

Interim Impact Evaluation of the Industrial Strategy Challenge Fund

Interim impact evaluation report

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Executive summary

The Industrial Strategy Challenge Fund (ISCF), established in 2017, has invested £2.6bn of public funding to leverage research and innovation (R&I) to support the development of solutions to major industrial and societal challenges facing the UK. The ISCF adopts a Challenge-led approach: under the Fund, individual ‘Challenges’ have been established, each focused on supporting collaborative, cross-sector R&I within a specific sector or thematic area.

RAND Europe and Frontier Economics were commissioned by UK Research and Innovation (UKRI) in October 2020 to undertake a Fund-level evaluation of the ISCF. The overarching aim of this evaluation is to assess the effectiveness and overall impact of the ISCF as a whole, complementing the ongoing individual Challenge-level evaluations. The Fund-level evaluation includes baseline measurement,¹ process evaluation,² and impact evaluation phases. This report presents findings of the Fund-level interim impact evaluation of the ISCF. **At the time of writing this report, further impact is anticipated given that many of the Challenges are ongoing and given the long-term nature of impacts anticipated, which are likely to emerge beyond the timeframe of the Challenges and this evaluation. The findings here present a snapshot in time of the impact, from the start of the ISCF to date, and we will continue to monitor incoming reports in the final phase of the evaluation and conduct further data collection to triangulate evidence of impact at the Fund level.**

The evaluation employed a mixed methods approach to data collection, drawing on Challenge evaluation reports, quarterly performance reports, a Delphi dataset (defined in Annex D.3) and a stakeholder workshop. Further primary data collection is expected in the final phase of the evaluation to capture information and fill gaps not otherwise addressed in these data sources. The evaluation is structured around a framework comprised of six high-level evaluation themes, with a combined total of 19 sub-themes: creating knowledge and innovation pathways; capacity and investment; connected innovation ecosystems; economic impact; value for money; and societal impact.

Key interim findings from five of the evaluation themes in scope for this phase are summarised below. We propose a methodology to evaluate the sixth theme – value for money – in a future evaluation (Annex D). **Overall, we found that the ISCF has had a positive impact on investment and capacity generation, collaborations, innovation and knowledge exchange. Wider health, environmental and societal impacts are nascent and are expected to transpire over a longer timescale; a post-hoc evaluation will be instrumental to elucidate the longer-term impacts and to determine attribution of outcomes to the ISCF.**

¹ ISCF [Baseline Report](#).

² ISCF [Process Evaluation Report](#).

Key findings

- **Creating knowledge and innovation pathways:** Across the Fund, processes and support structures enabled technologies to mature and commercialise. In particular, the Fund supported projects in adopting new internal processes and business models and enabled access to infrastructure. The latter provided important support to progressing technological maturity, whereby ideas could be taken from early-stage conception to proof of principle. For instance, compared with a baseline assessment conducted in 2022, in which most projects reported outputs in the technology readiness level (TRL) 1–4 range, a much greater proportion of projects are now within the TRL 5–9 range, with projects reporting an increase of at least 1 TRL level on average. Moreover, at least 31% of the projects across the Fund have generated intellectual property (IP). ISCF Challenges and projects provided numerous such platforms for stimulating innovation and cross-fertilisation across sectors; the knowledge outputs themselves contributed towards awareness raising of industrial challenges in a given sector among policymakers. The ISCF contributed to numerous knowledge-exchange activities through a variety of formats, such as webinars, virtual talks, open days, social media engagement, conferences and workshops, signifying activities engaging the public, academics, industry, and policymakers.
- **Capacity and investment:** ISCF has significantly increased UK business investment in R&D, as evidenced through the surpassing of the investment target of £2.82bn by three times to date, based on reporting from funded projects.³ This would equate to 15% of UK's 2.4% R&D investment target based on 2023 gross domestic product (GDP) figures. However, the cost effectiveness of the intervention cannot be determined, as the counterfactual is unknown. Private investments have been stimulated through de-risking of investments supported via various funding instruments in ISCF. Fund-level data indicate that, to date, ISCF investment has resulted in the creation of 3,563 full-time equivalent (FTE) jobs, reaching 14,266 FTE jobs predicted within the next five years. However, this is the estimated gross impact, not taking into account deadweight, and therefore net impacts are likely to be more conservative.⁴ ISCF has contributed to individual – and organisational-level capacity generation across the vast majority of sectors, ranging from technical skills development to managerial and commercialisation skills development across industry and academia. However, there has been limited mobility of international talent to the UK that can be attributed to the programme itself. A dedicated effort, in a manner bespoke to each sector, is required to increase mobility and attract international talent with sector skills, by highlighting the opportunities and value of coming to the UK.
- **Connected innovation ecosystem:** There is significant evidence that collaboration and partnerships were one of the strongest and most impactful areas of the ISCF, bringing together businesses, local authorities, and universities that would not have necessarily come together if not for the Fund. Examples of this span business-to-business collaborations and partnerships between companies (including between companies of varying sizes). Individual Challenges have been

³ ISCF Portfolio Performance Report (Q2, FY23/24).

⁴ ISCF Portfolio Performance Report (Q2, FY23/24).

recognised at the national and government-level (including being used as standards and informing policy), but it is premature to discern the extent of this influence at the Fund level. This collaboration has led to impact in stimulating multidisciplinary research and generating novel avenues of further research, as well as impacting national policies in bespoke sectors. Further analysis of the interconnectivity and scale of this interaction will be conducted in Phase 4 via a network analysis.

- **Economic impact:** ISCF has had a positive economic impact, increasing turnover for participating organisations and reaching foreign markets. Where measured, average increases in turnover have ranged from 70–175% for companies participating in Challenges. We expect this trend to continue as Challenges finish, but we recommend a consistent measurement system and use of counterfactuals in the Challenge evaluations to ensure comparison across Challenges. It has not been possible at this stage to assess realised impacts of the ISCF on productivity, given the time lags involved in generating productivity impacts and the lack of evidence in existing Challenge-level evaluations. To the extent that ISCF appears to be generating investment benefits and is supporting firm growth in high-productivity sectors, the theory of change suggests that productivity benefits could be realised in the future.
- **Wider societal impacts:** Longer-term impacts, including quality of life and reduced health inequalities, as well as environmental impacts, are premature to measure at this stage of the evaluation given the timelines expected for these longer-term impacts to be realised. Nevertheless, investments into ISCF Challenges have had notable impacts on the development or refurbishment of infrastructure and services that could act as long-standing platforms for generating population-focused health impacts. In the health and medicine-focused Challenges in particular, infrastructure developments can be seen as proxies for wider societal and health benefits, enabling access to new technologies even if they have not yet reached a large implementation phase. Similarly, examples of increased resilience have been provided in the context of COVID-19, when manufacturing capabilities were harnessed to mitigate against the challenges posed during the pandemic in vaccine manufacturing, for instance. Common wider impacts, such as public perception and attitude changes, have also been evidenced; the ISCF has influenced attitudes and cultural changes towards certain technologies, reporting increased awareness and understanding of their value and challenges.

Interim recommendations

Through analysis of the Challenge evaluation reports, internal UKRI monitoring data and discussions in the validation workshop, the study team identified interim recommendations, which aim to provide an enabling environment to both **maximise and measure impact of the ISCF**. These will be refined and further iterated on in the final impact assessment. The ISCF was commissioned using a novel approach that had not been applied to other government funds at the time. As a result, there were no equivalent programmes to learn from. The following recommendations stem from several learnings taken following the delivery of the ISCF. For full details and examples, see Chapter 7.

Box 1. Recommendations from the interim impact evaluation

Improving impact measurement

1. The structure for the commissioning of mission-oriented R&D programmes should be reconfigured into thematic or sectoral missions, mirroring the cluster-level configurations proposed, to ensure a focused impact measurement approach with relevant indicators. Learnings from the ISCF around this topic have already been applied to the Technology Missions Fund, and any commissioning of evaluation should also follow a thematic structure.
2. Timescales for achieving appropriate impacts in mission-oriented funding should align to what is achievable in that given time frame and fiscal cycle; this is particularly important when planning timelines for *ex post* evaluations. It would be beneficial for commissioners, such as UKRI and Challenge delivery teams, to work closely with evaluators to temper and stress test proposed theories of change, measurement frameworks and benefits realisation plans against the feasibility of achieving a given impact within the proposed timeline. This should determine which aspects of a theory of change should be developed into a measurement framework at a given point and be part of the formal evaluation, which could manage stakeholder expectations. While a theory of change for an investment can be comprehensive, an evaluation approach should be more focused and timebound.
3. While some data collection was mandated by the Fund, the flexibility of the data reporting was not aligned to a Fund-level evaluation, which necessitates aggregation of impacts to obtain a Fund-level understanding of impact. Consistent and mandated data collection should be introduced in the future for Challenge areas where policymakers have already established evidence needs. Based on this learning, Innovate UK (IUK) have developed a new impact framework consisting of mandated metrics for IUK-funded programmes. This should be reviewed to ensure that the level of granularity specified in the metrics is appropriate and useable for aggregate impact assessments.

Improving the likelihood of achieving impact – within UKRI

1. Changes to the financing model of the Fund could maximise impacts. For instance, using a tapered funding model where funding is allocated in stages, allowing use of 25–40% of the overall funds in the first 3 years of the Fund, with the remaining to be allocated across the tail-end of the Fund. This could unlock more focused activities to accelerate impact, while limiting use of funds while programmes are still bedding in.
2. Further provision of commercialisation support during the Challenge at the centralised Fund level could accelerate impact. While Challenge-level commercialisation focus and mechanisms of building capacity were present to a varying degree, some of the endeavours could have benefited from a centralised approach or a point person. Where possible, continued support post-completion, such as through an Impact Accelerator-type funding model, would enable the full investment potential to be realised.
3. Further linking of Challenge and Fund personnel with policy and decisionmakers via the governance structures established could support policy buy-in and engagement. This could support workarounds to bottlenecks and highlight systemic challenges from industry to relevant decisionmakers. This could also enable a cohesive identity of the Fund and direct links to government strategy, which has been shown to be impactful in other sectors.
4. It would be beneficial for UKRI to invest in legacy building for ISCF by leveraging the communities that have been formed and by maintaining networks and systems established by the multi-year efforts, such as the Quantum Communications Hub, the Validate Network and the Energy Revolution Research Consortium, to name just a few. This could provide an opportunity for UKRI to rejuvenate the ISCF identity in a post-hoc manner and ensure that the knowledge assets generated from the multi-year investment can be accessed and disseminated appropriately. This could in part be achieved through Impact Accelerator awards, as per the recommendation above; however, a centralised fund focused on ISCF knowledge asset management could be useful in realising ongoing value of the ISCF investment.
5. UKRI should introduce specific targets and measurement requirements for international investment and international talent mobility in future funds if this is of continued importance. UKRI should also provide centralised support tools to facilitate this proactively, for example by supporting navigation of commercialisation processes and offering training and relocation packages to international experts.

Table of contents

Executive summary.....	ii
Table of contents.....	vi
Figures.....	viii
Abbreviations.....	ix
1. Introduction.....	1
1.1 Overview of the Industrial Strategy Challenge Fund.....	1
1.2 Evaluation aims and scope.....	8
1.3 Phase 3 interim impact evaluation: aims and approach.....	9
1.4 Strengths and limitations of the interim impact evaluation.....	11
2. Creating knowledge and innovation pathways.....	13
2.1 Innovation.....	13
2.2 Knowledge creation.....	18
2.3 Stakeholder and public awareness.....	20
2.4 Informing policy.....	25
3. Capacity and investment.....	30
3.1 Investment.....	30
3.2 Geographic reach of investment and impact.....	35
3.3 Capacity.....	39
3.4 Employment and job creation.....	42
3.5 Diversity.....	45
4. Connected innovation ecosystem.....	49
4.1 Collaboration and partnership.....	49
4.2 Recognition and prestige.....	55
5. Economic impact.....	58
5.1 Economic impact.....	58
6. Wider societal impacts.....	67
6.1 Health impact.....	67
6.2 Environmental impact.....	69
6.3 Infrastructure and services impact.....	72
6.4 Wider societal benefit.....	75

7. Interim learnings and next steps for final impact assessment	77
7.1 Learnings and interim recommendations	77
7.2 Next steps for final impact assessment.....	79

Figures

Figure 1. Structure of the ISCF evaluation. The arrow denotes where in the impact evaluation this report sits.....	9
Figure 2. Impact evaluation themes and sub-themes.....	10
Figure 3. Impact evaluation methodology.	10
Figure 4. Alignment of Challenges to various industrial clusters.	11
Figure 5. The geographic distribution of ISCF grants offered to date (% of total) for all NUTS 1 regions.	37

Abbreviations

AI	artificial intelligence
AOTF	Audience of the Future [name of Challenge Fund]
ATF	Automotive Transformation Fund
ATMP	advanced therapy medicinal products
ATTC	Advanced Therapy Treatment Centres
BAME	Black, Asian and minority ethnic
BEIS	Department for Business, Energy and Industrial Strategy
CR&D	collaborative research and development
Defra	Department for Environment Food and Rural Affairs
DER	Driving the Electric Revolution [name of Challenge Fund]
DER-IC	Driving the Electric Revolution Industrialisation Centre
DHTC	Digital Health Technology Catalyst
DSBD	Digital Security by Design [name of Challenge Fund]
DSIT	Department for Science, Innovation and Technology
D2ED	Data to Early Diagnosis [name of Challenge Fund]
EDI	equity, diversity and inclusion
EDT	Energy Data Taskforce
ERIS	Energy Revolution Integration Service
FBC	Faraday Battery Challenge [name of Challenge Fund]
FTE	full-time equivalent
GBIP	Global Business Innovation Programme
GDP	gross domestic product

GHG	greenhouse gas
GVA	gross value added
HTA	Human Tissue Authority
IDC	Industrial Decarbonisation Challenge [name of Challenge Fund]
IP	intellectual property
ISCF	Industrial Strategy Challenge Fund
IUK	Innovate UK
MHRA	Medicines and Healthcare Products Regulatory Agency
MIDRI	multi- and interdisciplinary research and innovation
MMC	Medicines Manufacturing Challenge [name of Challenge Fund]
MRL	Manufacturing Readiness Level
MSI	Manufacturing Smarter Innovation [name of Challenge Fund – formerly Manufacturing Made Smarter]
NHS	National Health Service
NICE	National Institute for Health and Care Excellence
NPIC	National Pathology Imaging Co-operative
Ofgem	Office of Gas and Electricity Markets
PEMD	Power Electronics, Electronic Machines and Drives [name of Challenge Fund]
R&I	research and innovation
RSW	Robotics for a Safer World [name of Challenge Fund – now called Robotics and Artificial Intelligence in Extreme Environments]
SME	small and medium-sized enterprises
TCC	Transforming Construction Challenge [name of Challenge Fund]
TFI	Transforming Foundation Industries [name of Challenge Fund]
TFP	Transforming Food Production [name of Challenge Fund]

TRL	Technology Readiness Level
UKRI	UK Research and Innovation
VfM	value for money
VMIC	Vaccines Manufacturing Innovation Centre
WGS	Whole Genome Sequencing [name of UK Biobank project]

1. Introduction

The overarching aim of this evaluation is to assess the effectiveness and overall impact of the ISCF as a whole and establish a basis for a longer-term evaluation in future, complementing the ongoing individual Challenge-level evaluations. This evaluation stage represents the penultimate phase of reporting and builds on the individual evaluations of the existing ISCF Challenges. This report presents findings of the Fund-level interim impact evaluation of the ISCF. **At the time of writing this report, further impact is anticipated across all the Challenges. The findings here present a snapshot in time of the impact to date, and we will continue to monitor incoming reports in the final phase of the evaluation, which will be complemented through primary data collection for evidence triangulation at the Fund level.**

1.1 Overview of the Industrial Strategy Challenge Fund

The ISCF was established in 2017, to leverage R&I to support the UK government's Industrial Strategy. The Industrial Strategy identified several goals, including helping businesses create better and higher-paying jobs in every part of the UK, as well as ensuring that the population are able to 'embrace and benefit from the opportunity of technological change'.⁵ The Industrial Strategy outlined four 'Grand Challenge' areas of focus: Ageing Society, Artificial Intelligence and Data, Future of Mobility, and Clean Growth.⁶

A primary goal of the ISCF has been to support the development of solutions to the societal challenges facing the UK, through the delivery of a Challenge-led R&I funding programme. The Fund was delivered by UKRI, and through the Fund, UKRI established 20 Challenges – specific areas of thematic focus that aim to support collaborative, cross-sector R&I.⁷ The Challenges were established through three sequential funding waves.

