspiration. Bringing together graduates, current students, and faculty, the event celebrated the enduring strength of the IfM community while exploring how the Industrial Systems, Manufacture and Management (ISMM) course continues to evolve to meet future manufacturing challenges.

The day opened with remarks from Professor Tim Minshall, Head of the IfM, who recognised the achievements of more than 1,880 students who have taken part in the Advanced Course in Production Methods and Management (ACPMM), Advanced Course in Design, Manufacture and Management (ACDMM), and ISMM programmes over the past 59 years. He thanked the academics, industry partners, and students who have together shaped the programmes, highlighting their continued development through close collaboration. With alumni attending from as early as the second cohort in 1968 through to the current cohort, the event showcased continuity and change within the IfM community.

This legacy was underscored by the announcement that the ISMM course was ranked the UK's number one manufacturing engineering Master's course in the Complete University Guide 2025. While celebrating the milestone, Tim emphasised the need for ongoing innovation to address the evolving demands of manufacturing.

The afternoon focused on the future of advanced manufacturing, featuring a keynote by Professor Bill O'Neill on next-generation lasers and the work of the Centre for Industrial Photonics, followed by lively discussion. Current ISMM students Adya Hegde and Joud Dakkuri then presented group project work and reflections on their industry placements, highlighting the programme's applied and collaborative approach. The day concluded with student-led roundtable discussions on skills development, lifelong learning, and the IfM's role in supporting sector transformation, before closing with informal conversations over afternoon tea.

Reflecting on the event, alumni and faculty emphasised that the true strength of the IfM lies in not just academic excellence but the vibrant, enduring community it fosters.



REPORT ON QUANTUM COMPUTING TESTBEDS

The IfM has released a new report exploring the UK's pioneering work in developing quantum computing testbeds.

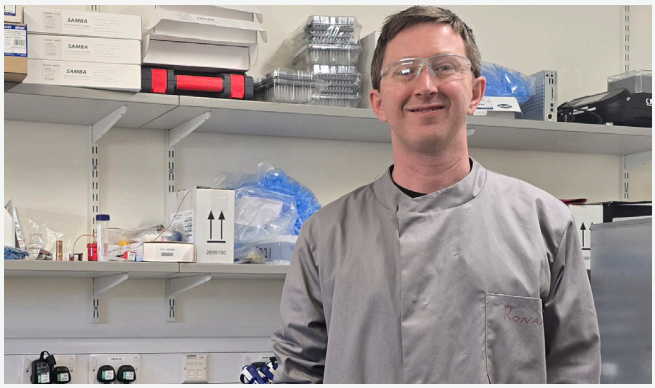
Authored by Professor Chander Velu (Head of the IfM's Business Model Innovation Research Group) and Keith Norman (formerly an IfM Research Associate and now with the UK's Hub for Quantum Computing via Integrated and Interconnected Implementations (QCi3)), the NQCC Quantum Computing Testbed Pilot Study was carried out in collaboration with the National Quantum Computing Centre (NQCC).

Established by the UK government through UK Research and Innovation, the aim of the NQCC is to accelerate the development and scaling of quantum computing technologies. In partnership with Innovate UK, in 2023 the NQCC launched its £30 million testbed programme to create and benchmark different quantum computing platforms. Seven companies – Aegiq, Infleqtion, ORCA Computing, Oxford Ionics, Quantum Motion, QuEra Computing, and Rigetti Computing – were selected to deliver testbeds spanning photonic, trapped-ion, superconducting, and silicon-spin technologies.

"The NQCC testbeds are an extraordinary national effort to develop, test, and showcase multiple quantum hardware approaches," said Chander. "They represent a 'living lab' model that not only advances the technology but also builds the surrounding business and innovation ecosystem required to realise its economic and societal benefits."

While public attention often focuses on hardware breakthroughs, the IfM–NQCC pilot study examines the business, economic, and ecosystem enablers needed for the technology to scale successfully. Drawing on interviews with the testbed firms and stakeholders from across the UK and international quantum communities, the report highlights strengths including the NQCC's role as a lead customer, the provision of world-class technical facilities, and its collaborative innovation model.

The report concludes that the UK's mission-driven, open innovation approach, where government acts as a customer through the NQCC, offers a strong foundation for national and international collaboration.



RONAN DALY ADMITTED AS FELLOW TO THE ROYAL SOCIETY OF CHEMISTRY

Professor Ronan Daly has been admitted as a Fellow of the Royal Society of Chemistry (RSC).

The RSC is the UK's professional body for chemical scientists, bringing together experts from across the globe. The world's oldest society in the field, it is driven by its purpose to help the chemical science community make the world a better place. RSC Fellows are admitted having shown senior responsibilities, strategic influence, and remarkable contributions to their discipline.

"The RSC has such an incredible history, with members and fellows around the world who have contributed so much to our society. I am honoured to have been appointed as a Fellow in the community, and have the opportunity to meet such people and be inspired to keep pushing research boundaries," says Ronan.

Ronan leads the Fluids in Advanced Manufacturing group at the IfM, where his research bridges chemistry and engineering. He studies underpinning microdroplet, colloidal, and chemical behaviours during translation to manufacturing scale processes and to physiological flows, to support the pathway for new technologies to full-scale implementation.

This prestigious recognition highlights Ronan's outstanding impact on the field and his dedication to advancing chemical sciences through research and innovation.

BILL O'NEILL WINS PRESTIGIOUS INTERNATIONAL LASER AWARDS

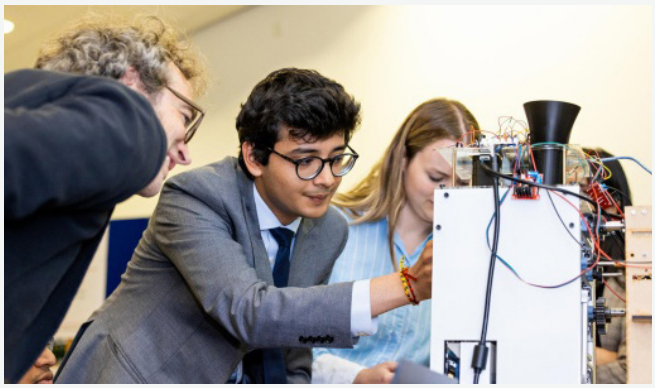
Bill O'Neill, Professor of Laser Engineering and Director of the Centre for Industrial Photonics at the IfM, has been honoured with two of the most prestigious awards in laser engineering and photonics.

The Laser Institute (LIA) announced Bill as the 2025 recipient of the Arthur L. Schawlow Award, which recognises outstanding contributions to basic and applied research in laser science and engineering. His work has transformed the understanding of ultrafast laser–matter interactions, micro- and nano-fabrication, additive manufacturing, and high-power laser processing. These advances have shaped both academic research and industrial practice. The award was formally presented at the 44th International Congress on Applications of Lasers & Electro-Optics (ICALEO®) in Orlando.

Adding to this international recognition, Bill was also named the 2025 AILU Fellowship Award winner by the Association of Industrial Laser Users at the Industrial Laser Applications Symposium. The Fellowship is the association's highest honour, granted for an outstanding lifetime contribution to the industrial use of lasers in the UK. The award acknowledges Bill's leadership in fostering innovation, collaboration, and practical impact across the laser community, alongside his scientific achievements.

"I'm deeply honoured to receive the LIA Arthur L. Schawlow Award and to be elected an AILU Fellow," says Bill. "These recognitions reflect the creativity and perseverance of my teams and our partners in advancing laser science into real-world manufacturing impact. They celebrate not just past achievements but our shared commitment to translating laser research into technologies that make manufacturing cleaner, faster, and more reliable."

Together, these awards highlight Bill's unique role in advancing laser technology from lab to factory floor and emphasise his global influence on the future of advanced manufacturing.



NEW PAPER CHARTS 60 YEARS OF INNOVATION IN MANUFACTURING ENGINEERING EDUCATION AT CAMBRIDGE

A new working paper from the IfM's Centre for Technology Management traces 6 decades of manufacturing engineering education at the University of Cambridge, highlighting how distinctive, experiential approaches to teaching have evolved to meet changing industrial and societal needs.

Titled "Manufacturing engineering education at the University of Cambridge: An illustrative case of long-cycle responses to contextual change", the paper brings together authors from across the IfM's teaching programmes to reflect on the past, present, and future of manufacturing education at Cambridge, and to consider how educational approaches must adapt to future industrial needs.

The paper outlines how the IfM's programmes have continually adapted since the 1960s, shaped by shifts in the global manufacturing landscape, UK education policy, and advances in technology and teaching methods. Across postgraduate, undergraduate, and executive education, the IfM has maintained a consistent commitment to experiential, project-based, and industry-engaged learning.

"A common feature of all the IfM's programmes is a pedagogy that merges technical skills, industrial experience and understanding, communication skills, and the ability to clarify real-life situations through industrial engagement and real-time projects," says lead author and Head of the IfM, Tim Minshall.

Over the decades, the curriculum has expanded from an early focus on production engineering to an integrated understanding of manufacturing as a complex system influenced by globalisation, sustainability, technology evolution, and supply chains.

Looking ahead, the authors highlight challenges including the impact of AI, increasingly unstable geopolitics, the rising demand for flexible learning, and the UK's evolving industrial strategy. While recognising that Cambridge's environment is distinctive, the authors argue that lessons from this long-term evolution are relevant to institutions worldwide seeking to prepare the next generation of manufacturing leaders. The IfM's experience illustrates the value of staying flexible, attentive to industrial signals, and open to new modes of delivery and assessment.

IFM TEAM DEVELOPS TOOLKIT TO SUPPORT STRATEGIC IP MANAGEMENT

Since 2017, the IfM's Innovation and Intellectual Property Management (IIPM) Laboratory, led by Professor Frank Tietze, has been developing a suite of tools designed to help organisations strengthen the strategic management of their intellectual property (IP). This long-term effort builds on the IfM's wider research into template-based and visual methods that make it easier for companies to hold structured, forward-looking strategy conversations about IP and its role in innovation and competitiveness.

The toolkit addresses a common challenge faced by organisations of all sizes: while IP is often recognised as strategically important, many teams struggle to align internal perspectives or create a shared understanding of how IP supports broader business goals. The tools help to bridge this gap by offering clear, repeatable frameworks that guide strategic discussions.

The team has observed two major benefits as organisations adopt these approaches. First, the tools help to create a shared strategic space, enabling IP managers to convene colleagues from across the business and engage in more integrated, strategy-focused conversations. By giving different functions a common language and structure, the tools enable IP considerations to be embedded earlier and more effectively in decision-making.

Second, the tools offer a valuable resource for SMEs and startups, many of whom have limited internal IP capabilities. Several templates include self-facilitation guidance, allowing smaller firms to run meaningful internal discussions about their IP assets, risks, and opportunities. This helps them to ask more informed and targeted questions when working with external service providers, such as patent attorneys or IP consultants.

"Our aim with the IP Strategy Toolkit is to make strategic conversations about intellectual property more accessible, structured and forward-looking. Too often, IP decisions are made in isolation or too late in the process. By giving organisations simple but powerful tools, we help teams create a shared understanding of how IP underpins innovation and competitiveness – and ultimately empower them to make better, more informed strategic choices," said Frank. "The toolkit has been deployed widely across companies and used in executive training, including recently in a WIPO teaching in China and in the Estonia programme," he concludes.