The ISCF has five objectives, which the Challenges are intended to support. These are to:

- Increase UK businesses' investment in R&I and improve capability and capacity;
- Increase multidisciplinary and interdisciplinary research around the Challenge areas;
- Increase business–academic engagement on activities relating to the Challenge areas;
- Increase collaboration between younger, smaller companies and larger, more established companies within the value chain;
- Increase overseas investment in R&I within the UK.

⁵ HM Government (2017), Industrial Strategy: Building a Britain Fit for the Future.

⁶ HM Government.

⁷ We distinguish here among 1) the 20 Challenges; 2) the fast-start investments made under Wave 1a; and 3) the three non-Challenge programmes established under Wave 1b.

Table 1. ISCF Challenges and their key aims

Cluster	Challenges	Key aims	Interim evaluation report available for this report	Final evaluation report available for this report
Healthy Society	Medicines Manufacturing	<p>The Medicines Manufacturing Challenge aims to promote the UK as a world leader in medicines manufacturing and the delivery of novel treatments. Subcomponent aims:</p> <ul style="list-style-type: none"> Digital Health Technology Catalyst (DHTC) programme – supports R&D projects aiming to accelerate the development and commercialisation of digital health technologies Medicines Manufacturing Programme – develops next-generation medicines, increasing technology opportunities within the medicines supply chain, improving vaccine manufacture and innovation, promoting advanced therapy via cell and gene therapies, and promoting commercialisation of the same 	Yes	Yes
	Data to Early Diagnosis and Precision Medicine	<p>The Data to Early Diagnosis and Precision Medicine Challenges support the development of precision medicine for improved early diagnosis and treatment and accelerate the use of research and health data.</p> <p>3 focus areas:</p> <ul style="list-style-type: none"> Genomics – supports large-scale, whole-genome sequencing for precision medicine Health data – combines NHS data with data from research and development programmes to provide analytical and data science support to businesses Integrated and early diagnostics – via a network of 5 research centres – pathology, radiology, diagnostics and artificial intelligence (AI) 	Yes	No
	Healthy Ageing	<p>The Healthy Ageing Challenge aims to enable businesses, including social enterprises, to develop and deliver scaled-up products, services and business models to support people as they age. The Challenge supports enterprises via investment partnerships, its Social, Behavioural and Design Research Programme, and competitions and awards for enterprises that focus on its 7 themes.</p>	No	No
	Accelerating Detection of Disease	<p>The Accelerating Detection of Disease Challenge supports research into the early diagnosis, prevention and treatment of chronic disorders using biological and digital data from up to 5 million volunteers.</p>	No	No

		<p>Focus:</p> <ul style="list-style-type: none"> Managing chronic disease and cancer – combining health and other data with AI to accelerate diagnosis, preventative strategies and treatments Early detection – linking to long-term volunteer data to NHS and health data to enable early detection and treatment 		
Data and Digital	Commercialising Quantum Technologies	<p>Building on the UK's National Quantum Technology Programme, the Commercialising Quantum Technologies Challenge supports new products and technologies based on advances in quantum science.</p> <p>4 focus areas:</p> <ul style="list-style-type: none"> Product and service innovations – funding research on new quantum-enabled product and service innovations Industry-led technology development project Supply chain feasibility on innovative components and supply chain elements across the quantum sector Investment accelerator – supporting early-stage, spin-out and start-up quantum technologies companies to secure venture capital 	Yes	No
	Digital Security by Design	<p>The Digital Security by Design Challenge supports projects that help the UK digital computing infrastructure to become more secure.</p> <p>Focus:</p> <ul style="list-style-type: none"> Creation of an updated hardware architecture in a physical prototype board Development of the software and system development tools that will run on it Demonstration in industry sectors, including automotive, e-commerce, defence, telecoms and operational technologies 	Yes	No
	Next Generation Services	<p>The Next Generation Services Challenge supports the UK's service industries to use technologies, such as AI and data analytics, to develop the next generation of services. The Challenge is focused on 3 priority sectors – the legal, accounting and insurance services. Projects focused on the following:</p> <ul style="list-style-type: none"> Research on barriers – examine the potential behavioural and socio-technical barriers to the use of the above technologies in the 3 sectors. 	Yes	Yes

		<ul style="list-style-type: none"> Data access – develop responsible data access/sharing methods and business models in the 3 sectors. 		
	Audience of the Future	<p>The Audience of the Future Challenge supports the development of immersive experiences and technologies in the UK-based creative sector, including research to better understand audiences for immersive productions.</p> <p>Focus:</p> <ul style="list-style-type: none"> Demonstrator programme covering 4 sectors – e-sports and gaming, performance, moving image, and visitor experience Production innovation for creating faster, more efficient immersive content Immersive technology investment accelerator to support early-stage businesses Design foundations support for projects exploring human-centred design StoryFutures Academy as a national centre for immersive storytelling 	Yes	Yes
	Manufacturing Smarter Innovation	<p>The Manufacturing Smarter Innovation Challenge aims to help the UK’s manufacturing industry become more productive and competitive through innovation and the adoption of the following digital technologies:</p> <ul style="list-style-type: none"> AI, ML and data analytics Additive manufacturing Robotics and automation Virtual and augmented reality Industrial Internet of Things and connectivity (5G, low-power wide area network [LPWAN]) 	Yes	No
	Robotics for a Safer World	<p>The Robotics for a Safer World Challenge supports the development of novel robotics and AI technologies and systems to reduce the number of people working directly in extreme environments.</p> <p>Supports projects across 4 main sectors:</p> <ul style="list-style-type: none"> Offshore wind energy – e.g. drones to maintain wind farms Nuclear energy – e.g. assisting with nuclear decommissioning Space – future AI and robotics for space Mining – e.g. inspect subterranean mines 	Yes	No

		In addition to these 4 sectors, the Challenge includes projects on automating fruit packing and has also evolved to include new needs, such as robotic sanitising of care facilities during COVID-19.		
Clean Growth	Transforming Foundation Industries	The Transforming Foundation Industries Challenge supports the development of innovative technologies, collaborations and investment in the foundation industries in order to increase competitiveness, secure jobs and reduce environmental impact. The six relevant sectors are: cement, glass, ceramics, paper, metals and chemicals.	Yes	No
	Low Cost Nuclear	The Low Cost Nuclear Challenge aims to develop a compact, standardised nuclear power station product based around a UK-designed small modular reactor. This is to be achieved via modern mass production methodology. The first phase of the project saw the development of a concept design (Rolls-Royce), and the second phase will focus on development of this technology until it has reached a stage that attracts private investment.	No	No
	Prospering from the Energy Revolution	The Prospering from the Energy Revolution Challenge aims to accelerate innovation in smart local energy systems. Focus areas: <ul style="list-style-type: none"> • Demonstrator projects – on transmission-connected electric vehicle (eV) charging network, integrated virtual energy system, local energy marketplace and intelligent grid • Detailed designs – developing designs for local energy systems at the level of towns, cities and regions • Modernising energy data – projects focusing on new open software, hardware and data solutions for the energy sector • Key technology components for local energy systems • New knowledge and tools – research on uptake and impact of local energy systems 	Yes	No
	Industrial Decarbonisation	The Industrial Decarbonisation Challenge aims to contribute to the UK's drive for clean growth across the six largest industrial clusters through development and deployment of technologies, such as carbon capture, utilisation and storage and hydrogen fuel switching.	Yes	No
	Transforming Construction	The Transforming Construction Challenge aims to accelerate a shift in the construction via three central Challenges: <ul style="list-style-type: none"> • Moving to a manufacturing approach – from suppliers right through to site 	No	Yes

		<ul style="list-style-type: none"> Embracing digital technologies to provide assurance, efficiency of projects and performance feedback to design Shifting to selling outcomes (what a building does rather than what it is) and maximising whole-life value of assets 		
	Transforming Food Production	<p>The Transforming Food Production Challenge supports the development and adoption of new ways to produce food, with a view to improving the productivity and resilience of primary food production while also reducing emissions and pollution.</p> <p>Focus areas:</p> <ul style="list-style-type: none"> Farming Innovation Programme – projects on productivity and sustainability in agriculture and horticulture while orienting towards net zero Future food production systems – development of new high-value food production systems Science and technology into practice – development and adoption of precision approaches International opportunities – accelerate shared international priorities and build export opportunities for agri-tech Investment ecosystem – drive private investment in agri-tech via investor partnership 	Yes	No
	Smart Sustainable Plastic Packaging	<p>The Smart Sustainable Plastic Packaging Challenge aims to tackle the challenge of plastic pollution in the environment by facilitating the development of a more sustainable plastic packaging value chain.</p> <p>Focus areas:</p> <ul style="list-style-type: none"> Sustainable plastic packaging materials and designs Collaboration and innovation for integrated circular supply chains – including insights on systems change and consumer behaviour Learning and knowledge dissemination from funded projects 	Yes	No
Future of Mobility	Driving the Electric Revolution	<p>The Driving the Electric Revolution (DER) Challenge supports the UK’s push towards a net-zero carbon economy and clean technology supply chains through investment in electrification technologies, including power electronics, electric machines and drives (PEMD)</p> <p>3 focus areas:</p> <ul style="list-style-type: none"> Industrialisation centres – creation of a network of regional centres to develop and scale PEMD technologies and manufacturing 	Yes	No

		<ul style="list-style-type: none"> • Collaborative innovative funding – projects to help businesses grow PEMD supply chains and manufacturing capabilities • Talent and skill development 		
	Faraday Battery	The Faraday Battery Challenge aims to drive the growth of a strong battery business in the UK through the development of battery technologies that are cost effective, high performing, longer range, faster charging, long lasting, safe and recyclable. The Challenge aims to support the UK automotive supply chain to meet deadlines for zero-emissions vehicles.	Yes	No
	Future Flight	<p>The Future Flight Challenge aims to bring together technologies in electrification, aviation systems and autonomy to create new modes of air travel and capability by demonstrating along 3 areas:</p> <ul style="list-style-type: none"> • Safe integration and operation of drones • Advanced air mobility and regional aircraft • Advancements in electrification and autonomy 	Yes	No

Table 1 provides an overview of the ISCF Challenges (referred to interchangeably as ‘Challenges’) and their key aims. The ISCF Challenges were selected through a central, Fund-level process that was led by the former Department for Business, Energy and Industrial Strategy (BEIS)⁸ and UKRI. The Challenges were both designed and implemented by the Challenge-level governance structures – including programme boards and advisory groups, Challenge programme teams, and Challenge directors⁹ – with these feeding into the Fund-level governance structure overseen by the ISCF Steering Board. A range of funding mechanisms were established to support the distribution of ISCF funds. An evaluation of the processes established within ISCF can be found in the published process evaluation report.¹⁰

1.2 Evaluation aims and scope

RAND Europe and Frontier Economics were commissioned in 2020 by UKRI to undertake a Fund-level evaluation of the ISCF. The overarching aim of this evaluation is to assess the effectiveness and overall impact of the ISCF as a whole and establish a basis for a longer-term evaluation in future, complementing the ongoing individual Challenge-level evaluations. This translated into the following:

- (i) building an evidence base with which to inform ongoing and future improvements to the ISCF;
- (ii) demonstrating what ISCF has delivered to taxpayers;
- (iii) understanding the impact of mission-oriented and Challenge-focused R&I support.

The Fund-level evaluation is being conducted in parallel with independent evaluations of each individual ISCF Challenge. While drawing upon the findings and data collected in the Challenge-level evaluations, the Fund-level evaluation will also collect additional primary and secondary data to provide an overarching assessment of the impact of the ISCF, including the overall contribution of the Challenge-led approach.

The Fund-level evaluation is being implemented through four phases: evaluation framework development (Phase 1, completed)¹¹; baseline assessment (Phase 2, completed)¹²; process evaluation (Phase 3, completed)¹³; interim impact evaluation (Phase 3, this report); and final impact evaluation (Phase 4, to be completed).¹⁴ **While this evaluation is being conducted to align with the end stages of many Challenges, impacts are expected to continue beyond the timelines of this evaluation. By conducting an impact**

⁸ In February 2023, the ISCF-relevant part of BEIS changed to the Department for Science, Innovation and Technology (DSIT). The report uses the acronym BEIS when referring to the past and the acronym DSIT when referring to the present or future.

⁹ Challenge Directors are industry leaders drawn from relevant sectors, recruited to ISCF to provide strategic leadership and oversight to the Challenges.

¹⁰ ISCF [Process Evaluation Report](#).

¹¹ ISCF [Evaluation Framework Report](#).

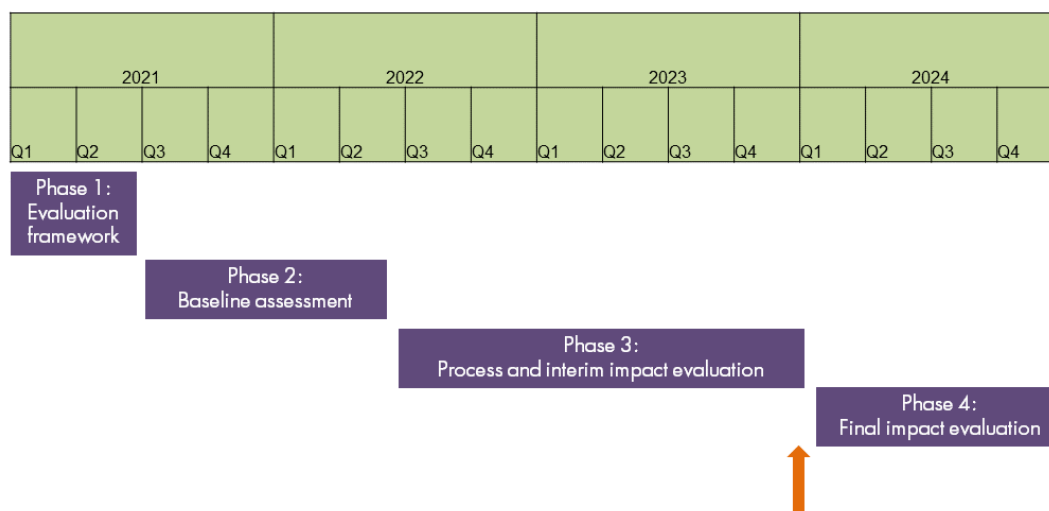
¹² ISCF [Baseline Report](#).

¹³ ISCF [Process Evaluation Report](#).

¹⁴ The phases presented here reflect a revision to the original evaluation structure as set out in the ISCF evaluation framework report. This revision was agreed with UKRI at the inception of Phase 3.

assessment at this stage, we build on the foundations of the baseline assessment, and both will feed into future evaluations of impacts in the long term.

Figure 1. Structure of the ISCF evaluation. The arrow denotes where in the impact evaluation this report sits.