FROM LEARNING TO IMPACT: IFM SHOWCASES EXCEPTIONAL ALUMNI

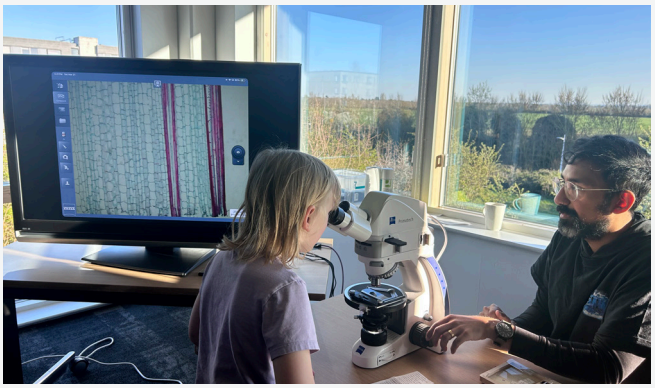
The IfM has launched a new series, "From Learning to Impact", celebrating the achievements of its alumni and the lasting impact of their education. Through in-depth profiles, the campaign explores how IfM teaching, research, and community have shaped careers across diverse industries within the manufacturing sector.

Featuring alumni from across our teaching programmes, the series demonstrates what defines the IfM experience: rigorous academic learning combined with hands-on industrial projects, strong industry connections, and a collaborative and supportive community.

The first five profiles highlight alumni pursuing careers across a range of industries:

- **Dr Amy Shang** is driving the global transition to sustainable transport, building on insights from her IfM PhD to help lead the world's largest EV charger manufacturer.
- **Dr Elliott Grant**, an IfM Manufacturing Engineering Tripos (MET) and PhD alumnus turned Alphabet CEO, is transforming global agriculture through AI and robotics, guided by a lifelong commitment to data-driven innovation.
- **Alice Richard**, an ACDMM alumna, blends creativity, engineering, and sustainability to help global organisations drive change through experiential learning and design thinking.
- **Dr DJ Hamblin-Brown**, founder of CAREFUL and an emergency medicine specialist, is reshaping patient care and safety, drawing on foundations developed during his ACPMM year.
- **Thomas Sutton**, a MET graduate now leading continuous improvement at Tate & Lyle Sugars, applies the practical, systems-focused mindset developed at the IfM to deliver multi-million-pound efficiency gains.

Each story offers a unique perspective on how skills, knowledge, and mindset developed at the IfM are being applied to drive innovation, leadership, and positive change across industries.



CAMBRIDGE FESTIVAL 2026

On Saturday 21 March, the IfM opened its doors for the Cambridge West Family Day as part of Cambridge Festival.

Staff and students welcomed more than 500 visitors to explore the world of manufacturing, sharing research technologies and real-world applications through a programme of hands-on activities, live demonstrations and engaging talks. The Cambridge Festival is an annual event that brings research from across the University of Cambridge to the public, through in-person, on-demand, and online events.

This year's activities showcased the breadth and impact of research at the IfM. Visitors discovered techniques for building better aeroplanes, explored the science of fluids and microdroplets, and heard the story of the Plastic to Ghar project, which is transforming Himalayan waste into useful products.

Across the IfM, interactive exhibits offered something for all ages and highlighted how manufacturing shapes everyday life. Attendees experienced the future of surgery with Versius®, CMR Surgical's robotic system, and stepped inside the chocolate-making process using virtual reality.

One attendee commented, "It was my first time at the IfM, and it was absolutely worth the drive! My kids enjoyed the activities, and it is a great way of getting people thinking about the various challenges and solutions involved with manufacturing."

Professor Tim Minshall, Head of the IfM, shared insights through his talk "Making Tomorrow: How the future will be manufactured". He took the audience on a journey through the scale and complexity of modern manufacturing and explored what is coming next: personalised healthcare, clean energy challenges, and reducing food waste.

Professor Florian Urmetzer, Associate Teaching Professor and Course Director for the MPhil in Industrial Systems, Manufacture and Management, led a session titled: "University Unpacked: What You Don't Learn in the Prospectus". Addressing perceptions of university as a costly and uncertain investment, he explored how students can actively manage risk and maximise value.

A huge thank you to our more than 40 volunteers, who gave their time to run activities, welcome visitors and ensure everyone left feeling inspired and ready to help manufacture a better world.

IFM PHD STUDENTS NAMED IN #21TOWATCH FOR 2026

Sara AlMahri and Callon Peate, both Doctoral Researchers at the IfM have been named as #21toWatch for 2026 winners under the 'People' category, which celebrates founders whose technical insight and entrepreneurial drive are helping to translate research into real-world impact.

The annual #21toWatch awards recognise the next generation of high-potential founders and technically ambitious ventures emerging from Cambridge and the wider East of England. The initiative highlights individuals developing deep-tech solutions to some of society's most pressing health, climate and industrial challenges.

Sara AlMahri, a member of the Supply Chain and Artificial Intelligence lab (SCAIL), is co-founder of Mina AI, which is building an agentic AI execution layer for supply chains. The platform aims to shift the industry from passive information systems to active intelligence that can take action across procurement, logistics and compliance. The technology is designed for use by manufacturers, governments and ports, helping them operate more efficiently and respond to disruptions in global trade.

Sara says, "I'm honoured to be recognised on the #21toWatch list for 2026. We're building Mina AI, the first AI-native workforce for port operations. Over 80% of global trade moves by sea, so helping terminal operations become more efficient and more resilient feels deeply important."

Callon Peate, studying in the Fluid in Advanced Manufacturing (FIAM) Group, is co-founder of GreenMixes, a startup working to build a carbon-negative future for construction materials. The company is developing a drop-in cement admixture designed to provide one of the most scalable and cost-effective routes to fully decarbonising concrete, while enabling buildings and infrastructure to act as long-term carbon sinks.

"I'm really happy to be named on the 21toWatch list for 2026," says Callon. "I'm grateful for the recognition of the work I've been doing and for the support I've received along the way."

The #21toWatch programme showcases founders building ventures grounded in advanced science and engineering, with the potential to create significant economic and societal value. The recognition highlights the growing role of Cambridge's research community in developing solutions to global challenges. Sara and Callon join a cohort of founders whose work spans sectors including AI, climate technologies, biotechnology and advanced manufacturing.

INCLUSIVE LEADERSHIP TAKES CENTRE STAGE AT WOMEN IN MANUFACTURING UK CONFERENCE

In October, around three hundred delegates gathered at the Manufacturing Technology Centre in Coventry, and online, for the third annual Women in Manufacturing UK Conference, which highlighted inclusive leadership as the key to securing the future of UK manufacturing.

Organised by Women in Manufacturing UK (WiM UK) – a national initiative led by the IfM in partnership with the High Value Manufacturing Catapult and Innovate UK Business Connect – the conference brought together industry leaders, policymakers, and researchers to explore how diversity and inclusion can drive innovation, resilience, and competitiveness across the sector.

According to "Women in UK Manufacturing 2025: leading with inclusion", led by authors from the IfM and launched at the conference, women now make up 28.4% of the UK manufacturing workforce, with representation in senior roles rising to 24.8%. But with nearly a quarter of the workforce expected to retire within the next decade, the report calls for urgent action to attract and retain diverse talent, and it outlines five guiding principles for embedding inclusive leadership across organisations.

Kate Willsher, Chief Operating Officer at IfM Engage, highlighted the human dimension: "Manufacturing's future depends on how we value people – their ideas, experiences, and aspirations. Events like the WiM UK conference show that inclusion is not an abstract goal but a shared commitment to building a sector where everyone can thrive."

Since it was founded in 2022, WiM UK has become a central voice in shaping national efforts to improve gender balance in manufacturing. Through its research, industry partnerships, and policy engagement, the initiative continues to provide practical pathways to build inclusive workplaces and empower women at all levels of the sector.

Scan to download the Women in UK Manufacturing 2025 report.

WHAT MAKES THE UK INDUSTRIAL INNOVATION SYSTEM DIFFERENT?

The UK's industrial innovation system is widely recognised for its excellence in research and strong performance in early-stage innovation. It benefits from internationally respected universities, mature industrial sectors, a thriving spinout culture, and steady investment in emerging technologies.

However, during later stages such as scaling up, manufacturing, and commercialisation, structural and financial barriers, sectoral concentration, and high levels of foreign ownership in R&D-intensive industries raise questions about the UK's ability to retain long-term economic value from innovation.

To better understand these dynamics, the Department for Science, Innovation and Technology commissioned the IfM's Cambridge Industrial Innovation Policy to examine the performance of the UK's industrial innovation system, from basic and applied research to product commercialisation.

The findings are summarised in "What makes the UK industrial innovation system different?", with further analysis in two supporting technical reports. The report highlights policy-relevant facts and characteristics of the UK's industrial innovation system. It provides a clear, accessible overview of the system's strengths and where key opportunities or gaps may exist, particularly in relation to R&D expenditure, technology scaleup, and value capture.

A key takeaway from the report is that the UK research and innovation ecosystem differs more from leading comparator economies than is often assumed – and these differences matter. Ecosystem and R&D portfolio configurations can provide advantage or disadvantage, particularly in critical technologies or during industrial scaleup.

NEW NATIONAL FRAMEWORK SETS OUT VISION FOR MATERIALS 4.0 IN THE UK

The Henry Royce Institute has published its interim National Framework for Materials 4.0, setting out a shared way of thinking about how digital technologies can transform the UK materials landscape. Supported by IfM Engage, the knowledge-transfer arm of the IfM, the framework provides a common language to align activity across the materials community.

The interim framework responds to a growing need for coherence in an evolving landscape. Digital tools are already being applied in materials research and industry, but activity has often been fragmented. The framework provides a reference point to support coordination, investment, and collaboration across academia, industry, and government. To test and illustrate the framework, the report draws on sector-spanning use cases, including composite materials for wind turbine blades, battery materials, steel, and sustainable packaging.

IfM Engage led a consortium of companies including Perspective Economics, Urban Foresight, and Frazer-Nash Consultancy, working closely with the Henry Royce Institute to develop the framework. The team conducted research, interviews, surveys and stakeholder workshops to identify the current investment landscape, initiatives and barriers for adoption of Materials 4.0 approaches; and highlighted gaps, and barriers and specific actions across technical, organisational, and regulatory dimensions.

Nicky Athanassopoulou, Head of Solution Development at IfM Engage, said: “This project brought together a wide range of perspectives from across the materials ecosystem. By combining detailed industrial insight with input from across the community, we were able to help create a framework that is both practical and ambitious, and that can support informed decision-making as Materials 4.0 continues to develop.”

The interim National Framework for Materials 4.0 is intended to be a foundation for further consultation and refinement. The next phase will build on this work to develop more detailed guidance, priorities, and actions, supporting the UK materials community as it moves towards a more connected, digitally enabled future.

UK INNOVATION REPORT 2026

On Thursday 19 March, policymakers, industry leaders, and experts gathered at the Institute for Government for the official launch of the UK Innovation Report 2026. The event, held in person and online, provided a platform to discuss the report’s key findings and their alignment with the UK’s evolving industrial strategy.

Published by Cambridge Industrial Innovation Policy, based at the IfM, the report offers a detailed analysis of the UK’s innovation landscape, assessing the performance of key industrial sectors compared to global competitors. It presents vital evidence on the UK’s industrial strengths, challenges, and opportunities within a shifting economic context.

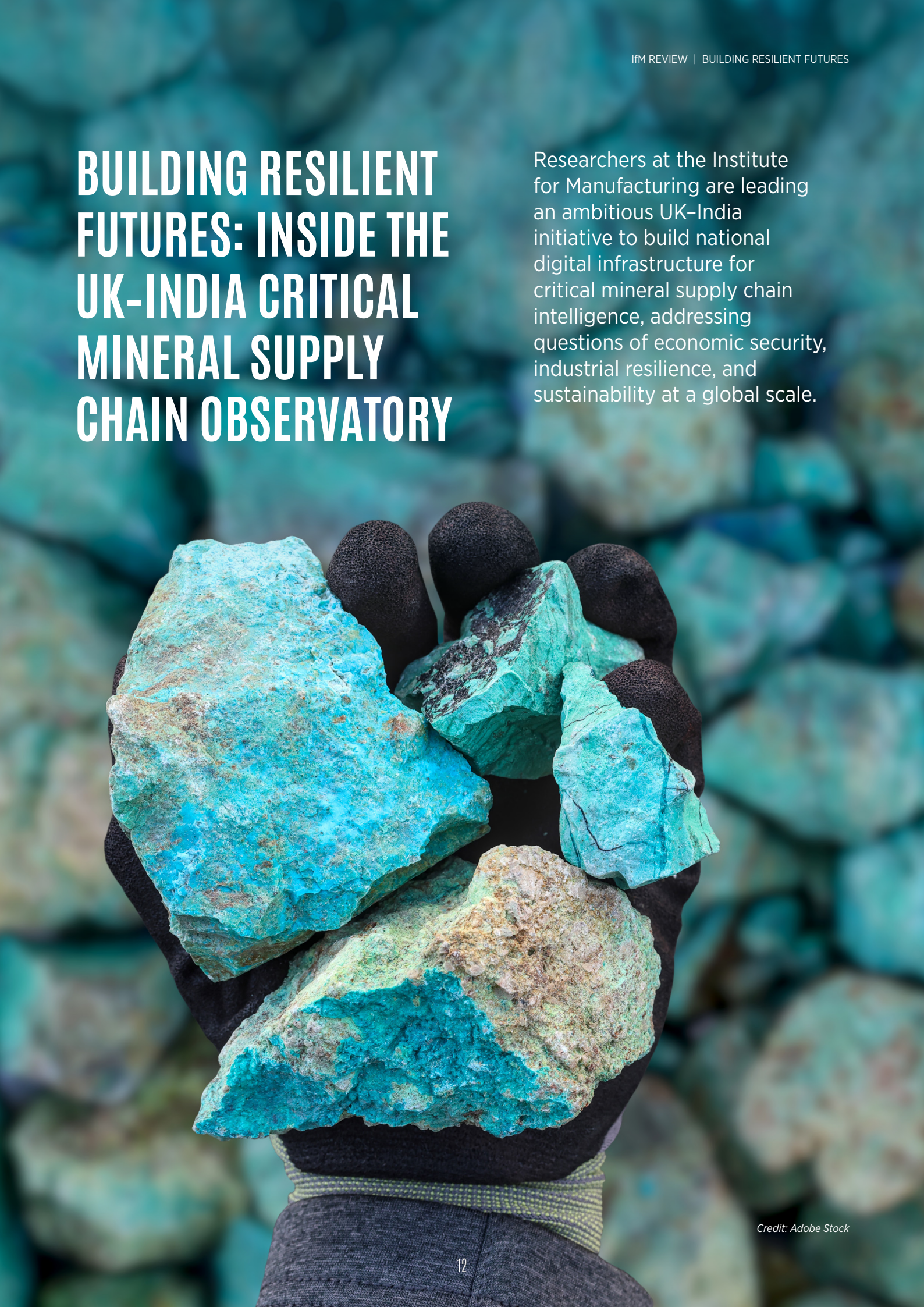
Attendees had the opportunity to hear from Lord David Sainsbury, former Chancellor of the University of Cambridge and former Minister for Science and Innovation, alongside the report’s authors. This session gave the audience a chance to engage directly with the researchers behind the report, explore the underlying data and charts in greater depth, and ask technical questions about the evidence base.

A panel of prominent industry and policy leaders – including Dave Smith, UK National Technology Adviser; Sharon Todd, CEO of SCI; and Stewart Lane, Head of Business Development at Renishaw – reflected on the report’s findings and explored their implications for the UK’s innovation and industrial strategy. The discussion considered how the UK can better translate research excellence into industrial competitiveness, the challenges of scaling and retaining high-growth technology companies domestically, the transformation underway in advanced manufacturing sectors, and the practical steps needed to strengthen the UK’s long-term innovation capacity.

As the demand for stronger evidence in industrial and innovation policymaking increases, the UK Innovation Report makes a timely contribution by offering new data, analyses, and perspectives to support evidence-based policy development.

BUILDING RESILIENT FUTURES: INSIDE THE UK-INDIA CRITICAL MINERAL SUPPLY CHAIN OBSERVATORY

Researchers at the Institute for Manufacturing are leading an ambitious UK–India initiative to build national digital infrastructure for critical mineral supply chain intelligence, addressing questions of economic security, industrial resilience, and sustainability at a global scale.



Credit: Adobe Stock

At any given moment, most organisations can only see a small part of their supply chains. Beyond immediate suppliers, transparency diminishes rapidly, with as much as 80% of activity remaining largely opaque. As a result, decisions about compliance, cost, environmental performance, and social responsibility are often made with incomplete information.

When these supply chains involve critical minerals, this lack of visibility takes on strategic significance. These materials support a wide range of technologies, from electric vehicle batteries and renewable energy systems to consumer electronics and defence applications, posing not only operational challenges but also questions of industrial resilience and national security.

To address these challenges, researchers in the Industrial Resilience Research Group at the IfM, in collaboration with partners in the UK and India, have established the UK–India Critical Mineral Supply Chain Observatory. More than a research project, this initiative builds national digital infrastructure for supply chain intelligence: a comprehensive data and analytics platform designed to enhance end-to-end supply chain visibility and support more informed decision-making across government and industry.

THE IMPORTANCE OF CRITICAL MINERALS

Critical minerals are a group of raw materials considered essential for modern technologies and industrial development. They include elements such as lithium, cobalt, nickel, and rare earths, which are essential for a range of industrial and energy applications.

Beyond facilitating the shift to cleaner energy systems, their significance lies in maintaining the competitiveness of industries that depend on advanced manufacturing. Demand for these materials is increasing rapidly, while their extraction and processing remain confined to a few geographic regions, creating structural vulnerabilities in global supply chains.

Both the UK and India require secure supplies of critical minerals to deliver on their industrial and environmental strategies. For the UK, this includes rapidly scaling renewable power and developing domestic battery-manufacturing capacity. For India, the priorities lie in meeting its ambitious electrification targets and growing its domestic EV market.

Despite these shared ambitions, both countries depend on imports, leaving supply chains exposed to geopolitical risks. Establishing a joint UK–India Observatory provides a mechanism to track and understand these vulnerabilities and a collaborative platform to address them.

MAPPING AND ANALYSING CRITICAL MINERAL SUPPLY CHAINS

The UK–India Critical Mineral Supply Chain Observatory is a collaboration between the IfM and a network of Indian partners, including the Indian Institute of Technology (IIT) Bombay, IIT(ISM) Dhanbad, TEXMiN, India's Department of Science and Technology, GMDC, and the International Centre of Excellence in Mining (iCEM), bringing together expertise across academia, government, and industry to develop a comprehensive digital platform for critical mineral supply chain intelligence.

The aim of the UK–India Observatory is to map the full life cycle of critical minerals, from mining and refining to manufacturing and recycling. Researchers at the IfM's Industrial Resilience Research Group apply systems modelling and supply chain analysis to build an integrated view of material flows, dependencies, and vulnerabilities. This includes monitoring mineral flows across UK and Indian contexts, identifying extraction sites, processing chokepoints, and opportunities for recycling.

Using Google Earth Engine and bespoke data architecture, the platform visualises the global distribution of resources and reserves, for example showing that 60% of identified lithium resources are concentrated in South America and 70% of cobalt mines are in the Democratic Republic of Congo (DRC).

"But it goes further than geography," as Dr Mukesh Kumar, Head of the IfM's Industrial Resilience Research Group and project lead, explains. "Researchers can interrogate mine ownership, mapping which companies and nations control specific extraction sites. They can also trace the refining stage, showing that processing facilities are overwhelmingly located not where the mines are, but in China. From there, the supply chain can be followed through to, for example, component manufacturing, battery cell production, and final EV assembly, connecting each stage on a single integrated platform."

Crucially, the observatory extends beyond conventional supply chain mapping by incorporating contextual data. By mapping artisanal and illegal mines alongside legitimate operations, researchers can identify where conflict minerals enter formal supply chains, and where child labour, human rights abuses, and violence against women are concentrated.

Government stability indices, armed conflict data from the United Nations, and climate-change projections (including heavy precipitation, heatwaves, and flooding) are layered onto supply chain maps to provide a multidimensional picture of vulnerability. Satellite imagery analysis enables the team to estimate greenhouse-gas emissions from individual processing facilities without requiring any cooperation from those facilities, creating an entirely new data set for sustainability auditing. These capabilities reveal patterns of concentration, control, and risk that aren't visible in conventional data sets.

"The project is considered of significant importance for both countries' national and economic security," says Mukesh. "The scale is vast – a single modern car contains more than eight thousand semiconductor chips. Many of the minerals required for clean-energy technologies are refined overwhelmingly in China, regardless of where the ore is mined: 85% of cobalt processing, for example, takes place there. When export controls, trade disputes, or logistics disruptions intervene, entire manufacturing sectors can grind to a halt."

CLOSING THE INFORMATION GAP

While export and import data provides insights into commercial relationships, it doesn't necessarily capture the physical origins of materials. The UK, for instance, appears in trade data as a major exporter of cobalt to India, despite having no domestic cobalt mining or processing capacity. In such cases, trade data may reflect contractual arrangements rather than underlying material dependencies.

"This distinction has important implications," says Mukesh. "Without an accurate understanding of where materials originate and how they move through supply chains, it is difficult to identify vulnerabilities or design effective mitigation strategies. Addressing this gap is a central objective of the observatory."

UK and Indian partners sign a Letter of Intent to collaborate on critical mineral supply chain resilience.

The need for supply chain observatories as national digital infrastructure has become increasingly urgent. Just as countries maintain strategic petroleum reserves to buffer against energy shocks, there is a growing recognition that equivalent intelligence infrastructure is needed for critical minerals. The UK–India Observatory will serve precisely this function: a digital intelligence platform that provides governments and industry with the comprehensive, near-real-time visibility required to anticipate disruptions, identify chokepoints, and make informed decisions about stockpiling, diversification, and investment.

SHAPING POLICY, INVESTMENT, AND PRACTICE

The UK–India Observatory has already begun to generate tangible outcomes. An initial industry–academia workshop in New Delhi provided a forum for stakeholders to identify shared challenges and priorities, resulting in structured recommendations across multiple areas of focus. The initiative has also established frameworks for monitoring mineral flows and developed an extensive data infrastructure covering supply and demand dynamics, production data, supply chain actors, and contextual risk factors.

These capabilities are expected to inform both policy development and investment decisions. Insights generated by the observatory can support research and development in recycling and recovery technologies, guide investment in processing capacity, and help to align standards across the UK and India.

For industry, improved visibility and analytical capability support greater resilience and more informed sourcing decisions. For communities, particularly those in proximity to extraction activities, integrating environmental and social data offers the potential for more responsible and inclusive outcomes.

SCALING THE OBSERVATORY: PHASE 2

The UK–India Observatory's growing importance was underscored during the official visit of the Rt Hon Sir Keir Starmer, Prime Minister of the United Kingdom, to India in October 2025, where both nations reaffirmed their commitment to strengthening the resilience of critical mineral supply chains and supporting green industrial growth. The launch of Phase 2 includes establishing a Satellite Observatory at TEXMiN IIT(ISM) Dhanbad, formalised through a Letter of Intent between IIT(ISM) and the University of Cambridge under the aegis of India's Department of Science and Technology.

Industry participation is being strengthened through collaboration with the Gujarat Mineral Development Corporation Ltd – promoted International Centre of Excellence in Mining (iCEM) – which supports the practical implementation of the observatory across the rare-earth-element value chain, with a focus on mid-stream capabilities and skills development.