Source: RAND Europe

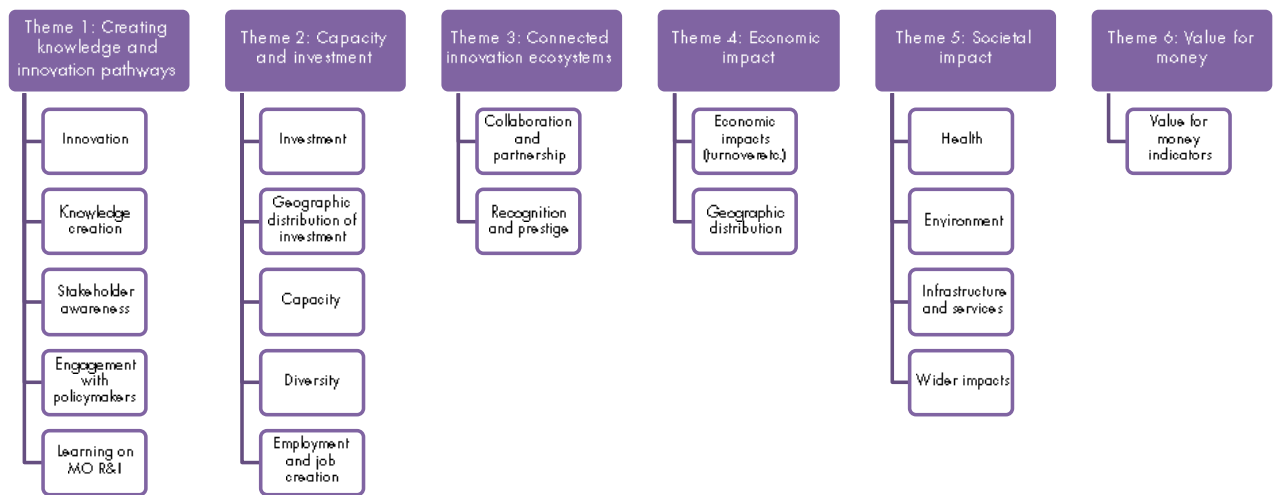
1.3 Phase 3 interim impact evaluation: aims and approach

This Fund-level interim impact evaluation is focused on assessing the overall impacts achieved to date from the ISCF Challenges. The evaluation is structured around a framework comprised of 6 high-level evaluation themes and 19 impact subcategories as highlighted in Figure 2. The detailed evaluation framework is presented in Annex B.

To collect evidence relating to the evaluation themes, we utilised information from Challenge-level interim and final impact evaluation reports (up to and including those submitted on the 15 September 2023), through a thematic coding approach, and utilised internal monitoring data from Innovate UK alongside key themes that surfaced during a stakeholder workshop (Figure 3). The detailed methodology can be found in Annex C. The evidence was triangulated and is presented throughout this report as a qualitative narrative assessment aimed at highlighting evidence of impact across the various thematic areas of interest. The standalone Challenge-level summaries developed against the evaluation themes are presented in Annex E, and these were used as a basis for the Fund-level narrative.

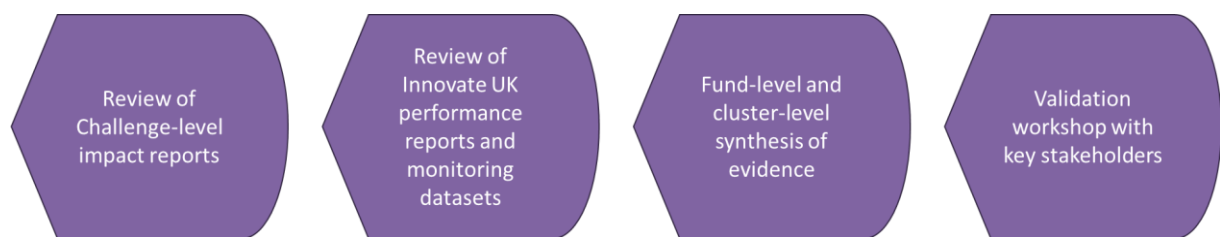
To facilitate the evidence triangulation while accounting for the breadth of the sectors and impacts that the Fund represents, all Fund-level evaluation themes and impact subcategories were reviewed against each Challenge-level evaluation framework to explicitly state what was within the scope of a given Challenge.

Figure 2. Impact evaluation themes and sub-themes.



Source: RAND Europe

Figure 3. Impact evaluation methodology.



Source: RAND Europe

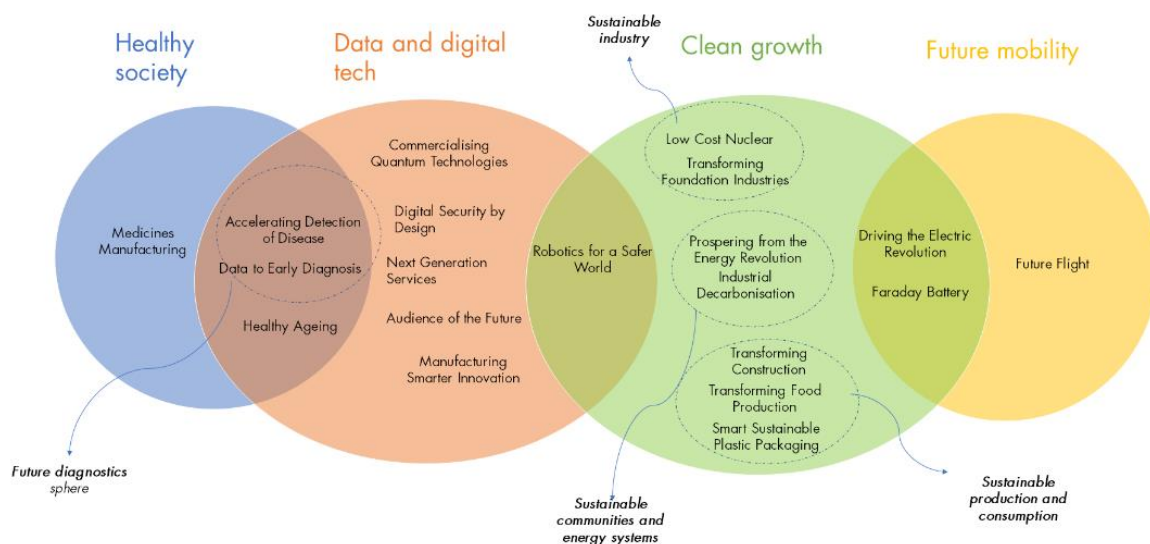
During the analysis, the study team found that certain types of impacts were common to a particular group of Challenges (e.g. improved health or net zero). To synthesise findings at this ‘cluster’ of Challenges, the team conducted an exercise to develop aggregate Challenges into clusters (details of which can be found in Annex C). Based on the exercise, four main clusters for the Fund were identified. These broadly mirror the original Grand Challenges, which have been decommissioned. Additional sub-clusters were identified during the clustering approach to provide a more nuanced grouping based on common indicators found across Challenges. The Grand Challenges groupings were not used due to the data-led approach that was in place.¹⁵ Figure 4 provides an overview of the cluster and sub-cluster groupings based on the indicator mapping exercise undertaken, which is detailed in Annex C.

It is worth noting that while the study team methodically assessed all the evidence against each cluster and sub-cluster, this level of synthesis has only been used where appropriate and where it adds to the narrative.

¹⁵ It is worth noting that the clusters represent a grouping from the evaluation team based on our grouping of common indicators found across a group of Challenges, and not from UKRI or the Challenges themselves. The groupings do, however, resonate with the Grand Challenges themselves.

For many impact subcategories/evaluation themes, Fund-level or Challenge-level evidence is more appropriate and useful to reflect on.

Figure 4. Alignment of Challenges to various industrial clusters.



Source: RAND Europe

Further primary data collection is expected in the final phase of the evaluation to capture Fund-level information and fill gaps not otherwise addressed in these data sources. Evidence from Phase 3 highlighted these data gaps.

As part of the work done alongside this interim impact evaluation, Frontier Economics engaged with a number of the Challenges and reviewed Fund-level management information to refine the approach to a Fund-wide econometric analysis that could inform the value for money (VfM) assessment in the final impact evaluation. This built on the scoping work conducted and reported as part of the Fund-level baseline report published in 2022.¹⁶ Full details of the approach and findings from this scoping are included in Annex D.

1.4 Strengths and limitations of the interim impact evaluation

The approach taken here has enabled us to synthesise and bring together the diverse outcomes of the ISCF portfolio. A detailed review and collation of the available interim and final impact evaluation reports for the ISCF Challenges has enabled the study team to capture rich data from across the Challenges. To complement this, a workshop with stakeholders involved in ISCF – including Challenge directors, Innovate

¹⁶ ISCF [Baseline Report](#).

UK, project awardees and industry representatives – provided us the opportunity to further sense-check and nuance the findings and analysis and to ensure we were utilising the best evidence possible for the evaluation.

Despite these strengths, the following limitations should be noted:

Several of the Challenge-level evaluations are ongoing (a list of Challenge evaluation reports assessed at this stage of the ISCF evaluation is provided in Annex D). At this stage of the evaluation, we were able to undertake an in-depth review of 16 interim impact evaluation reports and 4 final impact evaluation reports, which together represented 17 Challenges. At the time of writing, 13 of the Challenges do not yet have a final evaluation report, and for a further 3 Challenges we had no report at all (either interim or final). During the final phase of the Fund-level impact evaluation, we will incorporate the remaining reports into the analysis as they become available and collect further primary data on Fund-level impact to mitigate against this current limitation.

Evidence of the additionality of the ISCF is not included in this phase of reporting. There are no robust counterfactuals for ISCF as a Fund, and given the variation in data capture across Challenges, it is not possible to conduct additionality assessment across all the metrics. However, counterfactuals reported at the Challenge level have been incorporated into this report to provide evidence on additionality where possible. Moreover, additionality of the ISCF will be assessed as part of the econometric analysis by investigating additionality in business performance, including turnover and turnover per worker (see Annex D for methodological details).

Value for money. According to HM Treasury, ‘achieving value for money can be described as using public resources in a way that creates and maximises public value’,¹⁷ where public resources are defined as ‘public sector capital and resource expenditure, stewardship of assets, and raising revenue’.¹⁸ While initial evidence of wider economic impact is included in this report (Chapter 5), evidence for VfM at the Challenge level is still emerging at this stage, as many Challenges are ongoing and evaluation reports therefore have not assessed VfM fully. Moreover, many Challenges did not consider this as part of the evaluation scope.

¹⁷ *Public value* is defined as the value created when public money is translated into outputs and outcomes that improve people’s lives and economic wellbeing. Source: Barber, Delivering Better Outcomes for Citizens. HM Treasury note that the appraisal of social value, also known as public value, is based on the principles and ideas of welfare economics and that it concerns overall social welfare efficiency, not simply economic market efficiency. Social or public value therefore includes all significant costs and benefits that affect the welfare and wellbeing of the population, not just market effects. For example, environmental, cultural, health, social care, justice and security effects are included. Source: HM Treasury, The Green Book.

¹⁸ HM Treasury, Value for Money Framework; The Green Book: Value for Money (2022).

2. Creating knowledge and innovation pathways

This chapter presents findings relating to the knowledge generation– and innovation-focused outcomes of the ISCF. The chapter discusses findings relating to **innovation, knowledge creation, stakeholder awareness and engagement with policymakers.**

2.1 Innovation

Evaluation questions:

- To what extent has the ISCF advanced the readiness of new technologies, products and processes?
- To what extent have ISCF outputs (technologies, products, processes, services, approaches, etc.) been implemented/adopted within society?

Key summary of ISCF overall impact on knowledge creation

- The ISCF supported technological maturity and commercialisation across the Fund. Evidence from this interim stage of the impact evaluation shows that a much greater proportion of projects were within the TRL 5–9 range and most projects had increased by at least 1 TRL compared with baseline levels (most projects reported TRLs of 1 to 4 at baseline). Moreover, at least 31% of the projects across the Fund have generated IP.
- ISCF processes and support structures enabled technological maturity and commercialisation and supported projects in adopting new internal processes and business models.
- The ISCF enabled access to infrastructure, which provided important support to progressing technological maturity and commercialisation.
- Implementation and adoption of ISCF outputs within society remain at an early stage, with positive signs emerging for further adoption.

Table 2. Mapping of Fund-level metrics against metrics in Challenge evaluation reports (see Annex E, Table 7, for Challenge-level summaries from evaluation reports).

Challenge	Metrics in scope?	Evidence found in reports?
Audience of the Future	Y	Y
Medicines Manufacturing	Y	Y
Data to Early Diagnosis	Y	Y
Commercialising Quantum Technology	Y	Y
Digital Security by Design	Y	Y
Next Generation Services	Y	Y
Manufacturing Smarter Innovation	Y	Y
Robotics for a Safer World	Y	Y
Transforming Foundation Industries	Y	Y

Prospering from the Energy Revolution	Y	Y
Industrial Decarbonisation	Y	Y
Transforming Construction	Y	Y
Transforming Food Production	Y	Y
Smart Sustainable Plastic Packaging	Y	Y
Driving the Electric Revolution	Y	Y
Faraday Battery	Y	Y
Future Flight	Y	Y

Table 2 highlights whether we found metrics in the Challenge-level evaluation reports that matched those in the Fund-level evaluation framework (i.e. whether the metric was ‘in scope’). In addition, we tracked where we found evidence and discussions of the metrics in the Challenge-level evaluation reports. These grids are used to track each Fund-level evaluation metric throughout the report.

The ISCF has enabled progression in technology maturity across the Fund.

Across the Fund, technologies and products developed by ISCF projects progressed up TRL and manufacturing readiness levels (MRL) over the course of the project funding (**Box 2**).¹⁹ Some Challenges reported technologies and products meeting technical objectives, showing proof of concept or passing validation milestones, while others developed and tested prototypes and began production.

For Challenges reporting on this metric, most projects reported TRLs of 1 to 4 at baseline.²⁰ Evidence from this interim stage of the impact evaluation shows that a much greater proportion of projects were within the TRL 5–9 range and most projects had increased by at least 1 TRL. The Robotics for a Safer World Challenge, for example, reported an increase to an average TRL of 4.6 from an average TRL of 3.3, whereas unsuccessful projects remained at an averaged TRL of 3.6.²¹ Exceptionally, two Challenges showed TRL increases of up to 4 levels (Next Generation Services and Audience of the Future). Along with Prospering from the Energy Revolution, many projects within these three Challenges had reached commercialisation (TRL 9). While the remaining Challenges provided little evidence of a consistent measurement of TRL

¹⁹ Next Generation Services (Final); Prospering from the Energy Revolution (Interim); Transforming Foundation Industries (Interim); Robotics for a Safer World (Interim); Faraday Battery (Interim); Medicines Manufacturing (Final); Future Flight (Interim); Audience of the Future (Final); Driving the Electric Revolution (Interim).

²⁰ ISCF [Baseline Report](#). Challenges reporting on TRL at baseline: Audience of the Future, Future Flight, Prospering from the Energy Revolution, Commercialising Quantum Technologies, Medicines Manufacturing, and Faraday Battery. Note that this is with exception of Audience of the Future and Commercialising Quantum Technologies Challenges, which were at an advanced TRL (8–9).

²¹ Audience of the Future (Final); Next Generation Services (Final).

progression across projects, the increase in TRL seen across the 8 Challenges included in this assessment²² highlight ISCF support across sectors, i.e. TRL progress was not restricted to specific Challenges or clusters. The notable progression in technological maturity also supported wider ISCF objectives. Some Challenges noted that TRL progression enabled by the ISCF supported engagement with new and existing academic and business entities, as proof-of-concept designs and prototypes could be shared and demonstrated. In addition to supporting maturity of technologies and manufacturing processes, ISCF also supported the development and utilisation of new and improved digital and physical services, facilities and infrastructure. Further evidence on technology maturity and links with capacity and investment, such as infrastructure and skills, are discussed in Chapter 3.

In some areas, ISCF accelerated progression towards commercialisation, resulting in IP outputs.

The ISCF has accelerated the progression of technologies towards commercialisation. Notably, ISCF has supported patent and IP activity, and several of the Challenges have resulted in many successful IP applications.²³ Across the Fund to date, at least 319 items of IP have been granted, involving 31% of projects.²⁴ In contrast, at baseline, the majority of Innovate UK projects had ‘no formally protected IP or had considered but not applied IP rights’.²⁵ In addition, many Challenges reported progression to various stages along the pathway to commercialisation, including increasing expectations of commercial opportunity, reaching TRL 9 and applying for IP. As with technological and manufacturing maturity, progression towards commercialisation varied among Challenges at the outset, and, as such, it is therefore not reasonable to expect commercialisation within the timeframe of the ISCF for all Challenges. However, views from stakeholders on the promise of the technologies for the future were positive and project awardees thought that participation in ISCF had improved their understanding of applying solutions to real-world operations and processes.²⁶ Altogether, evidence from across Challenges indicates improvements in commercialisation potential and, in many cases, successful commercialisation across the Fund.

ISCF processes and support structures enabled technological maturity and commercialisation.

ISCF processes and support structures were seen by most Challenges as important enablers of technology maturation and commercialisation. Several Challenges noted that structures within the Fund provided support for commercialisation, including competitions, market testing and activities that promoted awareness of products and supported wider industry engagement and interest. For example, commercialisation was enabled through the Key Technology Component competition in the Prospering

²² Challenges reporting on TRL at this stage of the impact evaluation: Audience of the Future, Future Flight, Prospering from the Energy Revolution, Medicines Manufacturing, Faraday Battery, Robotics for a Safer World, Next Generation Services, and Transforming Foundation Industries.

²³ Commercialising Quantum Technology (Interim); Next Generation Services (Final); Faraday Battery (Interim); Medicines Manufacturing (Final); Future Flight (Interim); Audience of the Future (Final).

²⁴ ISCF Portfolio Performance Report (Q2, FY23/24).

²⁵ ISCF [Baseline Report](#).

²⁶ Robotics for a Safer World (Interim); Digital Security by Design (Interim).

from the Energy Revolution Challenge, which supported innovative projects to reach high TRLs.²⁷ The competition provided up to £3m (overall) in funding to small and medium-sized enterprises (SME) and partnerships involving SME, for developments in local energy systems efficiencies. In addition, some Challenges noted that ISCF support structures and de-risking enabled improved internal process and testing of new business models. For example, the Next Generation Services Challenge noted that many of those participating in the Challenge had trialled new business models and that the majority of participants noted implementation of AI solutions as part of their business models.²⁸

Box 2. Challenge spotlight on innovation²⁹

Medicines Manufacturing

- **Aims:** The Medicines Manufacturing Challenge (MMC) has been designed to boost UK medicine manufacturing by developing innovative, sustainable technologies that accelerate patient access, enhance sector resilience and support economic recovery and levelling up.
- **Impact on innovation:** The Challenge supported innovation through advanced technology development across various projects, with most collaborative research and development (CR&D) projects progressing in their TRL and 2 of them reaching commercialisation stage (TRL 8-9). Notably, 10% of the DHTC projects reached TRL 9. Analysis (which compared funding recipients with unsuccessful applicants) revealed that the programme contributed to an increase in R&D investment. Specifically, each grant was associated with a 13–18% increase in R&D expenditure, culminating in a £63.5–88m increase across grants between 2018 and 2021.

Alongside the progression in TRL, 14 of the 43 DHTC projects have also been successfully demonstrated within the NHS, including 10 projects providing evidence of their cost savings. The Advanced Therapy Treatment Centres (ATTC) initiated clinical trials featuring particularly innovative components that could advance the broader advanced therapy medicinal products (ATMP) sector (e.g. testing the use of wearable technology for remote patient monitoring and testing novel methods for cryogenic shipping of cell therapies). The trials have attracted significant interest from major pharmaceutical companies and other therapy developers, indicating potential for further trial launches.

Driving the Electric Revolution

- **Aims:** The DER Challenge aims to boost UK PEMD production by £5bn by 2025 through industry–academia collaboration, enhancing supply chains, innovation, and manufacturing across multiple sectors.
- **Impact on Innovation:** The DER Challenge has demonstrated significant innovation by increasing MRL and accelerating the commercialisation of PEMD technologies. Among the 54 participating firms, 17 are expected to reach an MRL of 7 or higher by the end of their involvement with the Challenge, compared with only 1 firm reporting that at the beginning of the Challenge. For instance, one project developed a novel die attachment process for next-generation power electronics, elevating the technology's MRL to level 9.
- **Barriers to impact:** Insufficient awareness and transparency about the equipment available at the Driving the Electric Revolution Industrialisation Centres (DER-ICs) has limited the use of these facilities. In addition, the diversification of the Challenge portfolio is anticipated to cause variable commercialisation across all sectors in scope and to subsequently create some gaps.

²⁷ Competition Overview - Key Technology Components for Local Energy Systems; Prospering from the Energy Revolution (Interim).

²⁸ Next Generation Services (Final).

²⁹ Medicines Manufacturing (Final); Driving the Electric Revolution (Interim).

Notable enablers to impact: Given the external factors brought on by COVID-19 (including disruptions in project delivery), UKRI's flexibility in extending timelines and providing continuity funding was noted as a key enabler to impact. The pandemic accelerated the adoption of digital technologies in healthcare, addressing such challenges as limited face-to-face interactions and staff shortages. This shift increased demand for digital, in-home solutions and allowed firms to recruit individuals with specific skill sets through remote working policies.

For the DER Challenge, the equipment and test facilities are accessible to companies, stimulating and accelerating innovation and commercialisation by allowing small and large firms to test and improve their manufacturing techniques with reduced risks and costs.

The ISCF enabled access to infrastructure supporting technological maturity and commercialisation across Challenges.

The ISCF enabled access to infrastructure, including facilities and centres that supported companies with their manufacturing capabilities. Similarly, some Challenges noted the creation of digital infrastructure as a valuable mechanism. Access to physical and digital infrastructure supported projects across multiple stages, including design and pilot testing and testing of manufacturing processes and techniques. For example, in the DER Challenge, DER-ICs supported the testing of manufacturing techniques and processes across project stages while projects were waiting for access to their own equipment,³⁰ whereas in the MMC, access to the ATTC supported companies to commercialise.³¹

Implementation and adoption of ISCF outputs within society remain at an early stage, with positive signs emerging for further adoption.

Evidence indicates that implementation and adoption of ISCF outputs – including technologies, products, processes, services and approaches – within society remains at an early stage, with positive signs, such as uptake of process-oriented ISCF outputs, indicating promise for further adoption.³² There is also evidence that participation in ISCF has led to increased adoption of products and services in the UK and abroad. For example, the use of AI and data solutions in Next Generation Services or the DHTC (Medicines Manufacturing). The latter has supported the adoption of 12 technologies in the National Health Service (NHS), and 7 firms were able to use their technologies outside of the UK.

Participation in ISCF supported the production of toolkits, guidance and best practice, many of which have been applied and adopted outside of the ISCF. In the case of the Energy Revolution Integration Service (ERIS) programme, which forms part of the Prospering from the Energy Revolution Challenge, knowledge and toolkits produced by the programme were adopted by local authorities to progress net-zero initiatives. Similarly, the ATTC, which forms part of the MMC, developed processes and guidance around different aspects of manufacturing, including supply, logistics, clinical training, clinical pathways, patient monitoring

³⁰ Driving the Electric Revolution (Interim).

³¹ Medicines Manufacturing (Final).

³² Medicines Manufacturing (Final); Data to Early Diagnosis and Precision Medicine (Interim); Next Generation Services (Final); Prospering from the Energy Revolution (Interim); Audience of the Future (Final); Transforming Construction (Final).

and engagement, and the development of commercial products and services. The centres have enabled wider adoption of these outputs in NHS Trusts, thereby expanding their reach and impact further.

Participation in ISCF also supported changes to wider processes across sectors and within organisational strategies. For example, the business model established by the Cell and Gene Therapy Catapult³³ together with the ISCF, through its Manufacturing Centre, has provided a blueprint for similar commercial and government-sponsored facilities and has since been replicated outside of the UK.³⁴ Within the construction sector, there were emerging signs that procurement processes have been broadened out to consider a wider range of impacts, including on people and the environment, where the Transforming Construction Challenge was seen to have played a role.

2.2 Knowledge creation

Evaluation question:

- What has been the contribution of the ISCF to new knowledge addressing the Challenges, both within the UK and internationally?

Key summary of ISCF overall impact on knowledge creation

- The ISCF contributed to significant knowledge creation in a variety of forms, including peer-reviewed journals, books and book chapters; policy briefings and reports; research processes; and tools and data resources that have spanned outputs relevant to a global audience.
- The ISCF also contributed to knowledge-exchange activities, including webinars, virtual talks, open days, social media engagement, conferences and workshops, signifying activities engaging public, academics, industry and policymakers, which is further discussed in Section 2.3.

Table 3. Mapping of Fund-level metrics against metrics in Challenge evaluation reports (see Annex E, Table 8, for Challenge-level summaries from evaluation reports).

Challenge	Metrics in scope?	Evidence found in report?
Audience of the Future	Y	Y
Medicines Manufacturing	Y	Y
Data to Early Diagnosis	Y	Y
Commercialising Quantum Technology	Y	Y
Digital Security by Design	Y	Y
Next Generation Services	Y	Y
Manufacturing Smarter Innovation	Y	Y**

³³ The Catapult Network supports SME in technology and innovation development, providing expertise and facilities to do so. These Catapults are not Challenges, but the Catapult Network worked collaboratively with the Challenge (e.g. Innovate UK commissioned the Digital Catapult to support the Digital Security by Design Challenge).

³⁴ Medicines Manufacturing (Final).

Robotics for a Safer World	Y	Y
Transforming Foundation Industries	Y	Y
Prospering from the Energy Revolution	Y	Y
Industrial Decarbonisation	Y	Y
Transforming Construction	N	Y*
Transforming Food Production	Y	Y
Smart Sustainable Plastic Packaging	Y	Y
Driving the Electric Revolution	Y	Y**
Faraday Battery	Y	Y
Future Flight	N	Y*

*Metric not included in the framework, but evidence found in the report

** Challenge did not comment on knowledge creation but held activities for knowledge transfer

The ISCF has significantly contributed to the generation of new knowledge and knowledge exchange in multiple forms.

The ISCF has contributed to a significant body of new knowledge across the Challenge sectors, with all Challenges reporting generation of new knowledge or engagement in knowledge-exchange activities, except for the DER Challenge, where this metric was out of scope. Challenges noted knowledge generation in multiple forms, including via peer-reviewed journals, books and book chapters and via conference papers. Several Challenges reported producing regulatory frameworks, policy briefings and reports. Challenges also generated new knowledge regarding processes and operations, including research materials and protocols, best practice guidelines, standard operating procedures, and toolkits, as well as data resources, such as databases, and data platforms and educational tools and materials. In addition, there were numerous examples of knowledge-exchange activities, including webinars, virtual talks, open days, social media engagement, conferences and workshops across many of the Challenges. Together, these outputs and activities illustrate the breadth of knowledge generation and knowledge exchange facilitated through the ISCF.

The volume and frequency of publications varied significantly across Challenges, ranging from limited evidence of publications³⁵ to publication numbers in the hundreds.³⁶ There was no discernible publications trend across the ISCF clusters, with the exception of the Data and Digital cluster, which published a relatively large volume of peer-reviewed outputs. Commercialising Quantum projects had the highest

³⁵ Transforming Foundation Industries (Interim); Transforming Food Production (Interim); Industrial Decarbonisation (Interim).

³⁶ Next Generation Services (Final); Robotics for a Safer World (Interim); Commercialising Quantum Technology (Interim).

number of publications on average, reaching 784 in 2021/2022. It should be noted that not all Challenges are situated in sectors or funded in areas where a peer-reviewed publication is warranted. In addition, some Challenges may have produced proprietary information or may have focused efforts on capacity generation and training as opposed to knowledge generation. Therefore, evidence of new knowledge generation and knowledge exchange is not comparable across the ISCF.

Box 3. Challenge spotlight on knowledge creation³⁹

Data to Early Diagnosis

- **Aims:** The Challenge seeks to accelerate the application of research and health data to improve health outcomes and stimulate economic growth in the UK. Key objectives include fostering the growth of UK companies, attracting overseas investment, enhancing NHS efficiency and expanding the UK's market share in diagnostics and related industries.
- **Impact on knowledge creation:** Beyond making possible the publication of more than 100 papers by partners at the centres of excellence, which have enhanced the national reputation, the projects have also made data resources accessible. A notable example is the UK Biobank Whole Genome Sequencing (WGS) project, the single largest investment of the Challenge. It aims to sequence the genomes of 500,000 UK Biobank participants, making it the largest whole-genome dataset in the world. The creation of a cloud-based research analysis platform and the release of data from the first 200,000 genomes out of the 500,000 UK Biobank WGS participants in 2021 were significant milestones. These developments will provide scientists with critical information to support research into the genetic determinants of a wide range of health outcomes.
- **Barriers and enablers:** The COVID-19 pandemic caused disruptions and was a substantial barrier to the project, but it also increased the profile of WGS, helping to accelerate the development of data and tools. The decision to involve multiple sequencing providers instead of just one was crucial when one of the partners had to redirect its efforts towards public health services in response to the pandemic.

Some of the main enablers for this success, particularly in the UK Biobank WGS project, have been the collaborative approach and project-level governance. Although these elements posed challenges initially (negotiations between industry partners and the planning needed to formulate an initial strategy were complex and time consuming), the governance and collaboration mechanisms resulted in an effective framework for addressing technical challenges.

2.3 Stakeholder and public awareness

Evaluation question:

- To what extent has the ISCF leveraged knowledge and insights to create increased awareness and understanding among key stakeholders of new technologies and outputs addressing the Challenges?

Key summary of ISCF overall impact on stakeholder and public awareness

- The ISCF supported broad engagement with stakeholders across industry, academia and the wider public.
- Industry engagement, particularly accessing and integrating into relevant networks, enabled ISCF recognition and raised awareness of sectoral challenges and innovation opportunities.
- Challenge targets and aims acted as a useful unifying concept, supporting stakeholder engagement and public awareness in given sectors.
- Public engagement was relatively limited across the Fund, with Challenges having different levels of perceived readiness for wider engagement.

Table 4. Mapping of Fund-level metrics against metrics in Challenge evaluation reports (see Annex E, Table 9, for Challenge-level summaries from evaluation reports).

Challenge	Metrics in scope?	Evidence found in report?
Audience of the Future	Y	Y
Medicines Manufacturing	N	Y*
Data to Early Diagnosis	Y	Y
Commercialising Quantum Technology	Y	N
Digital Security by Design	Y	Y
Next Generation Services	Y	Y
Manufacturing Smarter Innovation	Y	Y
Robotics for a Safer World	N	Y*
Transforming Foundation Industries	N	Y*
Prospering from the Energy Revolution	Y	Y
Industrial Decarbonisation	Y	Y
Transforming Construction	Y	Y
Transforming Food Production	Y	Y
Smart Sustainable Plastic Packaging	Y	Y
Driving the Electric Revolution	N	N
Faraday Battery	Y	Y
Future Flight	Y	Y

*Metric not included in the framework, but evidence found in the report

The ISCF facilitated broad, cross-sector engagement with industry, academia, government and the public.

The ISCF has engaged with a range of key stakeholders, including industry, academia and the wider public, leading to raised awareness of ISCF technologies and outputs. Participation in ISCF supported projects to engage with relevant stakeholders through varied activities, including presentations, conferences, webinars,³⁷

³⁷ Next Generation Services (Final); Data to Early Diagnosis and Precision Medicine (Interim); Smart Sustainable Plastic Packaging (Interim).

knowledge-exchange and demonstration activities,³⁸ and public engagement events and exhibitions.³⁹ Across Challenges, stakeholder engagement largely focused on industry, with nearly all Challenges indicating industry engagement.

Industry engagement, particularly accessing and integrating into relevant networks, enabled ISCF recognition and raised awareness of sectoral challenges and innovation opportunities.

Accessing and integrating into relevant networks, enabled by the ISCF, was an effective mechanism for engagement with key industry stakeholders across the Fund. Engagement with networks supported validation and testing of tools, technologies and processes across multiple Challenges by providing access to ecosystems and infrastructure for testing project outputs. For example, the IDC reported that a connection with an industry partner provided access to a testing site, which allowed them to test and prove the applicability and scalability of their output.

Engagement with networks also supported new opportunities for growth in several Challenges by improving their understanding of commercial opportunities and identifying key contacts in relevant supply chains. For example, members of the AI for Services network (a network of innovative professionals and academics) found the network valuable, particularly in understanding commercial opportunities in applying AI and data solutions through the Next Generation Services Challenge and providing a platform for the sharing of knowledge and the sharing of learnings about the programme.⁴⁰ The Digital Catapult (which collaborated with and received funding from the Challenge) also worked to attract and recruit early adopters for apprentices and new standards to enable organic growth in demand and penetration across industries.