Researchers in the Industrial Resilience Group developing the Critical Mineral Supply Chain Observatory.

TECHNOLOGY PARTNERSHIP WITH GOOGLE CLOUD

A critical enabler of the UK–India Observatory's ambitions is its partnership with Google Cloud. The collaboration provides the advanced computational infrastructure required for the observatory's data-intensive operations, including comprehensive supply chain data spanning 4,000 data points and 75 GB of integrated information. The platform has enhanced visibility of critical supply chains and delivered new operational efficiencies in data analysis, with end-to-end extraction tasks reduced from approximately two weeks of manual effort to just minutes.

THE WIDER PICTURE: THE GLOBAL SUPPLY CHAIN OBSERVATORY

The UK–India Observatory forms part of the Global Supply Chain Observatory (GSCO), a research initiative within the IfM's Industrial Resilience Research Group focused on mapping global supply chains.

Drawing on diverse data sources and advanced analytical methods, the GSCO builds an evolving picture of global supply networks and their associated risks. Research spans critical minerals and food supply chains, supporting scenario-based stress-testing and identifying vulnerabilities. Within this wider context, the UK–India Critical Mineral Supply Chain Observatory represents a focused application of these capabilities, demonstrating how integrated data and analytical approaches can support more resilient, transparent, and sustainable supply chains across sectors.

RESILIENCE THROUGH PARTNERSHIP

The UK–India Observatory is a pioneering example of how research, industry, and policy can come together to address a pressing global challenge. For both the UK and India, securing critical mineral supplies is not just a technical matter; it is central to their energy transitions, economic resilience, and global competitiveness.

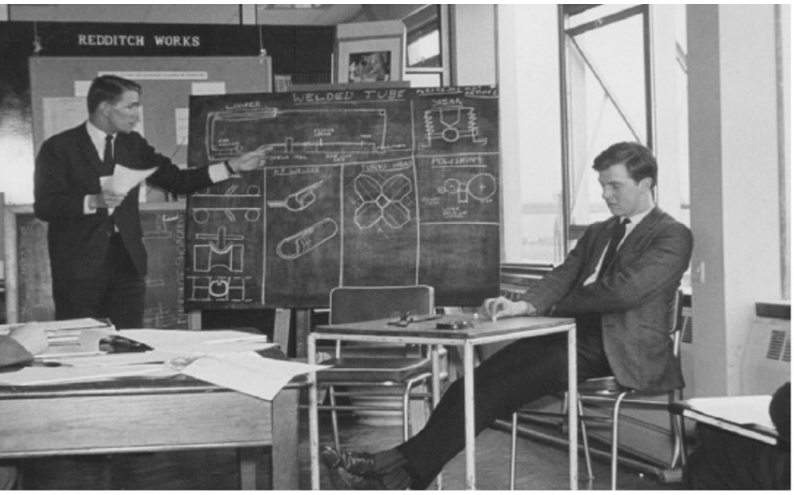
It also illustrates how the IfM's distinctive approach – combining data science, artificial intelligence, and policy innovation with deep engagement across academia, government, and industry – is being applied to real-world problems at a global scale.

Find out more about the Global Supply Chain Observatory:
https://app.cambridge-gsco.co.uk

GSCO team: Garry Clawson, Wei Nie, Mariel Alem Fonseca, Deepesh Jayasekara, Zhong Guan, Rana Hajirasouli, Aukrit Unahalekhaka, Edison Li, Yongxu Zhao, Nidhi Pathak, Naoum Tsolakis, Emre Usenmez, Gavin Harper, Ben Macdonald, Karen Smith, Thorge Schaum, Marvin Wersel, Oshadhi Herath, Mohammed Faisal Khan.

CELEBRATING 60 YEARS OF MANUFACTURING EDUCATION AT CAMBRIDGE

In 2026, the IfM marks 60 years of manufacturing engineering education at the University of Cambridge, celebrating a programme that has shaped generations of manufacturing leaders and which continues to evolve in response to industrial change.



Students on the first Advanced Course in Production Methods and Management in 1966

Top left: ACDMM 1998/99 students on study tour in Brazil, credit Alice Richards. Bottom left: ACPMM 1984/85 students visit a coal mine, credit DJ Hamblin-Brown. Right: 2026 ISMM study tour.

The IfM's manufacturing education programme began in 1966 with the Advanced Course in Production Methods and Management (ACPMM). Initially funded by 96 companies that recognised the value of graduates with practical, hands-on experience, the course immersed students in real industrial projects from the outset – an emphasis that would become a defining feature of the programme.

Over 6 decades, the programme has grown from an initial cohort of 12 students to a global community of more than 1,800 alumni working across manufacturing, technology, consulting, entrepreneurship, and policy. During this time, the course has evolved to reflect the growing complexity of manufacturing.

In the 1980s a design element was introduced, creating the Advanced Course in Design, Manufacture and Management (ACDMM). Then in 2004, the programme became the formal MPhil degree in Industrial Systems, Manufacture and Management (ISMM), as it is today, solidifying its place within Cambridge's formal academic structure.

Professor Tim Minshall, Head of the IfM, says the longevity of the programme reflects a consistent commitment to learning grounded in industrial reality: "What has kept this course relevant for 60 years is that it's never been just classroom learning. Students are taught the core engineering and management tools, but they develop their judgement by applying them immediately in real industrial settings – learning how to ask the right questions, work with uncertainty, and deliver practical change."

LEARNING GROUNDED IN INDUSTRY

True to its origins as an industry-embedded programme, the course provides students with an integrated view of manufacturing engineering, combining rigorous taught modules with industrial projects and visits. Graduates develop a strong technical understanding of markets, product and process design, and operations and supply chains, alongside the professional skills needed to work confidently across organisational and disciplinary boundaries. These skills continue to make graduates sought-after across industry.

"In-company projects solving real business or technical problems are what make the ISMM unique, and we try to give students as wide a range of opportunities as possible by working with lots of different-sized companies," explains Vanessa McNiven, ISMM Executive Course Director.

"In a typical year, students visit around thirty companies that range in size. These cover a wide range of industrial sectors, including aerospace, automotive, beverages, chemicals, consumer products, defence, electronics, energy, food, healthcare, measurement systems, metals, pharmaceuticals, and textiles.

"Students also get a chance to go overseas to see industry in a different culture and context – this really provides the students with a truly international perspective on manufacturing. In the recent past, our students have visited companies in countries including Japan, Germany, the USA, France, and Switzerland."

Gloria Simanjuntak, a 2024/25 ISMM student, explains: "The course is much more than just learning theories – it's about taking those theories and applying them in real-world contexts. Working on live projects, engaging with experts, and building connections with companies across different sectors have been invaluable in helping me understand how industries work and what it takes to make them more sustainable."

Dr Florian Urmetzer, ISMM Course Director, describes the programme as designed to build confidence as well as capability: "Students arrive with strong academic backgrounds, but the course helps them develop professional judgement. It gives them the opportunity to work with complex industrial situations, and to learn how to ask the right questions in real time."

That confidence-building element is something alumni continue to reflect on years later. Alice Richard, founder of Co-CREATE ImpACT, credits the programme with shaping her mindset as much as her skills: "Anyone can be a

2025 ISMM study tour in France

catalyst for change, regardless of their starting point. The key is having a can-do attitude and believing in yourself – a valuable lesson I learnt at the IfM, and one I aspire to pass on."

Long-term industry partners also point to the tangible impact students have had on their organisations. Dave Ford, Head of Production, Bowers & Wilkins (UK) said: "I am extremely happy to have worked with these students over the past 8 years. They complete tasks effectively, are highly critical, and possess the right mindset to drive change and progress in our work. When I look at our production facility now, I can see how the years of collaboration have positively influenced us both as a company and as a production site. We have made some very good decisions based on the work they have contributed, including choosing not to pursue certain options."

He also reflected: "One team of students took on a problem we encountered in a project, developed their dissertation topic around it, and subsequently started a startup to address that issue. We are now collaborating with them as well. It is wonderful to be part of this journey."

REFLECTING ON 6 DECADES OF EDUCATIONAL INNOVATION

As part of the anniversary year, the IfM will share stories from alumni and current students, highlighting the programme's impact across industry and the wider manufacturing ecosystem. Two in-depth alumni interviews, featuring Alice Richard and DJ Hamblin-Brown, are available as part of the IfM's "From Learning to Impact" series.

The programme's influence is reflected in the breadth of roles its graduates go on to fill – often in sectors far beyond the factory. DJ Hamblin-Brown, founder of healthcare coordination platform CAREFUL, says the course helped him build the skills to move between worlds: "Developing analytical and engagement skills taught me how to articulate my ideas effectively, from the shop floor to the boardroom. It's essential to communicate complex problems clearly to everyone … and to think through challenges systematically to find innovative solutions."

The anniversary also provides an opportunity to reflect on how manufacturing education must continue to adapt. A new working paper, with contributions from across the IfM's teaching programmes, examines the evolution of manufacturing education at Cambridge over 6 decades. It also considers how programmes may need to respond to emerging drivers such as AI, sustainability pressures, geopolitical instability, and changing patterns of lifelong learning.

Florian notes that the anniversary is as much about the future as the past: "Manufacturing is changing rapidly, and education has to keep pace. The anniversary is a chance to celebrate what has been achieved, but also to think seriously about what industry will need from manufacturing leaders in the next decade."

INVESTING IN THE NEXT 60 YEARS

To support this long-term development, the IfM has launched a 60th Anniversary Fund. The fund will strengthen access to the programme through student support, enhance the learning experience through additional industrial teaching capacity and facilities, deepen engagement with industry, and support the development of new routes, including a potential new MSt course.

Tim says the programme's continued relevance depends on maintaining its distinctive blend of academic rigour and industrial engagement: "Experiential education endures because it equips students to deal with ambiguity, complexity, and real-world industrial challenges. If manufacturing is to remain innovative and resilient, we must continue to develop people who can lead change in practice, not only in theory."

Find out more

Further information, including access to the working paper, alumni case studies, and the 60th Anniversary Fund, is available through the IfM website.

2026 ISMM study tour in Germany at UNESCO Stiftung Zollverein World Heritage Site

BRIDGING THE GAP FROM LAB TO CLINIC: CAMBRIDGE LAUNCHES INSTITUTE FOR BIOMEDICAL INNOVATION

The University of Cambridge has launched a new institute to tackle one of the biggest bottlenecks in UK medical research: turning promising laboratory discoveries into regulated devices that can be trialled with patients.

The Institute for Biomedical Innovation (IBI) sits within the Department of Engineering and is directed by Professor George Malliaras (Head of the Bioelectronics Laboratory) and co-directed by Professor Ronan Daly (Head of the Fluids in Advanced Manufacturing group at the IfM). It brings together engineers, clinicians, and manufacturers in a facility designed to help researchers develop and manufacture medical technologies ready for clinical trials and real-world use.

The institute is unique in the UK and is intended to support high-value manufacturing and economic growth. It will offer ISO-certified environments, meaning facilities that meet internationally recognised standards for quality, safety, and traceability, for developing medical devices and supporting "batch prototyping", producing tens or hundreds of devices to standards suitable for pre-clinical and clinical evaluation.

"We're very good at breakthrough, world-leading research in this country," says Ronan. "But the danger is that we can lose out on capturing value, potential employment, and resilience by manufacturing elsewhere. The UK has an outstanding, highly skilled medical technology manufacturing sector, so we should be building on this further."

By enabling this transition from laboratory innovation to manufacturable devices, the institute will help to close the gap between early-stage research and technologies ready for trialling with patients.

"If we can shorten the journey from lab to clinic, even by a few years, that can have an enormous impact, and make a real difference to people's lives," says George.

Alongside the patient impact, the IBI will act as a hub where future medical device manufacturers can connect with the broader supply chain, facilitating a clearer route to final manufacturing in the UK. The economic benefits – boosting jobs, exports, and strengthening an already prominent sector – are evident, and the team are committed to fostering that growth.

Professor Colm Durkan, Head of the Department of Engineering, said: "As a department, we are always looking for new ways of creating societal impact from our work. Our move to create a sector-focused institute is a way of convening clinical and engineering expertise to create that clear pathway to patients. We are opening this up to industry, startups, and other universities because we want it to catalyse more change than from our department alone."

Q&A WITH IBI CO-DIRECTORS

George and Ronan discuss the motivations behind the institute's creation, how their complementary expertise across medical device innovation and manufacturing shapes its direction, and what excites them most about the journey ahead.

Can you explain the reasons behind the launch of the IBI?

"We have been involved in various medical technology projects, including implantable devices, drug delivery systems, wearables, and in vitro diagnostics. Working with clinical, industrial, and cross-university partners, we often mapped the innovation journey from idea conception to small-scale manufacturing for trials.

"Alongside research advances, we faced challenges that are difficult to resolve within an academic setting, such as sterilisation, packaging, and scaling up production. Transitioning from a lab proof-of-concept to a clinically suitable device also means meeting strict safety, biocompatibility, and traceability standards outlined by medical device regulations. Lack of access to these capabilities can slow down the manufacturing process.

"From a manufacturing point of view, the field is complex and challenging for new companies to navigate; we aim to support startups by helping them understand the innovation infrastructure and providing access to the necessary expertise."

How do your respective strengths shape the institute's direction?

"We have had a range of different experiences. George has a long track record in world-leading medical device research and innovation, spinouts, and running similar innovation facilities. Ronan has been engaged with industry, industry-focused research needs, and manufacturability challenges, and he is at the interface between fundamental science and manufacturing.

"However, while we are shaping the institute, there is a broader team from across the University, who have been key to ensuring this can happen. It has taken all of us to get to this early stage, and it will take a broader community to turn it into a national innovation success story."

How is the IBI positioned to support devices through the transition from research to deployment?

"Right now, we are creating a facility to enable increased access to prototyping for medical technologies, with microfabrication, digital printing and laser fabrication, electronics, bio labs, a characterisation suite, and links to facilities outside the IBI.

"Our goal is to bring the facility to a level where devices can meet medical device standards and be shown to be safe for early-stage trials. During 2026, we plan to introduce additional manufacturing capabilities, including washing, disinfection, assembly, sterilisation, and packaging, helping create a clear pathway to safe devices for testing.

"The next stage will be to support the wider innovation ecosystem and connect with activities focused on commercialisation, adoption, supply chain innovation, procurement and final manufacturing."

Will sustainability be a focus for the IBI?

"Sustainability will be a core part of ongoing research projects, working with universities, industry, and the NHS. It is a key challenge across the health and care sector, with two clear strands: improving the efficiency and resilience of devices already in use, including waste reduction, remanufacturing, and recycling, and ensuring that future devices embed sustainability from the outset."

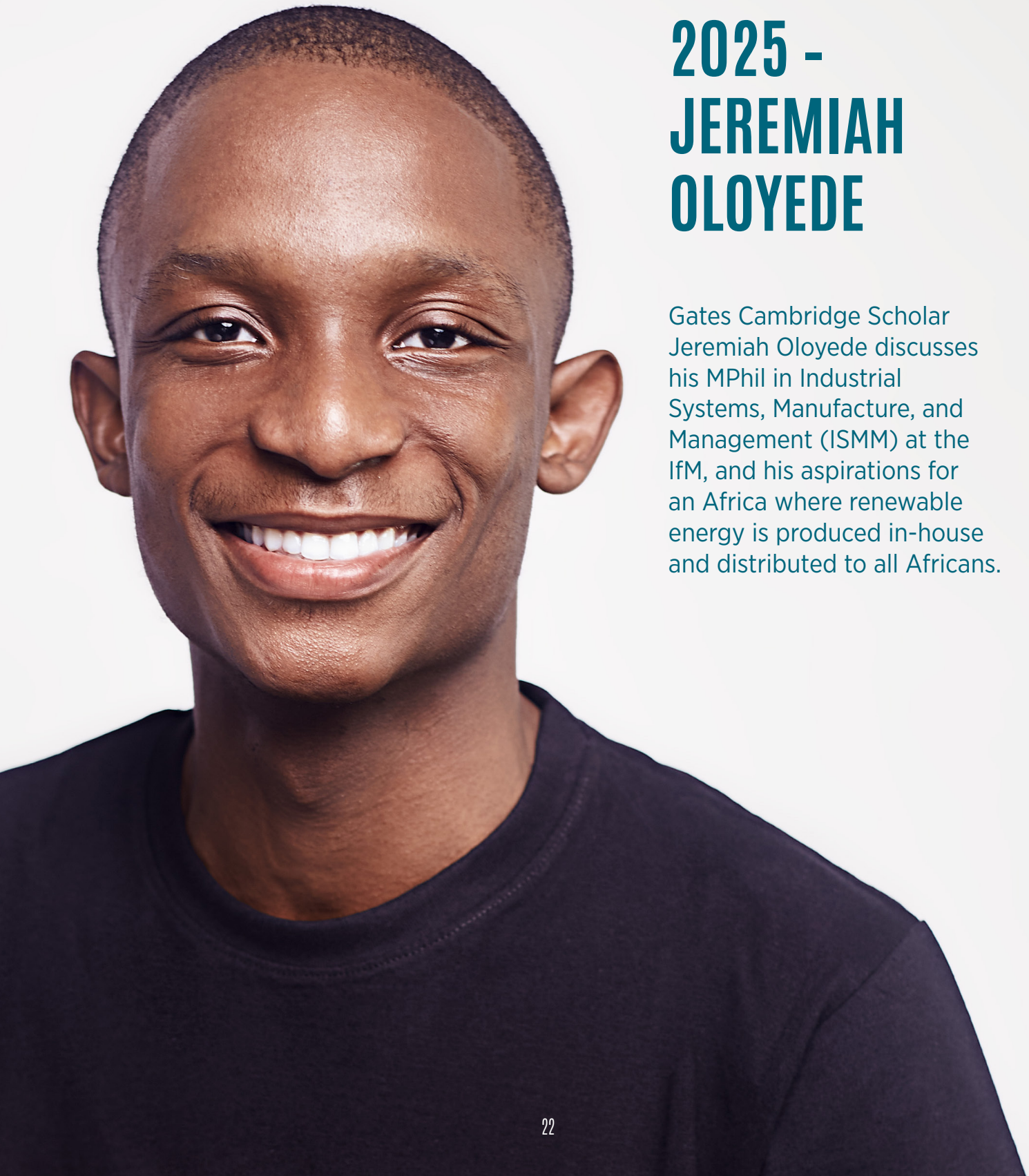
With the institute now launched, what excites you most about what lies ahead?

"The sheer level of support and positivity has been incredibly exciting. While we are just starting up, this is so important, as it confirms that this is needed and that people want us to provide these new capabilities.

"There have been so many people dropping by or telling us about other roadblocks they have experienced on their own biomedical innovation journey. The fact that this is sparking so many messages supporting action now is the exciting validation we needed to push forward."

Find out more about the IBI:

GATES CAMBRIDGE CLASS OF 2025 - JEREMIAH OLOYEDE



Gates Cambridge Scholar Jeremiah Oloyede discusses his MPhil in Industrial Systems, Manufacture, and Management (ISMM) at the IfM, and his aspirations for an Africa where renewable energy is produced in-house and distributed to all Africans.

I grew up in Lagos, Nigeria, and infrequent electricity was my birthright. I had never challenged the status quo until I witnessed an entire production line crumble during an internship because of the same unreliable electricity. Immediately I began thinking, *If centralising electricity production failed us, how about decentralisation?*

My academic journey began at Covenant University in Nigeria, where I graduated as the Best Student in Mechanical Engineering. My research at the Energy and Environment Research Group focused on a comprehensive techno-economic-environmental assessment of renewable energy potential in West Africa. Using the Multi-Criteria Analysis for Planning Renewable Energy methodology, I evaluated the feasibility of integrating solar photovoltaics (PV), concentrated solar power, and wind energy into the West African Power Pool. Our findings highlighted that solar PV, with an astronomical installed capacity potential and a competitive levelised cost of electricity, is the most viable option for decarbonising the region's energy supply.

Professionally, as a mechanical engineer at Space in Africa, I have been involved in projects aimed at enhancing energy access through innovative technologies. Collaborating with Maana Electric, I worked on integrating their TerraBox technology to enable rapid solar-panel manufacturing in Nigeria. This project involved technical evaluations of their glass frameless panels, navigating challenges in sourcing specialised solar glass locally, and structuring a viable economic model for local production. Although the deal faced setbacks because of severe inflation shocks in early 2024, the experience deepened my understanding of supply chain dynamics and the critical need for localised, cost-efficient manufacturing solutions in developing markets.

Additionally, I co-founded and led a team aiming to deploy 10,000 industrial-grade weather and air-quality stations powered by solar energy for a climate-resilient Africa at Climate in Africa. These stations provide accurate air-quality and climate data for environmental monitoring by integrating precision sensors with robust mechanical designs. My work has extended to developing a satellite mission for a 6U CubeSat project to monitor ecological conditions across the continent, securing a significant investment. These experiences have honed my technical skills in terrestrial and space-based solar technologies, deepening my practical understanding of implementing sustainable solutions in challenging environments.

The IfM's ISMM MPhil has offered me the advanced training, intuitive mentoring, and interdisciplinary collaboration I need to bring my vision to life. The programme's focus on sustainable industrial practices, systems optimisation, and innovative manufacturing technologies aligns perfectly with my aspirations.

During project placements, I have been at the centre of real-world manufacturing challenges, from shop floors to engineering laboratories of the UK's leading manufacturers, with the tools and support to analyse and implement student-led innovations. At the IfM's Centre for Industrial Photonics, I am researching sustainable, high-precision, solid-state additive manufacturing processes for producing near-net hardware that is crucial to the transition to net-zero energy systems.

The Gates Cambridge Scholarship represents a commitment to global impact and shared values. It has empowered me to access Cambridge's transformative opportunities, amplify my contributions to renewable energy, and catalyse meaningful change.

I aspire to lead Africa's renewable energy revolution, positioning the continent as a model for sustainable innovation. Moreover, I aspire to contribute to the scholarship's goal of improving the lives of all by leveraging the knowledge and networks gained at Cambridge. Upon completion of my MPhil, I intend to lead initiatives that implement scalable energy solutions in underserved Nigerian communities, improve industrial manufacturing processes to support local economies, and mentor the next generation of African engineers and entrepreneurs dedicated to sustainability.

Finally, pursuing the ISMM MPhil at the University of Cambridge, supported by the Gates Cambridge Scholarship, has empowered me to transform innovative concepts into tangible solutions, advance technologies that use locally available materials, lower production costs, and foster local industry growth in Nigeria.

The programme's interdisciplinary approach, emphasis on real-world impact, and access to world-class faculty and facilities provide the perfect incubating environment for my aspirations. I am confident this opportunity will equip me with the mentorship, tools, and network needed to drive sustainable development and improve lives across Africa.