For some Challenges, broad sector engagement, enabled by networks, was important for raising awareness about the Challenge. For example, the Smart Sustainable Plastic Packaging Challenge saw increased interest from retailers and plastic manufacturers as a result of sector-wide engagement, resulting in raised awareness and understanding of environmental impacts among the public, retailers and manufacturers.⁴¹ Similarly, 85% of participants stated that the Next Generation Services Challenge led to further thinking around the skills needed in their organisation going forward.⁴²

Box 4. Challenge spotlight on stakeholder and public awareness^{43,44}

Digital Security by Design

- **Aim:** The Digital Security by Design (DSBD) Challenge supports enhancements to the UK's digital infrastructure through the development of secure hardware and software systems. The DSBD Challenge aims to create a safer digital environment and promote a proactive approach to cybersecurity across various sectors.

³⁸ Transforming Food Production (Interim).

³⁹ Data to Early Diagnosis and Precision Medicine (Interim).

⁴⁰ Next Generation Services (Final).

⁴¹ Smart Sustainable Plastic Packaging (Interim).

⁴² Next Generation Services (Final).

⁴³ Digital Security by Design (Mid-term Report, 2023).

⁴⁴ Digital Security by Design (Interim).

- **Impact on stakeholder and public awareness:** The DSBD Challenge demonstrated improved awareness among industry, government and business stakeholders. The engagement with industry has increased the confidence in DSBD technologies, creating a successful ecosystem for early testing and adoption of technology. An example of this is the Morello Board, a real-world test platform developed by Arm, which enables companies to access cutting-edge cyber security technology, potentially providing them with the experience needed to have a greater competitive advantage in the cyber secure by design landscape. Moreover, since 2020, the use of Google hits of key search terms related to the Challenge, such as 'DSbDtech' has grown over time, which shows increased general awareness of the Challenge in the sector.

This level of engagement was achieved by focusing on the UK tech community and its awareness of the programme early in the Challenge, through the DSBD communications team, the Economic and Social Research Council (ESRC) Hub+ and the Digital Catapult, which began in November 2021. The DSBD Challenge has also been successful in establishing good links between government and the Programme Board, which has led to DSBD technology being featured in recent UK strategies.

- **Barriers and outlook:** While the testing ecosystem is functioning effectively, as in the case of the Morello Board, there is still a significant need to increase awareness of cyber- and digital-security threats and market failures. Additionally, it is crucial to enhance the understanding of DSBD and its advantages and to encourage cooperative efforts in creating new products and services.

The continued development of awareness is necessary to increase commercial demand and capabilities, by engaging with sectors that have a significant strategic need and are ready to adopt and further develop DSBD technology. Beyond continuing to build relationships with the UK government and ensuring that DSBD is on the UK research agenda, engaging with international stakeholders will facilitate the response to global opportunities for the UK. Public awareness is a necessary but long-term goal and is still limited at this point in the programme, as there are currently no products that can be purchased by customers.

Challenge targets and aims acted as a unifying point for stakeholders, supporting engagement, network formation and strengthening, and wider awareness.

Some Challenges noted the unifying effect of the Challenge targets and aims, which were enablers of stakeholder engagement. For example, the Faraday Battery Challenge reported that the targets were important for awareness raising about the Challenge and served as a useful basis for engagement and discussion on topics important to the Challenge, including battery safety, performance and efficiency.⁴⁵ The Challenges were also seen as a signal of government commitment supporting industry confidence and investment, including de-risking private investment; reducing technical barriers through demonstration and knowledge generation and sharing; and promoting collaboration – particularly through embedding industry into the Challenges.⁴⁶ This is supported by reporting on private investment for the battery sector, for example: UKRI analysis of private funding shows a jump in total private investments in battery technology from £33m in 2017, to £66m in 2019 following the establishment of the Faraday Battery Challenge in 2017 – primarily focused on seed and venture funding.⁴⁷ As of June 2024, the UK ranks third globally in battery investment markets (compared with tenth in 2017), although the report attributes this primarily to the UK's energy market design.⁴⁸

⁴⁵ Faraday Battery (Interim).

⁴⁶ Industrial Decarbonisation (Interim).

⁴⁷ Beauhurst (2021), [The Investment Battery Gap](#).

⁴⁸ de Giovanni and Warren, "Four Factors to Guide Investment in Battery Storage"; Warren, "Renewable Energy Country Attractiveness Index 2017."

Engagement with academic stakeholders supported knowledge generation and capacity building.

While a large proportion of engagement observed was geared towards industry, engagement with academic stakeholders was a core aspect of several Challenges. Many of these Challenges engaged academic stakeholders for knowledge-generation or knowledge-sharing purposes. In addition, some Challenges had productive cross-industry and academia collaboration, enabling cross-pollination of ideas and expertise. For example, the DSBD Challenge developed a collaboration between academia and industry that was built into the Challenge workstreams, resulting in a mixture of academic and industry-led investigation of the technology. Where academic engagement was more focused, it was primarily for the purpose of capacity building and upskilling. For instance, the AI in English Law project, which forms part of the Next Generation Services Challenge, contributed to the establishment of a new interdisciplinary master's course at the University of Oxford.

Despite a number of strong examples of knowledge sharing and creation with academic stakeholders and industry, the extent to which Challenges exchanged knowledge between Challenges is unclear. Collaboration between Challenges was not highlighted in the Challenge evaluation reports, but this may be an area to explore in the final part of the evaluation.

Public awareness was limited across the ISCF in comparison to academic and industry engagement.

Few Challenges noted specific engagement with the wider public. Challenges that did engage the wider public did so through engagement events, 'a citizens jury' and exhibitions. Demonstration and exhibition events, including those aimed at industry, also supported wider public engagement. While there was significantly less detail on public awareness across Challenges, a notable example came from the Audience of the Future Challenge, which reached a total audience of 2.38 million, primarily through the eSports Demonstrator. The evaluation report did not detail precisely how this was achieved. In addition, analysis of the Clean Growth cluster suggested that the Fund provided a platform to demonstrate technologies, thereby increasing awareness and understanding of technologies among businesses, which helped build investment confidence in the technologies and generated customer interest in turn.

Challenges varied in their perceived readiness for engagement with the wider public.

While stakeholder engagement across ISCF as a whole was comprehensive, it was thought that at a Challenge level, some were better equipped to engage with the wider public. For instance, some Challenges and projects, such as the DSBD, thought that they were too far removed from the public consciousness to engage members of the public meaningfully, while the Faraday Battery Challenge thought it was able to engage with the public due to the establishment of an academic research institute, the Faraday Institution.⁴⁹ By contrast, the Transforming Construction Challenge thought that among relevant stakeholders there was high awareness of concepts relevant to the Challenge, but that the Challenge was nonetheless important for increasing awareness around specific concepts and their potential, particularly among government stakeholders. Finally, some Challenges undertook dedicated efforts to support engagement with the wider

⁴⁹ ISCF Interim Impact Workshop.

public. For example, the Future Flight Challenge focused its social science research activities on understanding and influencing public acceptance for future flight technologies, to influence uptake of these. This included appointing a team of academics, articulating priorities and gathering evidence on public attitudes.

2.4 Informing policy

Evaluation questions:

- To what extent has the ISCF contributed to evidence-based policymaking surrounding the Challenges?
- To what extent has the ISCF enhanced understanding of the effectiveness of mission-oriented R&I programmes and informed more effective policymaking for mission-oriented goals?

Key summary of ISCF overall impact on informing policy

- The ISCF engaged with policymakers and regulatory authorities across sectors in the UK and abroad.
- ISCF structures, particularly designated leaders, such as Challenge directors, supported policy engagement and facilitated interactions with policymakers through acting as a single point of contact for the Challenges.
- The ISCF has contributed to evidence-based policymaking surrounding the Challenges, including strategies, regulatory guidance and frameworks, strategic direction, standards and government policy.
- The ISCF has informed policymaking for mission-oriented goals through raising awareness of the UK's areas of strength.

Table 5. Mapping of Fund-level metrics against metrics in Challenge evaluation reports (see Annex E, Table 10, for Challenge-level summaries from evaluation reports).

Challenge	Metrics in scope?	Evidence found in report?
Audience of the Future	Y	Y
Medicines Manufacturing	Y	Y
Data to Early Diagnosis	N	Y*
Commercialising Quantum Technology	N	N
Digital Security by Design	Y	Y
Next Generation Services	Y	Y
Manufacturing Smarter Innovation	N	N
Robotics for a Safer World	N	Y*
Transforming Foundation Industries	N	N
Prospering from the Energy Revolution	Y	Y
Industrial Decarbonisation	Y	Y

Transforming Construction	Y	Y
Transforming Food Production	N	Y*
Smart Sustainable Plastic Packaging	Y	Y
Driving the Electric Revolution	N	Y*
Faraday Battery	Y	Y
Future Flight	Y	Y

*Metric not included in the framework, but evidence found in the report

The ISCF has been successful in engaging with a range of policymakers and regulatory authorities, contributing to policy influence across multiple sectors in the UK and internationally.

The ISCF has contributed to engagement with policymakers and regulators and influenced policymaking across the Challenge areas. Engagement with policymakers and regulatory authorities took many forms, including attending events and participating in committee meetings and advisory groups – building on the baseline level of informing policy.⁵⁰ Notably, multiple Challenges provided evidence to government reviews and consultations, participated in advisory committees, and contributed evidence to policy documents (Box 5).⁵¹

Challenges reported engaging with policymakers and regulatory authorities across sectors. This has included engagement with government departments, such as the Department for Science, Innovation and Technology (DSIT) and the Department for Environment, Food and Rural Affairs (Defra), and with arms-length bodies and regulators, such as the Office of Gas and Electricity Markets (Ofgem) and the National Institute for Health and Care Excellence (NICE). Some of the engagement activities have led to wider interactions and continued relationships within government bodies. For instance, through the Prospering from the Energy Revolution Challenge, regular engagement with stakeholders at Ofgem has led to Ofgem and UKRI partnering on the Strategic Innovation Fund.

There was also evidence of wider engagement outside of the UK. Projects within the Next Generation Services Challenge reported wider policy influence in Europe, providing written and expert stakeholder evidence to European consultations and committees.

ISCF structures, including Challenge directors and advisory boards, supported policy engagement and influence.

The ISCF provided structures that enabled engagement with policy actors, supporting broader policy influence and addressing one of the barriers noted at baseline ('lack of coordination between policy

⁵⁰ ISCF [Baseline Report](#).

⁵¹ Next Generation Services (Final); Robotics for a Safer World (Interim); Medicines Manufacturing (Final); Prospering from the Energy Revolution (Interim).

actors').⁵² In some cases, the Challenge Director played a significant role. For example, the Challenge Director of Next Generation Services was involved in the steering group for the LawTechUK Sandbox activity, funded by the Ministry of Justice. Similarly, the Challenge Director of the MMC, alongside the Vaccine Manufacturing and Innovation Centre (VMIC) team, supported the work of the Vaccine Taskforce. In this instance, the role of the Challenge Director was seen as a valuable and clear, single point of contact for coordinating and streamlining communication between the Challenge and regulatory stakeholders. Other designated positions within Challenges, including technical leads and monitoring officers, were similarly valued in organising and communication efforts.

Other structures within the Challenges also supported policy engagement. For example, within the DSBD Challenge, links to government were provided through the Programme Board and advisory group members, and for the MMC, the ATTC network enabled engagement with the UK regulatory community, including NICE, the Medicines and Healthcare Products Regulatory Agency (MHRA), the Human Tissue Authority (HTA) and the Health Research Authority, as well as the Regulatory Advice Service for Regenerative Medicine. Overall, engagement with policymakers came via multiple channels and mechanisms established in the ISCF.

The ISCF has had an influence on policymaking through various input mechanisms.

In terms of outcomes, there were several examples across the Challenges of an influence on policymaking. This included being featured in government or regulatory body strategies,⁵³ regulatory guidance and frameworks,⁵⁴ supporting strategic direction for parts of the sector,⁵⁵ improving standards,⁵⁶ and informing government policy.⁵⁷ The Energy Systems and Clean Growth clusters appear to have been particularly impactful in their influence. For example, the Prospering from the Energy Revolution Challenge was quite successful in showcasing outcomes of the Challenge's influence through the launch of the Energy Data Taskforce (EDT) and influence on the Ofgem regulation on sharing and accessing data in the energy sector.⁵⁸ Work by the EDT was cited in policy initiatives, and the former department BEIS, alongside Ofgem, committed to implementing recommendations on the back of this work.⁵⁹ The work undertaken was also thought to be influential in the drafting of strategies, such as the Energy Digitalisation Strategy, and engagement with the National Infrastructure Bank to support financing plans for energy projects.

⁵² ISCF [Baseline Report](#).

⁵³ Prospering from the Energy Revolution (Interim); Digital Security by Design (Interim).

⁵⁴ Medicines Manufacturing (Final); Future Flight (Interim).

⁵⁵ Transforming Food Production (Interim).

⁵⁶ Transforming Construction (Final).

⁵⁷ Future Flight (Interim); Prospering from the Energy Revolution (Interim).

⁵⁸ Prospering from the Energy Revolution (Interim).

⁵⁹ Prospering from the Energy Revolution (Interim).

Policy stakeholders had positive perceptions of the Challenges and their activities in the policy arena.

Although sparse evidence was captured across the Challenge evaluations on the direct perceptions of stakeholders in terms of influencing policy (i.e. whether policy stakeholders perceived, or were aware, that Challenges had influenced policy), it was generally positive. There was evidence that the Challenges brought together influential and informed senior leaders, which further supported credibility in conversations with government stakeholders. The links that the Challenges provided between policymakers and industry were also seen as positive. The Future Flight Challenge was seen as bridging a communication gap and acting as an intermediary among the government, regulators (Civil Aviation Authority (CAA)) and industry. Government stakeholders valued the Future Flight Challenge gathering and distilling information from the varied and diverse industry stakeholders. In addition, some of the engagement activities have led to wider interactions and continued relationships within government bodies. Through the Prospering from the Energy Revolution Challenge, regular engagement with stakeholders at Ofgem has led to Ofgem and UKRI partnering on the Strategic Innovation Fund, for instance.

Box 5. Challenge spotlight on informing policy³⁸

Transforming Food Production

- **Aim:** The Transforming Food Production (TFP) Challenge aims to support innovative methods for producing resilient and sustainable food efficiently, while reducing emissions, pollution and waste and improving soil quality, in order to meet the growing global food demand and achieve net-zero emissions by 2040.
- **Impact on informing policy:** The Challenge involved various engagement activities with policymakers and regulators, including collaborations with the Department for International Trade, local Growth Hubs, Defra, and such organisations as the John Innes Centre. Two projects established advisory boards to engage with the agri-food sector. There is evidence that the Challenge positively influenced policy and fostered partnerships with Defra, raising awareness and demonstrating the benefits of innovation investments. There is also evidence that the Challenge helped secure Defra's financial commitment to the Farming Innovation Programme and promoted better policy alignment through Defra's participation in the TFP Programme Board. The projects were linked to broader UKRI/Department of International Trade offerings, enhancing the visibility of TFP-funded initiatives. The TFP team also worked with regulatory bodies to help commercialise new products, contributing to the sector's strategic direction (e.g. the collaborative development of the Alternative Proteins Roadmap).
- **Barriers and enablers to informing policy:** The full impact of the strategic activities mentioned above is still being assessed. There were mixed opinions on the Challenge's influence; limited awareness of TFP across the sector was indicative of the potential to further elevate the programme's influence. Other challenges included the limited capacity of the Challenge team, COVID-19, Brexit and the war in Ukraine. Additionally, the Challenge faced issues with design and delivery, including a £13m budget cut from the TFP and bureaucratic obstacles within UKRI, specifically regarding the competition process. Minor delays can have a significant impact, because competition timings are crucial for the agri-food sector; delays could mean waiting for the next growing season and losing a year of data collection.

Several aspects of TFP's design and implementation have facilitated progress, including its large scale; adaptability; robust management; collaborative approach; emphasis on industry and end-user engagement; and allocated funding for demonstrations, dissemination and market engagement.