THE GATES CAMBRIDGE TRUST

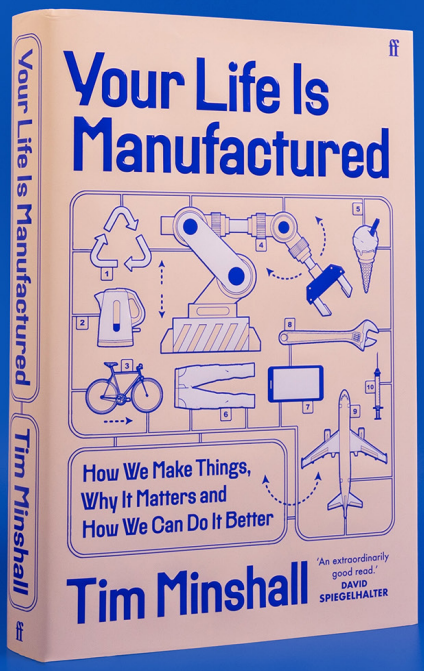
The year 2025 marked the 25th anniversary of Gates Cambridge, the University of Cambridge's prestigious postgraduate scholarship programme. The programme, established by a donation from the Bill and Melinda Gates Foundation, supports academically outstanding and socially committed postgraduate students from outside the UK who wish to study at the University of Cambridge. The Gates Cambridge Trust selected 95 new scholars globally for the anniversary year, representing a diverse range of nationalities, backgrounds, and academic disciplines.

**Adapted from a Department of Engineering article*

Credit: Adobe stock.

FROM COMPLEXITY TO CLARITY: RETHINKING MANUFACTURING

From the food on our plates to the phones in our pockets, modern life is shaped – often invisibly – by manufacturing. We talk to Professor Tim Minshall, Head of the IfM, about why manufacturing systems are so easily overlooked, how the IfM has long sought to make the invisible visible, and how his book, *Your Life Is Manufactured*, uses storytelling to show that manufacturing is ultimately about people, values, and the future we choose to build.



MAKING THE INVISIBLE VISIBLE

Manufacturing underpins almost every aspect of modern life, shaping what we eat, how we travel, how we communicate, and how we care for one another. Its importance extends well beyond the everyday: manufacturing remains a cornerstone of the UK economy, supporting millions of jobs, driving exports, and powering business investment in research, development, and innovation. As a result, the UK continues to rank among the world's leading manufacturing nations.

Yet, despite its central role, manufacturing is often poorly understood – reduced to outdated stereotypes or overlooked in public debate. This gap between importance and understanding has real consequences, limiting our ability to make informed choices about the systems we all depend on.

At the IfM, addressing this gap has long been part of our purpose. The IfM's ambition to *manufacture a better world* is about not just increasing output but also improving manufacturing's role in society: creating safer and more sustainable products, providing good-quality and meaningful work, ensuring our national security, and building resilient systems for long-term economic growth that respect environmental limits. Achieving this requires more than technical expertise alone; it depends on a shared understanding – on connecting our everyday experiences with the management of complex industrial systems.

For Professor Tim Minshall, Dr John C Taylor Professor of Innovation and Head of the IfM, one major obstacle continues to stand in the way of this shared understanding: what he describes as the "M-word problem". "As soon as manufacturing is mentioned," he says, "many people mentally switch off. Factories are seen as relics of the past – dull, polluting, disconnected from modern life.

"The COVID-19 pandemic briefly forced manufacturing into public view, exposing how little understanding existed of what it actually takes to scale up production, reconfigure supply chains, or manufacture essential goods at speed."

"What is missing," he argues, "is a clear connection between the things we value in our everyday lives and the complex systems that bring those things into being. How does a sandwich reach a supermarket shelf? Why can't the production of semiconductors or medicines simply be shifted 'back home' when global supply chains falter? What does it take to scale up the manufacture of medical devices, vaccines, or renewable energy technologies at speed? These are not abstract questions. They sit at the heart of how societies respond to shocks, manage risk, and pursue long-term goals such as sustainability and resilience."

It was this absence of an accessible explanation that ultimately prompted Tim to write *Your Life Is Manufactured*. In searching for a book that reflected how he and his colleagues understand manufacturing – as complex, creative, and deeply human – he couldn't find one. As he recalls, quoting Toni Morrison: "If you find a book you really want to read, but it hasn't been written yet, then you must write it."

That realisation was shaped by years of outreach work with schools and families, where Tim was repeatedly struck by how often parents and teachers would respond with genuine surprise: *"I didn't know any of that."*

Published by Faber & Faber after several years of writing and reflection, *Your Life Is Manufactured: How We Make Things, Why It Matters, and How We Can Do It Better* has reached audiences far beyond academia, through book festivals, radio programmes, podcasts, community halls, and classrooms.

Its aim is not to instruct or persuade but to explain – to give readers the language and insight needed to understand how manufacturing works, and why improving it matters to everyone. And in doing so, the book mirrors the IfM's broader mission: to understand manufacturing as a system, to improve it, and to help our society flourish rather than struggle to survive.

FROM INFORMATION TO STORY

Writing the book forced Tim to confront not just *what* he wanted to explain but *how* he wanted to explain it. Like many engineers, he had long operated within what he describes as an "information-deficit" model of communication: *I know something you don't; I will now tell you what you need to know.* For manufacturing – a complex, system-wide, and "not interesting" subject – he realised the "information deficit" approach was never going to work.

Working with professional storytelling coach Dr Anna Ploszajski prompted a shift in mindset. Rather than organising material around key points and conclusions, Tim began to think in terms of narrative: how to draw readers in, when to reveal complexity, and how to balance seriousness with accessibility. Everyday experiences – baking at home, shortages on supermarket shelves, running out of toilet paper – became ways to ground abstract systems in lived reality.

That shift has influenced far more than the book. "Every presentation now," he reflects, "I ask myself: what's the story here?" From lectures and student supervision to meetings with industry and policymakers, storytelling has become a way of building shared understanding rather than simply transmitting information.

But storytelling, Tim cautions, is not a neutral tool. Used carelessly, it can oversimplify complex realities or distort evidence, replacing understanding with reassurance rather than insight. For early-career researchers in particular, there is a delicate balance to strike between accessibility and credibility. Stories, he argues, should illuminate complexity, not hide it.

This principle resonates strongly with the IfM's ethos. Manufacturing challenges are rarely simple, and solutions almost never lie within a single discipline or technology. The task is not to remove complexity but to make it intelligible enough to act upon. Clear communication is not an optional extra but a core capability.

Although *Your Life Is Manufactured* was never conceived as an institutional manifesto, it reflects this distinctive way of thinking. At its heart is a systems view of manufacturing – an acknowledgement that technologies, organisations, supply networks, skills, policies, and societies are deeply interconnected.

This perspective will be familiar to generations of IfM students. As Tim puts it, the book is something he hoped students might give to their parents or friends and say, "This is what I study." Not a collection of disconnected anecdotes but a coherent explanation of why manufacturing is messy, complex, and essential – and why that complexity is a source of possibility rather than despair.

The examples woven through the book – from regenerative manufacturing approaches to digital tools to new production processes – echo the work

of colleagues across the institute. They show that recognising complexity does not lead to paralysis but enables targeted, practical interventions that make a real difference.

THRIVING, NOT JUST SURVIVING

A recurring theme in the book is the idea that manufacturing systems should help societies to thrive and not just survive. This is a call not for unchecked production but for thoughtful, responsible making – making things better and making better things.

Examples from across the IfM community bring this idea to life. Research into regenerative manufacturing challenges the assumption that industrial activity must inevitably generate waste. Work on energy, construction, and healthcare manufacturing demonstrates how products, processes, and systems can be rethought and redesigned to reduce environmental impact while improving outcomes against a range of measures.

For Tim, recognising this reality reframes debates about sustainability and innovation. "Manufacturing is not the enemy of progress; it is one of its primary tools. The question is not whether we make things, but how, why, and for whom," he says.

That emphasis on how and why we make things runs through not only the book but also the institute's long-standing approach to education. "Turning this way of thinking into lasting change depends on how people are educated, supported, and equipped to work within complex and ever-evolving manufacturing systems," says Tim.

This year marks the 60th anniversary of the IfM's taught Master's programmes – a reminder that the institute's commitment to manufacturing education has always been future-facing. Over 6 decades, those programmes have evolved alongside industry itself, embedding systems thinking, interdisciplinarity, and real-world engagement long before such approaches became commonplace.

"As manufacturing continues to change, the legacy of adaptation and lifelong learning remains central to the IfM's mission of preparing people not just for today's challenges but for those still to come," says Tim.

AN INVITATION TO SEE DIFFERENTLY

Your Life Is Manufactured ends without a manifesto. There is no checklist of actions, no prescriptive call to arms. This is a deliberate choice.

"I didn't want to be all preachy and try to tell people how to live their lives," Tim explains. Instead, the book leaves readers with something more fundamental: awareness – of how things are made, why those processes matter, and how they might be improved.

In this sense, the book is not a conclusion but an invitation: to notice the systems that sustain modern life, to question assumptions, and to imagine alternatives. It is an invitation that sits comfortably within the IfM's broader mission: to connect research with reality; complexity with clarity; and expertise with empathy.

"History offers reason for cautious optimism. Practices once seen as inevitable have been transformed within a generation, suggesting that manufacturing, too, can change in a profound way," he says.

If manufacturing is to help build a better world, these conversations must extend far beyond factory walls and academic journals. They must reach homes, classrooms, boardrooms, and communities. Through efforts such as *Your Life Is Manufactured,* and through the collective work of the IfM's students, researchers, partners, and alumni, those conversations are increasingly taking place.

"Making manufacturing visible – understandable, debatable and improvable – is a first step towards making it better," Tim concludes.

Your Life Is Manufactured: How We Make Things, Why It Matters, and How We Can Do It Better is published by Faber & Faber and is available from major booksellers, including independent bookshops and online.

UNIVERSITY OF CAMBRIDGE
Department of Engineering

IfM Engage
Part of the Institute for Manufacturing

CAMBRIDGE SUSTAIN 8

Eight steps to sustainable, continuous business improvement

Connect your key business drivers and sustainability engagement on the factory floor

Many organisations have clear, strong sustainability strategies and plans, but often fail to link these to the day-to-day reality of the factory floor. Our methodology fills this gap by inspiring frontline staff to create improvement plans that resonate with their work and align them with key business drivers. This alignment is crucial for the sustained success of your sustainability initiatives.

Focus on success: harness the power of 'good days'

Our method highlights the achievements and practices that drive success on the best days in factories. This approach serves as a powerful motivational technique, increasing engagement and dedication to the project.

Achieve significant sustainability improvements in just 12 months

The initial steps of our engagement process focus on establishing a robust data collection plan, baselines and effective KPIs to drive improvement. Within four months, there are improvement teams set up and working on action plans across the factory. The result is that notable KPI improvements have been achieved within a year across diverse cultures and sectors.

"The ability to ensure that the impact on sustainable performance is aligned to and drives standard business performance goals is really powerful. It is also exciting to find a programme that creates highly motivated workforces while reducing climate impacts."

Sustainability director, leading global fashion brand

Explore how you can make significant improvements in sustainability in just 8 steps:

UNLOCKING SCALABLE AUTOMATION

As manufacturers push to scale automation across complex global operations, many face the challenge of knowing where to start. The Wabtec Corporation – one of the world's leading transportation technology companies – addressed this head-on by partnering with IfM Engage and applying a research-backed Automation Assessment. The collaboration delivered significant gains in idea generation, prioritisation, decision-making, and internal capability-building.

A GLOBAL LEADER WITH A BOLD VISION

Wabtec is a leading global provider of equipment, systems, digital solutions, and value-added services for the freight and transit rail sectors. With more than a hundred and fifty years of experience, the organisation has consistently set the industry standard for safety, efficiency, reliability, innovation, and productivity. Its technologies stretch beyond rail into mining, industrial, and marine applications, accelerating the future of transportation around the world. At the heart of Wabtec's success are its people – 27,000 employees across more than fifty countries whose collective expertise drives continuous progress.