The ISCF contributed to wider awareness of Challenges in the policy landscape, highlighting the UK's areas of strength and supporting additional investment.

Challenges were seen to raise awareness and strengthen the policy landscape for their respective areas, compared with baseline assessment, which highlighted gaps in understanding and awareness around

Challenge areas.⁶⁰ In terms of strengthening the landscape, the Faraday Battery Challenge was seen to showcase the UK's strength in applied research, positively influencing the policy landscape for batteries. For example, research into electric vehicles and battery production was influential in leading to the establishment of the Automotive Transformation Fund (ATF).⁶¹ Having been influenced in its creation by the Challenge, the ATF is thought to have provided a platform for automotive companies and other stakeholders in UK battery manufacturing to communicate with government on issues related to the battery value chain. The ATF was considered as a key attractor for UK battery manufacturing and provided a basis for global discussions on related topics. Separately, increased public investment through the Challenges has raised awareness of government interest in these areas; this helped to secure additional financial commitments or matched funding (see Chapter 3.1 for discussions on investments, private funding and enabling mechanisms).

⁶⁰ ISCF [Baseline Report](#).

⁶¹ Faraday Battery (Interim).

3. Capacity and investment

This chapter presents findings relating to capacity generation and investment-focused outcomes, specifically assessing **infrastructure, skills, diversity and employment**.

3.1 Investment

Evaluation questions:

- To what extent has the ISCF increased UK businesses' investment in R&D?
- To what extent has the ISCF increased overseas investment in R&D in the UK?
- How much additional public and private R&D investment has the ISCF contributed towards the R&D investment target of 2.4% of GDP by 2027?
- To what extent has research supported by the ISCF opened up new avenues of investment (de-risking)?

Key summary of ISCF overall impact on investment

- The ISCF has significantly increased UK business investment in R&D, having catalysed £4.65bn in co-investment to date, surpassing the £2.82bn target as self-reported by projects.⁶² This amount equates to 15% of UK's 2.4% R&D investment target based on 2023 GDP figures; however, we cannot determine the cost effectiveness of the intervention given that the counterfactual is unknown.⁶³
- The ISCF has leveraged some overseas investment despite some broader market disincentives; however, information on amount of investment leveraged is not available for all the Challenges or the Fund. There is anecdotal evidence on amount of investment leveraged from overseas; however, this is likely an underrepresentation due to gaps in data collection. Attribution of this investment to the Fund is not definitive; engagement with companies with a global footprint could have masked overseas investment benefits.
- Overseas engagement also produced non-monetisable benefits, such as cultivating strong relationships and networks.
- There were early indications that the ISCF enabled de-risking investment from industry into high-risk sectors by facilitating private co-investment. This provided access to key skills and infrastructure, as well as capabilities to test concepts and low-TRL products and to support maturity and commercialisation of risky technologies.

Table 6. Mapping of Fund-level metrics against metrics in Challenge evaluation reports (see Annex E, Table 11, for Challenge-level summaries from evaluation reports).

Challenge	Metrics in scope?	Evidence found in report?
Audience of the Future	Y	Y
Medicines Manufacturing	Y	Y
Data to Early Diagnosis	Y	Y

⁶² "SCF Portfolio Performance Report (Q2, FY23/24).

⁶³ 2.4% of UK GDP for 2023 was reported to be approximately £54.5 bn.

Commercialising Quantum Technology	Y	Y
Digital Security by Design	Y	Y
Next Generation Services	Y	Y
Manufacturing Smarter Innovation	Y	Y
Robotics for a Safer World	Y	Y
Transforming Foundation Industries	Y	Y
Prospering from the Energy Revolution	Y	Y
Industrial Decarbonisation	Y	Y
Transforming Construction	Y	Y
Transforming Food Production	Y	Y
Smart Sustainable Plastic Packaging	Y	Y
Driving the Electric Revolution	Y	Y
Faraday Battery	Y	Y
Future Flight	Y	Y

The ISCF has generated significant investments from public and private sectors across a range of industrial sectors, signalling growth.

Across the Fund, there has been an increase in R&D spend as a result of the ISCF, which has been achieved through matched funding and co-investments. The ISCF has enabled an increase in R&D spend across the public and private sectors, with most programmes reporting co-investment exceeding forecasted targets. Namely, the Fund has catalysed £4.65bn in co-investment to date, surpassing the £2.82bn co-investment target.⁶⁴ According to internal, self-reported data, the Fund is on track to realise a forecasted £8.19bn by 2025. The pledged and realised investment in the Fund has thus surpassed the investment by the government in the ISCF (£2.6bn). This is a significant achievement for the Fund given the boost in R&I initiatives and the negative impacts on productivity and skills shortages that the UK has experienced due to lower investments⁶⁵ (see Chapter 5 for further discussion on productivity). Box 6 highlights examples of Challenge-level evidence on investments.

While the Challenges catalysed investments and R&D spend broadly, in some sectors the Challenges represented a significant proportion of the sector itself where ISCF had acted as a primary driver for further investment. For instance, Prospering from the Energy Revolution firms collectively raised £874.3m in funding from external investors, representing about 40% of the £2.2bn total equity investment in the UK

⁶⁴ ISCF Portfolio Performance Report (Q2, FY23/24).

⁶⁵ Van Reenen and Yang (2023), “Cracking the Productivity Code.”

between 2019 and 2021.⁶⁶ The increased investment has, in turn, led to an increase in UK interests, including the establishment of the Cummins Innovation Centre to increase the Challenge's footprint in the UK, and acquisition of electric propulsion businesses through engagement within the DER Challenge.⁶⁷

Box 6. Cluster spotlight on investment and private funding⁶⁸

Data and Digital Technology cluster

Challenges in the Data and Digital Technology cluster aimed to put the UK at the forefront of AI and data revolution. The nine Challenges within this cluster align with the original Grand Challenge on Artificial Intelligence and Data Economy. The cluster consists of the following Challenges: Manufacturing Smarter Innovations, Data to Early Diagnosis, Next Generation Services, Commercialising Quantum Technologies, Audience of the Future, Robotics for a Safer World, Accelerating Detection of Disease, Healthy Ageing and DSBD. For a summary of Challenge aims, see Table 1. *Note that not all Challenges in this cluster have been analysed at present, since their evaluations have not concluded.*

Impact on investment and private funding: Our analysis indicates that the Data and Digital Technology cluster is expected to bring approximately £450m in private matched funding across the nine Challenges. The Manufacturing Smarter Innovations Challenge is expected to raise £162m from industry sources, while the Data to Early Diagnosis Challenge has leveraged more than £175m in matched funding. More than £64m in private matched funding was secured under the Commercialising Quantum Technologies Challenge, providing essential support to start-up companies. An additional project investment of £28m was secured within the Next Generation Services Challenge. For successful applicants, their participation in the Challenge facilitated advancements to technology readiness, improving their ability to attract private sector attention.

Some Challenges bucked the wider sector trend to generate investments while the overall sector was in decline, showcasing the protective effect of ISCF funding.

Some areas, including health- and creative industry-related Challenges and the Next Generation Services Challenge, were highlighted in the baseline assessment as being under-resourced or had struggled to access public funds.⁶⁹ Where the UK sector itself was experiencing a decline in overall spend and investment (for example the creative/immersive sector experienced a 17% decline in R&D spend between 2019 and 2022), the firms associated with the Audience of the Future Challenge bucked the trend and saw increased levels of spend or maintained spend compared with firms not associated with the Challenge.⁷⁰

International interest and engagement increased as a result of the Fund; however, some market disincentives appeared to limit foreign investment.

Some Challenges reported international investment, and a large number of Challenges reported generation of international interest in a variety of sectors, such as medicines manufacturing and smarter energy systems. While the amount of actual funding committed from international sources remains relatively small, as

⁶⁶ Prospering from the Energy Revolution (Interim).

⁶⁷ Driving the Electric Revolution (Interim).

⁶⁸ Manufacturing Smarter Innovation (Interim); Data to Early Diagnosis (Interim); Commercialising Quantum Technologies (Interim); Next Generation Services (Final).

⁶⁹ ISCF [Baseline Report](#).

⁷⁰ Audience of the Future (Final); ISCF [Baseline Report](#).

evidenced by the Challenge evaluations,⁷¹ notable examples of foreign investment include the Medicines Manufacturing R&D, which has seen large-scale investments by Big Health and by Fujifilm Corporation in diagnostics and gene therapy capacity (totalling more than £450m). The robotics sector also saw investments of £0.5m, from Europe and China.⁷²

Box 7. Challenge spotlight on international engagement⁷³

Faraday Battery Challenge

- **Aims:** The Faraday Battery Challenge (FBC) aims to drive the growth of a strong battery business in the UK through the development of battery technologies that are cost effective, high performing, long lasting, safe and recyclable. It also aspires to support the UK automotive supply chain in meeting deadlines for zero-emission vehicles.
- **Impact on international engagement:** The Challenge has facilitated industry engagements between organisations with significant global footprint since 2018. For example, £7m was allocated to fund international engagements in Australia and Germany under the FBC national skills framework.⁷⁴ The rise of battery-related publications involving UK and international experts further indicates increased opportunities for international engagement.

There appears to be a perception among Challenge stakeholders that there are market disincentives for foreign investors to physically set up offices, primarily linked to high costs and an unclear or at times challenging route to market. These disincentives are especially relevant for sectors where physical presence is not required and remote data access could be facilitated, limiting the need to invest in local infrastructure. The other factor cited is that the cost of business is higher than what investors are willing to pay and could be considered not very competitive in the global landscape.⁷⁵ This, however, is a general trend noted in the UK economy, and multiple government strategies and initiatives are focused on supporting international investment and talent mobility.⁷⁶

The ISCF enabled successful mechanisms to open up new avenues of investment through de-risking investments from industry into high-risk sectors.

Several ISCF sectors were regarded as high risk at baseline, driven by lack of R&D support and fragmented funding.⁷⁷ The ISCF was seen as pivotal by industry stakeholders in de-risking investment from industry into high-risk sectors by enabling private co-investment, providing access to key skills and infrastructure, and providing platforms for testing concepts and low-TRL products to increase technology maturity and

⁷¹ Data to Early Diagnosis and Precision Medicine (Interim); Robotics for a Safer World (Interim); Driving the Electric Revolution (Interim); Faraday Battery (Interim); Prospering from the Energy Revolution (Interim); Transforming Food Production (Interim); Smart Sustainable Plastic Packaging (Interim); Medicines Manufacturing (Final).

⁷² Robotics for a Safer World (Interim).

⁷³ Faraday Battery Challenge (Interim).

⁷⁴ ISCF Interim Impact Workshop.

⁷⁵ Data to Early Diagnosis (Interim); Faraday Battery (Interim).

⁷⁶ DSIT, [The UKs International Technology Strategy](#), 2023; UKRI, [Supporting Global Innovation](#) (accessed 2024); UKRI, [International Strategic Framework](#) (accessed 2024).

⁷⁷ ISCF [Baseline Report](#).

commercialisation. This appeared to create a snowballing effect of positive investments, whereby government and private sector buy-in created further investor confidence, opening new avenues of investment, including internationally.

Examples of further investment due to de-risking can be seen across the Fund, with many Challenges noting changing industry perceptions due to de-risking of technologies, and the ISCF was viewed as a signal from the government to stimulate growth in these areas.⁷⁸ For instance, the Robotics for a Safer World Challenge worked across sectors that represent a highly risk averse ecosystem in critical areas, such as offshore energy, nuclear and space. The mechanisms that have enabled R&D activity and private investments have primarily been ISCF funding instruments; these included research hubs, which acted as sector aggregators to improve the visibility and coordination of activities in the field.⁷⁹

Box 8. Challenge spotlight on generating investor confidence and new routes to market⁸⁰

Industrial Decarbonisation

- **Aims:** The Industrial Decarbonisation Challenge (IDC) aims to contribute to the UK's drive for clean growth through the development and deployment of new technologies, such as carbon capture, utilisation and storage and hydrogen fuel switching.
- **Impact on investor confidence and new routes to market:** Investments into industrial decarbonisation were earlier hindered by unclear or unstructured routes to commercialisation of developed technologies. IDC has promoted 'industry confidence' and increased investments by consolidating past and active funding inflows in the sector. The Challenge adopted a broad, sector-level approach to avoid narrow focus on individual technologies, thereby also catalysing new opportunities for growth. For instance, the Net Zero Teesside project estimated additional investment of £1.7bn from the private sector towards clean energy for the Net Zero Industrial cluster.

Multiple stakeholders from industry, academia and projects funded under Challenges stated that private investments would not have happened if not for the ISCF infrastructure and initial investment because that was a sign of government interest at large.⁸¹ Private co-investment itself was seen as a new route to market and a mechanism to de-risk investing in technologies in the digital security space, for instance.⁸² There has been a notable mention of ISCF across multiple Challenges in providing access to key skills and infrastructure, testing concepts, and low-TRL products, which went a long way to de-risk research and investment in multiple sectors.

⁷⁸ All Challenges.

⁷⁹ Robotics for a Safer World (Interim).

⁸⁰ Prospering from the Energy Revolution (Interim); Industrial Decarbonisation (Interim).

⁸¹ ISCF Interim Impact Workshop.

⁸² Digital Security by Design (Interim).

3.2 Geographic reach of investment and impact

Evaluation questions:

- While the ISCF is place-agnostic, to what extent have the Fund's investment and activities been widely distributed across the UK?
- While the ISCF is place-agnostic, to what extent have the impacts of the ISCF been widely distributed across the UK?

Key summary of ISCF overall impact on geographic reach of investment and impact

- To date, the greatest proportion of grants offered occurred in the nomenclature of units for territorial statistics (NUTS) regions South East (27.1%), West Midlands (14.4%), London (12.9%), East Midlands (9.2%) and North West (7.9%); however, a broad dispersion of investments and activities was noted across the Fund, in alignment with the UK government's Levelling Up agenda.
- The impact of these investments and activities have not been tracked in a place-based manner beyond anecdotal evidence of capacity upskilling and catalysing industry growth in those regions.

Table 7. Mapping of Fund-level metrics against metrics in Challenge evaluation reports (see Annex E, Table 12, for Challenge-level summaries from evaluation reports).

Challenge	Metrics in scope?	Evidence found in report?
Audience of the Future	Y	Y
Medicines Manufacturing	Y	Y
Data to Early Diagnosis	N	N
Commercialising Quantum Technology	N	N
Digital Security by Design	N	N
Next Generation Services	Y	Y
Manufacturing Smarter Innovation	Y	Y
Robotics for a Safer World	Y	Y
Transforming Foundation Industries	Y	Y
Prospering from the Energy Revolution	Y	Y
Industrial Decarbonisation	Y	Y
Transforming Construction	N	N
Transforming Food Production	N	N
Smart Sustainable Plastic Packaging	N	N
Driving the Electric Revolution	Y	Y
Faraday Battery	Y	N
Future Flight	Y	Y

For six Challenges, assessment of the geographic reach of investment was not in scope in the Challenge evaluation. Analysis focuses on Challenges where this indicator was considered.

The ISCF had a mixed portfolio of geographically dispersed funding and regional impacts, with skills shortages acting as a barrier to promoting further regional growth.

Fund-level data from UKRI show that while funding continues to be concentrated in London and the South East, investment is increasingly observed in other regions, namely the North West and the West Midlands (Figure 5).⁸³ To date, the greatest proportion of grants offered were in the South East (27.1%), the West Midlands (14.4%), London (12.9%), the East Midlands (9.2%) and the North West (7.9%).⁸⁴ The proportion of grants offered in the West Midlands is nearly equal to that in the South East, when the proportion of funding received is normalised by the number of business in the region claiming R&D tax credits.⁸⁵ The geographic distribution of ISCF grants varies from that of IUK investment reported at baseline. IUK investment in financial year 2018/2019 was greatest in the West Midlands (14.1% of a total GBP 941 million), the South East (13.7%), London (13.3%) and the South West (12.3%).⁸⁶ While ISCF investment shows some geographic dispersion in alignment with the UK government's Levelling Up agenda, it is unclear from the data available whether investment spend and impacts are similarly distributed across regions, as registered postcodes for funding allocations may not accurately reflect where investment is operationalised.