The ambition to embrace automation at Wabtec was clear and backed by senior leadership. An "automation council" was formed to define a corporate strategy, but it faced a critical hurdle: the high-level ambition was there but lacked a practical, structured process to identify and prioritise the right projects at the facility level. The company needed a proven methodology to serve as the starting point and foundation for scaling automation.

The leadership team explored various external vendors but found that most offered product-specific solutions. They needed an impartial partner to help build a robust, insightful approach from the ground up. The search for this led them to the IfM and its research-backed Automation Assessment.

"Most solutions we found were product-led or focused on a single technology or solution provider wanting to sell their products. We needed an approach that was independent of an actual solution provider. That way, we could focus in on the significant value in the ideas from our employees, who understand the context of our organisation and facilities. The IfM's Automation Assessment was unique in this regard and exactly what we were looking for," said Thomas Rupp, Lead Manufacturing Engineer, the Wabtec Corporation.

TURNING SITE-LEVEL IDEAS INTO A PRIORITISED PORTFOLIO

The IfM's Automation Assessment is a structured, five-step process to guide companies from initial scoping to a prioritised implementation plan. The series of workshops is designed to be a collaborative, practical process through which experts across the organisation identify automation opportunities and projects.

IfM Engage, the knowledge-transfer arm of the IfM, facilitated two initial pilot workshops with Wabtec in facilities in the USA. The engagements were intentionally framed by Wabtec not as a top-down "assessment" but as a collaborative "workout". The goal was to harness the deep knowledge that existed within the facilities and channel it into a structured, prioritised plan.

Credit: Adobe stock.

The experience was very successful, leading Wabtec to scale the initial initiative to an additional five facilities, making seven in total to date. From the seven "workout" events, more than two hundred and fifty distinct automation opportunities have been identified. A wide range of processes and activities across Wabtec's operations were considered, including machine tending and deburring, inventory management, and assembly and foundry operations, empowering teams to think broadly. This resulted in ideas ranging from the physical to the digital, including projects to exploit technologies like robotics, cobots, AGVs, and palletisers, alongside data-driven solutions targeting process optimisation in inventory management and automated inspection.

But the real power in the approach was in providing a clear, objective method to filter this high volume of ideas. The Automation Assessment's data-driven framework gave the teams the focus they needed, enabling them to distil a long list of possibilities into 15 key initiatives. Just as importantly, it provided clarity on the reasons behind each decision, ensuring alignment and consensus on which opportunities to move forward with.

The tool also acted as a "translator" between technical teams and senior leadership. Its simple visual output allowed leaders to see the *why* behind each priority, creating a shared language and building the confidence needed to fully invest in the long-term, scaled-up strategy. This shared language and alignment have also given local engineers the confidence to champion new and innovative ideas.

"The tool gives us a data-driven way to filter a high volume of potential projects, giving us much-needed focus. It clearly shows us the key areas to pursue; but, just as critically, it also highlights which projects to avoid, preventing us from investing resources in low-value initiatives," said Thomas.

FINANCIAL RETURNS, STRONGER CAPABILITY, SMARTER DECISIONS

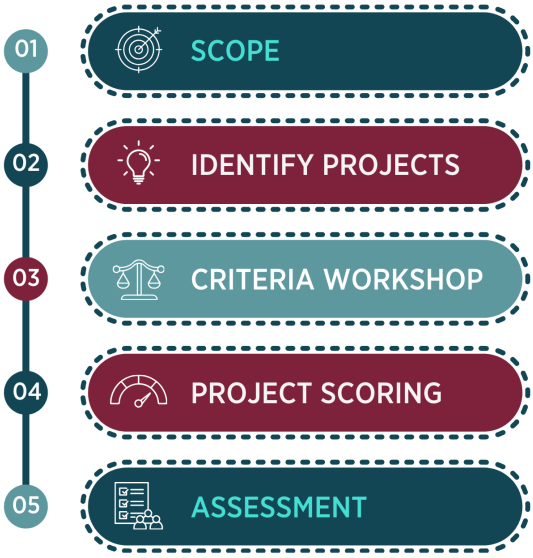
The Automation Assessment delivered significant, measurable impact across the organisation, from the factory floor to the boardroom. Financially, the process has been transformational. The 15 major projects identified and prioritised through the assessment are already projected to generate more than $2.5m in recurring annual earnings (EBIT). And when Wabtec extrapolates that value across the wider set of opportunities uncovered, the total potential rises to around $15m.

But the story isn't just about returns. A defining feature of the approach was the emphasis on capability-building and knowledge transfer – designed to leave the organisation stronger and more self-sufficient at the end of the engagement than at the start.

Wabtec has since developed its own custom tool based on the IfM methodology, enabling teams to run the process independently. The "workout" events also became a powerful internal mechanism for team-building: they helped spread practical automation capability, raise confidence, and create shared ownership across sites and functions.

Just as importantly, the assessment improved how decisions are made. The tool has bridged the knowledge gap between technical teams and senior leadership. It provides a shared, robust decision-making platform for the company's automation strategy, and it is now embedded to a point where any major automation project must be validated through a workout before it progresses.

5 Step Automation Assessment Process



"The IfM Engage team were great partners in this project. Their expert facilitation of 'workout' events was key to securing buy-in from day one. They provided critical support for our pilot workshops and have been a fantastic source of guidance in helping us build the internal capability to scale the solution ourselves," concluded Thomas.

A MODEL FOR MANUFACTURERS BEGINNING THEIR AUTOMATION JOURNEY

For manufacturers earlier in their automation journey, Wabtec's experience offers a practical blueprint. Their partnership with IfM Engage has delivered a multi-million-dollar project pipeline, but also a repeatable methodology – and the internal confidence to scale automation well into the future.

Ready to explore how this could work in your organisation?

Learn more about the IfM's Automation Assessment and the wider support available from IfM Engage

RANA HAJIRASOULI: TURNING THE TIDE ON WASTE

Rana Hajirasouli's company, The Surpluss, was one of five global startups to address the World Economic Forum (WEF) 2026 on AI in circular value chains, intelligent infrastructure, and resource security.

Credit: Adobe stock.

IfM doctoral researcher Rana Hajirasouli, founder and CEO of The Surpluss, is aiming to save billions of tonnes of waste materials from businesses around the world. She set up the company to enable a structured transition to a circular economy through an AI-powered platform. Based in the United Arab Emirates, The Surpluss aims to reduce waste and enhance resource security by shortening vulnerable supply chains.

Combining Rana's knowledge of international relations and industrial systems, The Surpluss has achieved 300% growth in the last year. Her work has also been recognised by global leaders. She was invited to speak about AI in circular value chains, intelligent infrastructure, and supply chain/resource security at the WEF 2026 in Davos. The Surpluss was one of just five global startups to be invited by UpLink, the WEF's early-stage innovation engine.

Rana, part of the IfM's Industrial Resilience Research Group, is helping businesses become more resilient while supporting the United Nations Sustainable Development Goals. She explained: "The core engineering challenge here is not building software; it is designing robust resource coordination systems under real constraints. These can include incomplete information, regulatory friction, logistics, emissions accounting, and behavioural inertia.

"In today's geopolitical context, with supply chain fragmentation, localisation pressures, and strategic resource risk, the ability to map and reconfigure existing resources is increasingly a matter of economic and industrial resilience. Engineering expertise is essential to make our systems function reliably and at scale."

She added: "Around 100 billion tonnes of materials are produced each year, but 92% of those are lost from the supply chain. The Surpluss aims to support their redistribution by reusing this waste to create supply chain stability, new products, and industrial symbiosis. This is a $1.6 trillion a year issue, and the problem is growing each year!"

So far, The Surpluss has helped to save more than 4 million kilograms of resources from going to landfill. Rana said that by moving away from a linear and purely environmental view of recycling, The Surpluss was helping businesses save money, as well as reducing carbon emissions. The default growth model of take–make–dispose created deep vulnerabilities, exposing companies to supply shortages and volatile pricing. A circular model, based on reusing, repairing, and sharing resources in real time, acted as a risk buffer, insulating businesses from shocks. It also identified new value streams and allowed faster sourcing, with the additional benefits of lower prices and carbon emissions.

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The platform uses AI to interpret messy, unstructured organisational data and human input. It is then turned into something legible, searchable, and actionable at scale. This provides a means of security by identifying the location of assets and materials. It also gives businesses information to find secondary market opportunities and pricing mechanisms.

"Circularity isn't just about doing less harm; it's about creating smarter industrial systems that endure change," Rana said.

The business operates via a monthly subscription or through partnerships. Organisations pay for access to the coordination infrastructure of resource intelligence, traceability, matching logic, and reporting.

"At The Surpluss, we work with institutions, governments, and businesses to make secondary resources economically legible. The same unit of matter can remain physically unchanged while holding radically different economic futures, depending on whether it is classified as waste, stock, surplus, scrap, liability, donation, or reusable input.

"These inefficiencies only become actionable when resources occupy a reachable classificatory state: visible enough to be identified, structured enough to be valued, and translatable enough to move across departments, firms, sectors, or regions. In that sense, our technology solves an ontology problem before it solves a transaction problem. Companies cannot price what they cannot see, and they cannot coordinate what they cannot classify. As workflows become increasingly digital, physical resources are lagging behind, trapped in accounting categories that no longer reflect their material condition, redeployment potential, or strategic value."

Rana's PhD investigates the pre-network conditions of industrial symbiosis 4.0, focusing on how information asymmetry influences resource security and economic coordination between firms. What began as a sustainability goal is now a competitive differentiator for The Surpluss, by enhancing supply chain visibility, industrial resilience and turning underutilised resources into strategic economic intelligence.

The Surpluss was one of the first startups to be part of SPARK, King's College's new incubator programme. Created by King's E-Lab, in partnership with Founders at the University of Cambridge, SPARK is an entrepreneurial launchpad that aims to turn research-backed ideas from University of Cambridge students and alumni into investable companies.

*Adapted from a Department of Engineering article

IFM-LED INITIATIVE TO ACCELERATE NEW INTERVENTIONS FOR DEPRESSED MOOD

A major new initiative hopes to accelerate the pace of innovation in interventions for clinically depressed mood.

Credit: Adobe stock

The Mental Health Catalyst – led by the IfM through its knowledge-transfer company, IfM Engage – brings together researchers, innovators, funders, policymakers, and people with lived experience to identify and prioritise new opportunities to address clinically depressed mood, and to help people get better and stay well.

Supported by Wellcome, the programme will apply innovation management and systems approaches developed at Cambridge to support the translation of mental health research into practical interventions that can be implemented at scale to improve outcomes.

Depression affects hundreds of millions of people worldwide and has profound individual, social, and economic impacts. Although research has greatly expanded understanding of the condition, many people still face long delays before receiving effective treatment, existing interventions don't work for everyone, and relapse is common.

The Mental Health Catalyst will address this challenge by identifying high-potential intervention opportunities and supporting their development and implementation at scale. The programme's mission is to make clinically depressed mood a short-lasting condition that doesn't affect lives in the longer term. The Catalyst will pursue this by developing more effective, faster-acting, and longer-lasting interventions that can be implemented sustainably at scale.

Peter Templeton, Project Director of the Mental Health Catalyst at IfM Engage, said: "Mental health research has generated an enormous amount of valuable knowledge, but translating that knowledge into effective interventions remains a major challenge. The Mental Health Catalyst will bring together evidence, innovation, and implementation in a structured way that helps the global mental health community to identify and accelerate the most promising opportunities for impact."

CONNECTING RESEARCH, INNOVATION, AND REAL-WORLD IMPACT

The initiative will synthesise evidence from across the social, psychological, and biological sciences to better understand the drivers of depressed mood and identify strategic opportunities for intervention. These opportunities may include pharmaceutical, digital, and other non-pharmaceutical approaches to improving the management and treatment of depressed mood.