Around half of the Challenges analysed in this report mentioned regional distribution of activities. While some Challenges were heavily operational in the South of England, including London, many were focused on wider geographic distribution to support the UK government's Levelling Up agenda.⁸⁷ Most of this transpired as a result of pre-existing hubs of activities and skills where Challenges congregated. In addition, given the positive impacts captured more generally across a range of indicators relating to capacity and skills, knowledge generation, investment, etc., it is expected that these impacts would have been operationalised to some degree in the regions where investment has occurred. However, regional impacts have not been specifically captured in a place-based manner beyond anecdotal evidence of capacity development and industry engagement. A Fund-level assessment of regional investment and impacts is not possible in this evaluation without consistent and specific data capture.

⁸³ ISCF Portfolio Performance Report (Q2, FY23/24).

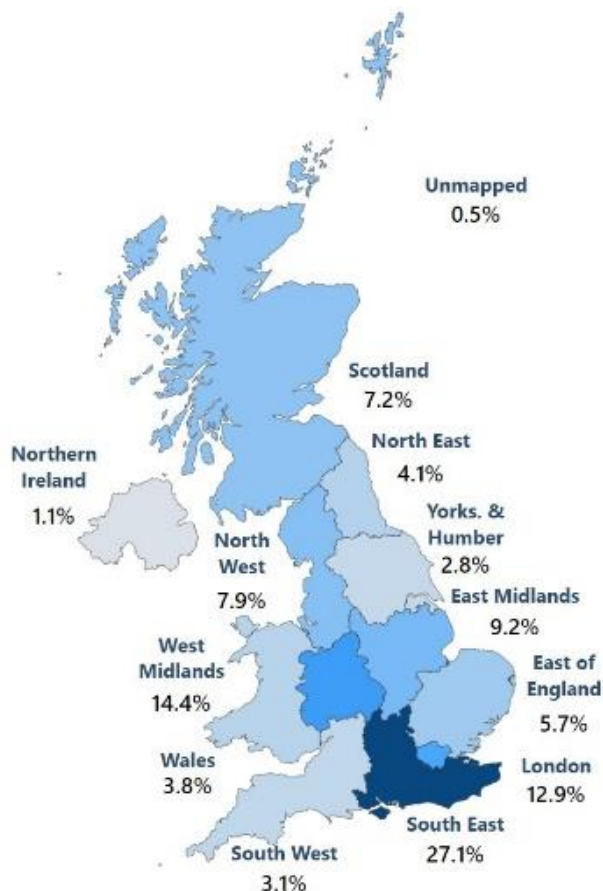
⁸⁴ ISCF Portfolio Performance Report (Q2, FY23/24).

⁸⁵ ISCF Portfolio Performance Report (Q2, FY23/24).

⁸⁶ ISCF [Baseline Report](#). In figures, this equates to IUK funding in the West Midlands (£133m), the South East (£129m), London (£125m) and the South West (£116m).

⁸⁷ Robotics for a Safer World (Interim); Industrial Decarbonisation (Interim); Medicines Manufacturing (Final); Future Flight (Interim); Driving the Electric Revolution (Interim); Manufacturing Smarter Innovation (Interim); Transforming Foundation Industries (Interim); Audience of the Future (Final).

Figure 5. The geographic distribution of ISCF grants offered to date (% of total) for all NUTS 1 regions.⁸⁸



Box 9. Spotlight on geographical distribution of investment⁸⁹

Health cluster

Challenges in this cluster include Medicines Manufacturing, Accelerating Detection of Disease, Data to Early Diagnosis, and Healthy Ageing. For a summary of Challenge aims, see Table 1.

Challenges in the Health cluster identified the need to deliver regional growth through concentrated efforts addressing the gap in key skills. Our analysis highlighted that skills supply has been a limitation outside of the NUTS regions London and South East. The MMC represents a significant exception on this parameter, highlighting ways of improving. It succeeded in stimulating regional growth through investments in capacity building. It also funded innovation and treatment centres that were established beyond the core centres of excellence, supporting wider access to medical technologies and therapies.

Data and Digital Technology cluster

Challenges in this cluster include Commercialising Quantum Technologies, DSBD, Next Generation Services, Robotics for a Safer World, Audience of the Future, Manufacturing Smarter Innovation, Accelerating Detection of Disease, Data to Early Diagnosis, and Healthy Ageing. For a summary of Challenge aims, see Table 1.

⁸⁸ ISCF Portfolio Performance Report (Q2, FY23/24).

⁸⁹ All Challenges.

The Data and Digital Technology cluster was substantively active in the London and South East regions. While projects were well distributed across the UK, these two regions accounted for the highest number of workforce and collaborators. For instance, within the Robotics for a Safer World Challenge, University of Southampton generated the highest volume of publication-based outputs. Similarly, most impactful citation-based outputs were produced by the University of Sheffield and the National Energy Research Council British Antarctic Survey. More than one third of all companies engaged by the Audience of the Future Challenge were also based in London, highlighting a concentration of the sector in this region.

Clean Growth cluster

Challenges in this cluster include Low Cost Nuclear, Transforming Foundation Industries, Prospering from the Energy Revolution, Robotics for a Safer World, Industrial Decarbonisation, TFP, Smart Sustainable Plastic Packaging, DER and Farraday Battery. For a summary of Challenge aims, see Table 1.

The Clean Growth cluster contributed to its net-zero ambitions by offering opportunities for retraining and upskilling to relevant workforce populations. IDC's portfolio was well distributed, including projects from the regions North West, Scotland, Yorkshire and the Humber, Teesside, Black Country and South Wales. Similarly, most businesses under the Transforming Foundation Industries Challenge were located in Yorkshire and Humber, North West, and Wales, indicating wider regional spread of the projects and organisations engaged. The allocation of funding under the DER Challenge was also regionally balanced, with 27% of the funds assigned to West Midlands, and with London and South East region receiving only 10% each.

Box 10. Challenge spotlight on barriers and enablers to geographic distribution of investment⁹⁰

Barriers – Medicines Manufacturing

The MMC aimed to advance the UK's position as a world leader in the manufacturing of medicines and delivery of novel treatments. Specific projects within the Challenge aspired to deliver a wide range of highly skilled manufacturing jobs outside of the London and South East regions. To this end, training courses on clinical administration were created to build capabilities. For example, the Advance Therapies Apprenticeship scheme was established to actively expand on existing clinical skill levels. Despite the success of these programmes, skills gaps outside of London affected their efforts for balanced regional growth. Additional investments are needed to strengthen, sustain and scale up the skills base established through this Challenge.

Enablers – Driving the Electric Revolution

The main objective of DER Challenge was to support the UK's push towards a net-zero carbon economy and clean technology supply chains through investments in electrification technologies. The Challenge successfully balanced a wide distribution of funds, catering to sector-significant automotive regions, such as the West Midlands, the South West, Scotland, the North East and Wales. Their emphasis on these regions built additional capacity among workforces facing the danger of obsolescence due to net-zero targets. Capacity-building programmes for retraining and upskilling of organisations and people were implemented to fulfil this objective.

⁹⁰ Medicines Manufacturing (Final); Driving the Electric Revolution (Interim).

3.3 Capacity

Evaluation questions:

- To what extent and how has the ISCF increased individual capabilities and capacities in both research and innovation?
- To what extent has the ISCF attracted additional talent and Challenge-associated skills into the UK?
- How and to what extent has the ISCF contributed to improved infrastructure to support future R&I investment?

Key summary of ISCF overall impact on capacity

- The ISCF has contributed to individual and organisational-level capacity generation across the vast majority of sectors. This ranges from technical skills development to managerial and commercialisation skills development across industry and academia.
- Although the ISCF has stimulated talent development and capacity building across many sectors, there has been limited mobility of international talent to the UK that can be attributed to the programme itself. It is likely that attracting international talent would require a dedicated effort, in a sector-bespoke manner, by highlighting the opportunities and value of coming to the UK.
- Infrastructure investment has generated long-standing platforms that are geared to supporting future R&I activities and leveraging further investments. A snapshot of this can be seen from the MMC Infrastructure, which became critical during the Covid-19 pandemic response.

Table 8. Mapping of Fund-level metrics against metrics in Challenge evaluation reports (see Annex E, Table 13, for Challenge-level summaries from evaluation reports).

Challenge	Metrics in scope?	Evidence found in report?
Audience of the Future	Y	Y
Medicines Manufacturing	Y	Y
Data to Early Diagnosis	Y	Y
Commercialising Quantum Technology	Y	Y
Digital Security by Design	Y	Y
Next Generation Services	Y	Y
Manufacturing Smarter Innovation	Y	N
Robotics for a Safer World	Y	Y
Transforming Foundation Industries	Y	Y
Prospering from the Energy Revolution	Y	N
Industrial Decarbonisation	Y	N
Transforming Construction	N	Y*
Transforming Food Production	Y	Y
Smart Sustainable Plastic Packaging	Y	Y

Driving the Electric Revolution	Y	Y
Faraday Battery	Y	Y
Future Flight	Y	Y

*Metric not included in the framework, but evidence found in the report

The ISCF has contributed significantly to the development of skills and capacity through dedicated programmes funded through the Challenges.

Although the impact was in scope for all but one of the Challenges, a handful of Challenges did not report any evidence of capacity building as indicated in the grid above.

The majority of the Challenges across the Fund had a learning and development component built in to support skills and capacity building. This contributed to transferable skills, generation of new knowledge (see Chapter 2.2) and an increase in workforce capacity especially in sectors with shortages or where upskilling has been needed.⁹¹ Types of skills reported on being gained have ranged from commercial and business skills to technical skills and strategic/problem solving skills.

The Health cluster has had a particular focus on apprenticeships and upskilling in new technologies in digital health and in the NHS more specifically⁹² – highlighted as a key under-resourced area in our baseline assessment.⁹³ For example, the ATMP Apprenticeship Programme led to 118 apprentices, who developed new technical skills and knowledge and the programme also upskilled existing employees while recruitment of new employees with the skills required also proved successful.⁹⁴ Box 11 highlights some further examples of notable capacity generation across the Fund, including the DER Challenge investments into skills. Skills in the UK transport sector were in decline at baseline,⁹⁵ and the ISCF has had a notable impact here. Overall, the ISCF has contributed to individual and organisational-level capacity generation across a vast majority of sectors. This ranges from technical skills development to managerial and commercialisation skills development across industry and academia. Challenge-level reporting suggests this has generated capacity in the thousands; however, exact numbers have not been captured and will be further interrogated in Phase 4 of the evaluation.

There has been little evidence of international talent mobility to the UK associated with the ISCF.

Given the broad nature of the programmes and sectors that have been engaged in ISCF, including international and private, it is very likely that international workforce may have been engaged with in some capacity but there has been little evidence of their mobility to the UK. Some positive examples were

⁹¹ All Challenges except Industrial Decarbonisation, Prospering from the Energy Revolution, and Transforming Construction.

⁹² Medicines Manufacturing (Final); Data to Early Diagnosis and Precision Medicine (Interim).

⁹³ ISCF [Baseline Report](#).

⁹⁴ Medicines Manufacturing (Final).

⁹⁵ ISCF [Baseline Report](#).

presented in the IDC, where funding had contributed towards attracting skilled international experts from the oil and gas sector into the domestic energy sector to work with UK utilities and onshore networks.⁹⁶ Recruitment personnel in the DER also stated that 9 out of 10 engineers and semiconductor physicists were non-UK nationals. An interesting example of international workforce recruitment came from the Audience of the Future Challenge where physical presence was not required at some of the operational headquarters, which allowed them to recruit internationally from Sweden and South America and which was found to be a cost-effective strategy.⁹⁷ Overall it appears that the ISCF has stimulated talent development and capacity building across many sectors but there has been limited mobility of international talent to the UK that can be attributed to the programme itself. In addition, external factors, including visas and immigration policies could impact mobility, and it is therefore difficult to attribute any changes to mobility to the ISCF. It is likely to require a dedicated effort, in a sector-bespoke manner, to attract international talent by highlighting the opportunities and value of coming to the UK.

Box 11. Challenge spotlight on skills capacity⁹⁸

Driving the Electric Revolution

- **Aims:** DER Challenge aimed to support the UK's push towards a net-zero carbon economy and clean technology supply chains through investment in electrification technologies.
- **Impact on skills capacity:** The PEMD sector is challenged by significant gaps in its skills base, hindering further growth and innovation. The DER Challenge wished to address this problem through upskilling programmes, skills competitions, knowledge exchange and equipment training. It allocated £6m to fund training activities for people across different skill and experience levels and setting up the PEMD Skills Hub. For example, a new teaching module at the University of Nottingham was funded through skills competition and the course is expected to train 140 undergraduate students each year on PEMD-specialised skills. Challenge also established DER-ICs to supply funding for knowledge exchange through collaborative research projects and training to build expertise in new equipment.
- **Enablers:** Access to the DER-ICs' training opportunities has been amplified through well-intended partnerships with academic and industrial institutions. Academic researchers involved in the Midlands DER-IC site have contributed to industrial projects, providing research and equipment support to enterprises and fostering transfer of skills between partners. Not only does this encourage capabilities in newer technologies and equipment but also fosters better academia-industry relations. Partnerships have also expanded the reach of developed training programmes, providing opportunities to greater numbers compared with what was originally possible.

Capital and infrastructure investments from the ISCF have culminated in a variety of assets.

Evidence of investment and development of infrastructure has been found across ISCF, with examples of investing in workforce, technology platforms, data platforms and centres of innovation and excellence. While it is difficult to assess the scale of how these investments will transpire into future R&I impacts, it is very likely that the investments facilitated through the ISCF will have a lasting impact in catalysing further R&D, particularly given our observations at baseline, which noted the mixed picture of existing R&I

⁹⁶ Industrial Decarbonisation (Interim).

⁹⁷ Audience of the Future (Final).

⁹⁸ Driving the Electric Revolution (Interim).

infrastructure – either lack of, or aged infrastructure, which impacted scale-up.⁹⁹ This has become evident over the last few years through examples of legacy building, such as vaccine and viral vector manufacturing capacity and investment in physical equipment (scanners and sequencing equipment), as well as data linkage platforms.¹⁰⁰ Development on new good manufacturing practices-compliant facilities and viral vectoring manufacturing capabilities in particular heightened during the pandemic with ISCF support infrastructure and there have also been some investments in data linkage and data discovery, which is likely to create wider societal impact in therapeutics development and precision medicine.

Box 12. Challenge spotlight on infrastructure capacity¹⁰¹

Data to Early Diagnosis

- **Aims:** The Data to Early Diagnosis (D2ED) Challenge provides essential support towards the development of precision medicine for improved early diagnosis and treatment. It also aims to accelerate the use of research and health data.
- **Impact on infrastructure capacity:** ISCF funding was seen as the catalyst for investing in new equipment, where infrastructure had previously been underinvested in (see baseline report¹⁰²). Its financial inputs into the sector enabled development of further infrastructure and aided in leveraging match funding from industry. In particular, D2ED's centres of excellence established new facilities and advanced existing equipment levels on site, facilitating innovative projects with vital implications for the sector. It also succeeded in encouraging academia-industry collaborative projects that led to further investments in technology development. For example, over 60 NHS sites received better infrastructural support for digital diagnostics.

Faraday Battery

- **Aims:** The FBC aimed to drive the growth of a strong battery business in the UK through the development of cost-effective and high-performing battery technologies.
- **Impact on infrastructure capacity:** Interim evaluation of FBC revealed that ISCF funding enabled growth of research infrastructure and fostered a general understanding of and appreciation for future technologies in the sector. For example, one vehicle manufacturer reported that the Challenge helped advance their existing infrastructural levels on cell development.

3.4 Employment and job creation

Evaluation questions:

- To what extent has the ISCF contributed to the creation and retention of new businesses and high-skilled jobs?

Key summary of ISCF overall impact on employment and job creation

- The ISCF has supported job creation both directly and indirectly. Self-reported data indicates that, to date, ISCF investment has resulted in the creation of 3,563 FTE jobs, with 14,266 FTE jobs predicted within the next five years. Alongside new job creation, ISCF has also been shown to contribute towards job retention with retention of 7,499 FTE jobs to date, with 11,308 FTE job retained predicted with the next five years, likely due to the R&D investments leveraged and catalysed in a given sector.