The programme will also develop a Mission Map to inform and coordinate research, innovation, and investment across the mental health ecosystem. By bringing together stakeholders from research, healthcare, innovation, and policy, it is hoped that the Catalyst will accelerate progress towards more effective interventions.

BUILDING ON 7 YEARS OF WORK

The initiative builds on 7 years of collaboration between the IfM and partners in mental health research and practice. During this time, the IfM and IfM Engage have applied innovation management and systems engineering approaches to help translate research on the bio-psycho-social drivers of depression into practical intervention opportunities. Working with researchers, clinicians, charities, and people with lived experience, the team has adapted methods such as evidence synthesis, root-cause analysis, and a range of innovation management methods to identify promising opportunities for improving mental health outcomes.

This work has led to the development of a structured methodology – Understand : Innovate : Implement – which integrates evidence synthesis to understand the drivers of depressed mood, systematic identification and prioritisation of intervention opportunities, and coordinated approaches for developing, validating, and implementing effective interventions at scale. The Mental Health Catalyst will apply this methodology to guide its work.

Peter B. Jones, Department of Psychiatry, University of Cambridge, said: "Research has greatly improved our understanding of the social, psychological and biological factors that contribute to depressed mood. The Mental Health Catalyst provides an important opportunity to translate that knowledge into innovative interventions that can improve outcomes for people affected by depressed mood."

A GLOBAL COLLABORATION

The Mental Health Catalyst will be delivered in collaboration with international partners in mental health research, evidence synthesis, lived experience, and other stakeholders across high-, low-, and middle-income countries. Researchers, innovators, funders, clinicians, and policymakers will also be invited to participate in collaborative workshops and roadmapping activities to identify and develop new interventions.

> "RESEARCH HAS GREATLY IMPROVED OUR UNDERSTANDING OF THE SOCIAL, PSYCHOLOGICAL AND BIOLOGICAL FACTORS THAT CONTRIBUTE TO DEPRESSED MOOD.

Max Ahmed, Head of Mental Health Innovation at Wellcome, concludes: "We urgently need more effective, faster-acting, and long-lasting ways to intervene early in depressed mood. Too often, promising research does not translate into interventions that reach people at scale. Initiatives like the Mental Health Catalyst are critical because they bring together expertise across research, innovation, and implementation to identify and accelerate the most promising opportunities for impact."

Learn more about the Mental Health Catalyst and how to get involved by scanning the QR code.

INNOVATION REPORT FINDS UK STRONG ON SCIENCE BUT LOSING INDUSTRIAL COMPETITIVENESS

The latest UK Innovation Report, published by the IfM's Cambridge Industrial Innovation Policy, finds that while the UK excels in research and early-stage innovation, it continues to underperform on innovation outcomes such as high-technology exports, technology scale-up, and global industrial market share.

The UK is one of the world's leading innovation economies. It ranks fourth globally for scientific publications and sits among the top countries for high-impact research and patents in critical technologies. It has also built one of the strongest startup ecosystems outside the United States.

As the government moves from designing its Industrial Strategy to delivering it across eight priority sectors and begins to frame public R&D investment around a set of broad funding "buckets", the question is shifting: not how much research the UK produces, but whether it translates into sustained industrial competitiveness.

At a time of economic uncertainty, rapid technological change, and increasing geopolitical pressure, the demand for robust, policy-relevant evidence continues to grow. The UK Innovation Report 2026 responds by providing new data, analysis, and perspectives to support more informed decision-making across the UK innovation system – and to inform a more effective approach to industrial strategy and long-term economic transformation.

"The report highlights that competitiveness – measured at sector level through value added, export performance, employment, and global position – should become the central benchmark for success," said report co-author Carlos López-Gómez.

FROM INNOVATION INPUTS TO INDUSTRIAL OUTCOMES

The UK's research performance remains internationally strong. For example, in 2023 the UK ranked sixth globally for total R&D expenditure, accounting for 3.5% of global spending. R&D intensity stood at 2.68% of GDP, below the OECD average and leading R&D-intensive economies, though above several G7 peers and China.

In 2022 the UK ranked fourth worldwide for total publications and was among the top five for highly cited outputs in technology fields across the physical sciences and life sciences. It was also among global leaders in patent applications in areas such as artificial intelligence, biotechnology, and semiconductors.

Yet this strength has not proportionately translated into industrial advantage at a time of intensifying global competition. The report finds, for example, that the UK has a relatively low share of high-technology exports in total trade, and its representation among the world's top R&D-investing firms has declined since 2012.

> "THE REPORT HIGHLIGHTS THAT COMPETITIVENESS - MEASURED AT SECTOR LEVEL THROUGH VALUE ADDED, EXPORT PERFORMANCE, EMPLOYMENT, AND GLOBAL POSITION - SHOULD BECOME THE CENTRAL BENCHMARK FOR SUCCESS."

While the UK ranks among global leaders in startup creation and has produced a high number of so-called "unicorn" firms, this success has not translated into sustained productivity growth, export dynamism, or deeper domestic industrial capacity.

"The UK performs strongly on research excellence and scientific output," said Carlos. "But research excellence alone does not guarantee industrial competitiveness. Considering the Industrial Strategy's stated objectives, the question is how this research strength connects to domestic production, export performance, and sustained industrial capability. The UK cannot simply become the 'lab of the world', with new products and services based on knowledge created here but produced abroad."

THE TECHNOLOGY SCALE-UP GAP: WHERE VALUE LEAVES THE UK

UK technology scale-up activity is concentrated in a narrow set of sectors, notably life sciences, software, and fintech. While the UK performs strongly in early-stage innovation, since 2012 most university spinout IPOs have taken place overseas, and acquisitions of UK firms by foreign companies have increased significantly over the past decade.

These patterns point to a persistent challenge in domestic value capture. Structural factors – including access to supply chains, specialised skills, regulatory conditions, and market scale – influence where long-term industrial benefits are realised.

The report highlights that technology scale-up should not be defined by firm valuation or capital raised alone – but by the extent to which companies build domestic production capacity, exports, and sectoral depth over time. The concentration of scale-up activity in a limited number of sectors helps to explain why strong innovation performance has translated unevenly into competitiveness across manufacturing-intensive and other strategic sectors.

"Industrial strategy must focus less on the number or valuation of high-growth firms and more on whether innovation helps to regain competitiveness in priority sectors," said co-author David Leal-Ayala.

ELECTRONICS AND ELECTRICAL EQUIPMENT: PRODUCTIVITY WITHOUT SCALE, A WARNING SIGN?

The report's analysis of the electronics and electrical equipment sectors illustrates the broader structural shift in UK manufacturing. Together, these sectors account for 10% of UK manufacturing value added and 13% of manufacturing exports.

Electronics has grown faster in value added than manufacturing overall since 2000 and performs strongly in labour productivity. At the same time, both electronics and electrical equipment have seen long-term employment reductions, and the UK runs trade deficits in both sectors.

The findings highlight a transition away from scale and volume towards highly productive, knowledge-intensive niches embedded in global value chains. Competitiveness increasingly rests on strengths such as metrology, photonics,

medical technologies, and specialised grid-related equipment rather than high-volume, low-cost products.

"The real opportunity for the UK lies in reversing the long-term decline of high-value-added sectors," said co-author Zongshuai Fan. "The UK has an enviable research and innovation base, but the challenge is ensuring that these capabilities support the competitiveness and growth of its industrial sectors."

SKILLS AND WORKFORCE CONSTRAINTS

The report identifies workforce pressures as a structural constraint on competitiveness. A total of 64% of the workforce in the eight priority sectors identified in the 2025 Industrial Strategy hold graduate-level qualifications, compared with 52% across the economy. Around 82% of new jobs in priority occupations between 2025 and 2030 are expected to require post-secondary education.

Despite overall vacancy levels easing, skills shortages persist. In 2024 skills-shortage vacancies accounted for 27% of all vacancies. In 2025, 76% of engineering employers reported difficulties recruiting workers with the required skills, with specialist sustainability skills most frequently cited as the main challenge.

Co-author Michele Palladino said the skills challenge risks becoming a binding constraint on Industrial Strategy delivery: "The data suggests that current shortages are structural rather than cyclical, particularly for science and engineering professionals. Without closer alignment between skills and industry needs, workforce constraints could limit the effectiveness of industrial strategy implementation."

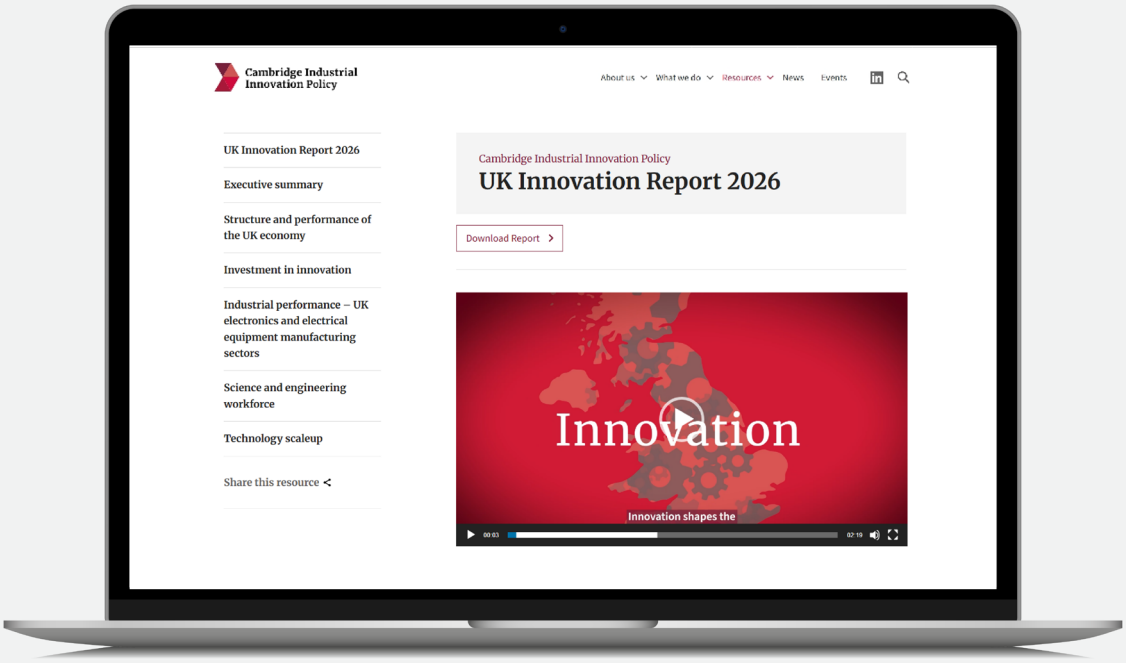
THE CASE FOR OUTCOME-LED INDUSTRIAL POLICY

As the government enters the delivery phase of its Industrial Strategy, the report demonstrates that policy attention may need to shift from inputs – such as R&D intensity and startup numbers – towards outcomes measured at sector level: value added, employment, export performance, and global market share. Increasing investment and capital supply alone is unlikely to close the UK's scale gap without complementary capabilities, including skills, supply chain depth, manufacturing capacity, and market access.

"The evidence highlights three areas requiring particular focus: strengthening the link between research excellence and domestic industrial scale; supporting later-stage technology deployment and adoption within priority sectors; and addressing structural skills and capability constraints that limit growth," Carlos concluded.

"The central challenge is not whether the UK produces world-class science but whether it can convert that strength into a durable industrial advantage in an increasingly competitive global environment. Together, the findings in the Innovation Report suggest that competitiveness and good jobs – not innovation activity alone – should be the benchmark for success."

The full UK Innovation Report is available via Cambridge Industrial Innovation Policy.



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