⁹⁹ ISCF [Baseline Report](#).

¹⁰⁰ Medicines Manufacturing (Final); Data to Early Diagnosis and Precision Medicine (Interim).

¹⁰¹ Faraday Battery (Interim); Data to Early Diagnosis and Precision Medicine (Interim); ISCF [Baseline Report](#).

¹⁰² ISCF [Baseline Report](#).

Table 9. Mapping of Fund-level metrics against metrics in Challenge evaluation reports (see Annex E, Table 14, for Challenge-level summaries from evaluation reports).

Challenge	Metrics in scope?	Evidence found in report?
Audience of the Future	Y	Y
Medicines Manufacturing	Y	Y
Data to Early Diagnosis	Y	Y
Commercialising Quantum Technology	Y	Y
Digital Security by Design	Y	Y
Next Generation Services	Y	Y
Manufacturing Smarter Innovation	Y	Y
Robotics for a Safer World	Y	Y
Transforming Foundation Industries	Y	Y
Prospering from the Energy Revolution	Y	Y
Industrial Decarbonisation	Y	Y
Transforming Construction	N	Y
Transforming Food Production	Y	Y
Smart Sustainable Plastic Packaging	Y	Y
Driving the Electric Revolution	Y	Y
Faraday Battery	Y	Y
Future Flight	Y	Y

Across the Fund, there has been an increase in new jobs created, ranging from highly skilled research jobs to a variety of managerial roles, brought about primarily through high levels of innovation and new spin-outs.

Fund-level data indicates that, to date, ISCF investment has resulted in the creation of 3,563 FTE jobs, with 14,266 FTE jobs predicted within the next five years.¹⁰³ In addition to creating new roles, ISCF investment has resulted in the retention of 7,499 FTE jobs to date, with 11,308 FTE job retained predicted with the next five years.¹⁰⁴

¹⁰³ ISCF Portfolio Performance Report (Q2, FY23/24).

¹⁰⁴ ISCF Portfolio Performance Report (Q2, FY23/24).

This has in part been attributed to the creation of new businesses and opportunities (explored further in Chapters 2.1 and 5). New spin-outs have particularly contributed to this creation of jobs. There have been reports of at least 20 spin-outs generated or in development across the ISCF, but it is likely that this number is underreported across evaluation reports due to the varying focuses of the reports. The Commercialising Quantum Technology Challenge has led to the creation of two companies thus far, with one in development.¹⁰⁵ Overall, ISCF has supported a substantive level of commercialisation of outputs in the form of spin-outs and IP generation (as elaborated on in Chapter 2) via support mechanisms built in explicitly into some of the Challenges. For instance, in the FBC, the fellowship programme specifically supported researchers in commercialising battery technologies by providing seed funding, business support and mentoring.¹⁰⁶

Box 13. Challenge spotlight on employment and job creation¹⁰⁷

Health and Data and Digital Technology clusters

- **Health cluster:** Challenges in this cluster include Medicines Manufacturing, Accelerating Detection of Disease, Data to Early Diagnosis and Healthy Ageing.
- **Data and Digital Technology cluster:** Challenges in this cluster include Commercialising Quantum Technologies, DSBD, Next Generation Services, Robotics for a Safer World, Audience of the Future, Manufacturing Smarter Innovation, Accelerating Detection of Disease, Data to Early Diagnosis and Healthy Ageing. For a summary of the aims of all Challenges, see Table 1.

Impact on employment and job creation: The Health cluster shows good evidence of job creation and retention, offering significant opportunities for growth and sustenance in the sector. For example, the MMC led to an overall 3 to 4 % increase in employment across life sciences firms, creating up to 530 new jobs. The cluster has fostered highly trained and well-paid employment opportunities in other domains as well as follow-on private investment. However, firms supported under these Challenges also benefited through the national and global emphasis on vaccine production in recent years. Similarly, the Data and Digital Technology cluster performed well on the parameter of employment, creating hundreds of new jobs. For example, organisations participating in the Audience of the Future Challenge reported 79 new FTEs generated and additional 110 FTEs retained. In addition, the employment increased by 18% among Challenge participants compared with an 8% increase among unsuccessful applicants.

¹⁰⁵ Commercialising Quantum Technology (Interim).

¹⁰⁶ Faraday Battery (Interim).

¹⁰⁷ Medicines Manufacturing (Final); Data to Early Diagnosis (Interim); Commercialising Quantum Technologies (Interim); Digital Security by Design (Interim); Next Generation Services (Final); Robotics for a Safer World (Interim); Audience of the Future (Final); Manufacturing Smarter Innovation (Interim).

3.5 Diversity

Evaluation questions:

- How has the ISCF contributed to equity, diversity and inclusion (EDI)?

Key summary of ISCF overall impact on geographic reach of investment and impact

- Although EDI was not formally built into the reporting mechanism across the Fund and Challenges, advocacy and strategy development spearheaded by Innovate UK and the Challenge teams has propelled data capture in this area. The EDI strategy and frameworks were seen as useful levers for considering EDI across the Fund, but lack of a mandate or Challenge-level measurement objectives has led to sparse data capture and implementation efforts. The ISCF has therefore provided a useful framing and process for EDI considerations and based on the number of Challenges that considered EDI in some form indicates that ISCF has created a cultural shift at the very least and raised awareness of the importance of building in EDI into such programmes.

Table 10. Mapping of Fund-level metrics against metrics in Challenge evaluation reports (see Annex E, Table 15, for Challenge-level summaries from evaluation reports).

Challenge	Metrics in scope?	Evidence found in report?
Audience of the Future	N	Y*
Medicines Manufacturing	N	N
Data to Early Diagnosis	N	Y*
Commercialising Quantum Technology	N	N
Digital Security by Design	N	N
Next Generation Services	N	N
Manufacturing Smarter Innovation	Y	Y
Robotics for a Safer World	N	N
Transforming Foundation Industries	Y	Y
Prospering from the Energy Revolution	N	N
Industrial Decarbonisation	Y	Y
Transforming Construction	N	N
Transforming Food Production	N	N
Smart Sustainable Plastic Packaging	N	N
Driving the Electric Revolution	Y	Y
Faraday Battery	N	N
Future Flight	Y	Y

*Metric not included in the framework, but evidence found in the report

EDI was not in the original measurement specification of the ISCF.

Integration of EDI monitoring requirements into the Fund, as well as having a dedicated EDI budget, was a key recommendation to the UKRI we identified during the process evaluation.¹⁰⁸ Leading up to this recommendation, Innovate UK and Challenge teams had already made significant progress towards embedding this agenda in the ISCF through the development and launch of an EDI strategy and through embedding EDI monitoring in a handful of the Wave 3 Challenges as a blueprint for future efforts. However, given the EDI strategy and requirements followed many years after the ISCF launch, EDI activities and monitoring their impact was not mandated across the Fund. This resulted in varied implementation and priority given to this agenda, as anticipated.¹⁰⁹

The ISCF has provided a useful framing for EDI considerations.

Around half of the Challenges analysed in this report mentioned activities relating to EDI within the Challenges and/or the wider sector within which the Challenge was situated. Some Challenges pledged high-level ambitions with regards to EDI and created measures so as not to be prescriptive or top-down in asks – rather than a mandated approach requiring Challenges to achieve a particular level of diversity. For instance, the Manufacturing Smarter Innovation Challenge asked projects to consider how EDI would be integrated into the work in their application forms, and the Future Flight Challenge streamlined its workflow by automating previously manual tasks that had historically been carried out by male staff; the automation of infrastructure inspection tasks allowed a diverse set of staff to deliver the overall workflow.¹¹⁰ Similarly, in DER, skill development and talent pipeline development focused efforts on ensuring disabled individuals and those from disadvantaged backgrounds had access.

Barriers to impact lie in lack of a consistent and mandated ask on EDI with underpinning data capture.

While there were many positive examples of EDI actions incorporated into the Fund, including setting up an EDI committee and developing an EDI framework in the Manufacturing Smarter Innovation Challenge,¹¹¹ it has not been explicitly measured nor reported what the impact of these actions have been across the Challenges and sectors they represent. Additionally, although some Challenges tried to incorporate EDI considerations into their projects, such as setting up diverse assessor panels and interviewees, one Challenge noted that limited diversity in the sector was a particular barrier.¹¹²

The EDI strategy and frameworks were seen as useful levers for considering EDI across the Fund and has embedded a cultural shift in considering EDI given the number of Challenges that have considered it in some form. However, a lack of a mandate on EDI actions and lack of Challenge-level measurement

¹⁰⁸ ISCF [Process Evaluation Report](#).

¹⁰⁹ ISCF [Process Evaluation Report](#); ISCF [Baseline Report](#).

¹¹⁰ Future Flight (Interim).

¹¹¹ Manufacturing Smarter Innovation (Interim).

¹¹² Manufacturing Smarter Innovation (Interim).

objectives has led to sparse data capture and implementation efforts. This supports our key recommendations from the ISCF process evaluation:

- UKRI should establish a clear scope of EDI at the outset in the business case planning stage supported by high-level ambitions;
- UKRI should create EDI monitoring requirements at the outset to drive good practices and establish clear baseline; and
- UKRI should allocate an EDI budget at business case planning stage while considering high-level ambitions.

Box 14. Challenge spotlight on EDI¹¹³

While EDI considerations were not in the original remit of the ISCF, some Challenges have been active on this front, and we highlight this evidence below. For a summary of Challenge aims, see Table 1.

Audience of the Future

Audience of the Future (AOTF) Challenge has performed significantly well through its efforts in the implementation of EDI. Clear targets were set for improvements in gender equity and these targets were consistently achieved. For example, AOTF aimed that at least 50% of the people engaging with their projects would be female and at least 20% to belong from Black, Asian and Minority Ethnic (BAME) backgrounds. Overall, 52% of its participants were female while 23% belonged to BAME backgrounds. It also utilised immersive content from a national collection to interact with wider populations, especially young women outside of workshop. AOTF also included mentorship opportunities that specifically targeted relevant age and demographic groups.

Manufacturing Smarter Innovation

The Manufacturing Smarter Innovation (MSI) Challenge developed an EDI framework with support from other Challenges and organisations. It enabled project teams to appoint EDI-special champions and committees. It also ensured diversity of work backgrounds and accessibility to project events. MSI also conducted EDI analysis on all research outputs conducted through its activities. However, the Challenge’s focus on EDI was neither consistent nor explicit across all project stages. This led to additional difficulties for participating teams, such as lack of specific targets and lack of support on navigating/synchronising variations in EDI policies across organisations. Existing level of resources in some research centres and limited diversity among manufacturing sector experts also hindered further growth in terms of EDI.

Transforming Foundation Industries

The Transforming Foundation Industries (TFI) Challenge positions EDI as a significant characteristic of its programme design and activities. For example, EDI is a vital indicator in monitoring and evaluation of projects. The Challenge also constituted an equity and diversity working group to contribute to actions, such as development of an EDI framework, designing a Women’s Leadership Development programme and further opportunities of EDI-driven mentorship. The Challenge was affected by lack of diversity in the sector, which led to its participation with the MSI Challenge and establishment of the TFI Network+.

¹¹³ Audience of the Future (Final); Manufacturing Smarter Innovation (Interim); Transforming Foundation Industries (Interim).

Measurement issues across Challenges

While there were many positive examples of EDI actions incorporated into the Fund, it has not been explicitly measured nor reported what the impact of these actions have been across the Challenges and sectors they represent. Challenges and projects need to have a clear scope and understanding of EDI requirements, with monitoring requirements implemented at the outset to enable good practice.

4. Connected innovation ecosystem

This chapter presents findings relating to the innovation ecosystem of the ISCF, considering the extent to which the ISCF has helped to foster multidisciplinary, interdisciplinary and multi-stakeholder collaboration and networks around the Challenge areas.¹¹⁴ The chapter discusses findings relating to **collaboration and partnerships** and **recognition and prestige**.

4.1 Collaboration and partnership

Evaluation questions:

- To what extent has the ISCF increased collaboration between businesses, including between younger, smaller companies and larger, more established companies up the value chain?
- To what extent has the ISCF increased business–academic engagement on innovation activities relating to the Challenge areas?
- To what extent has the ISCF increased multi- and interdisciplinary research around the Challenge areas?

Key summary of ISCF overall impact on collaboration and partnership

- There is significant evidence that collaboration and partnerships were one of the strongest and most impactful areas of the ISCF, bringing together the actors, businesses, local authorities, and universities that would not have necessarily come together if not for the Fund. Examples of this span business-to-business collaborations and partnerships between companies of the same size and between companies of varying sizes.
- Collaborations between businesses and academic institutions were consistently tracked throughout the reports, there is notable evidence of this type of collaboration. This was facilitated through knowledge portals, technology platforms and dissemination events, bringing early career researchers together with industry.
- Evidence from across the Fund indicates at least 400–600 new collaborations were established.
- Both multi- and interdisciplinary research was promoted by the ISCF-facilitated collaborations, which brought together different disciplines, industries, and organisations; however, some limitations were experienced in implementing multi- and interdisciplinary research and innovation (MIDRI).

Table 11. Mapping of Fund-level metrics against metrics in Challenge evaluation reports (see Annex E, Table 16, for Challenge-level summaries from evaluation reports).

Challenge	Metrics in scope?	Evidence found in report?
Audience of the Future	Y	Y
Medicines Manufacturing	Y	Y
Data to Early Diagnosis	Y	Y
Commercialising Quantum Technology	Y	Y
Digital Security by Design	Y	Y

¹¹⁴ ISCF [Evaluation Framework Report](#).

Next Generation Services	Y	Y
Manufacturing Smarter Innovation	Y	Y
Robotics for a Safer World	Y	Y
Transforming Foundation Industries	Y	Y
Prospering from the Energy Revolution	Y	Y
Industrial Decarbonisation	Y	Y
Transforming Construction	Y	Y
Transforming Food Production	Y	Y
Smart Sustainable Plastic Packaging	Y	Y
Driving the Electric Revolution	Y	Y
Faraday Battery	Y	Y
Future Flight	Y	Y

The ISCF has achieved significant collaborations enabled through the governance mechanisms and programme design.

Significant evidence of collaborations, going beyond pre-existing relationships, were reported by all Challenges assessed at this stage. This represents further improvement from high levels of business-business, and, in some sectors, business-academia collaboration reported from participants across ISCF Challenges at baseline.¹¹⁵

Challenge workshop participants stated that collaboration and partnerships were one of the strongest and most impactful areas of the ISCF, bringing together the actors, businesses, local authorities and universities that would not have necessarily come together if not for the Fund.¹¹⁶ Evidence from across the Fund indicates at least 400–600 new collaborations were established. While in some instances, wider industrial and societal factors were referenced as having driven collaborations between businesses and some collaborations were from pre-existing relationships,¹¹⁷ there is a strong acknowledgement of ISCF’s role in fostering collaborations across Challenges.

A number of Challenges reported that formal mechanisms implemented by the ISCF were key to this, enabling collaboration both between businesses and with academic institutions.¹¹⁸ The Fund application process mandated collaborations (particularly Challenges in the Future of Mobility cluster), requiring

¹¹⁵ ISCF [Baseline Report](#).

¹¹⁶ ISCF Interim Impact Workshop.

¹¹⁷ Smart Sustainable Plastic Packaging (Interim); Transforming Construction (Final).

¹¹⁸ Data to Early Diagnosis (Interim); Medicines Manufacturing (Final); Digital Security by Design (Interim); Transforming Food Production (Interim); Driving the Electric Revolution (Interim); Faraday Battery (Interim).

businesses to collaborate and thus leading to an overall increase in networking and relationship-building. In particular, the TFI Challenge noted that involving industry in the programme design brought industry sub-sectors together and facilitated collaboration,¹¹⁹ while the IDC noted that the programme design and funding provided ‘clear signalling of government commitments to industrial decarbonisation’, fostering confidence, which led to enhanced collaboration.¹²⁰

In addition, the Fund’s governance was also highlighted by multiple Challenges with particular mention of the Challenge directors and programme teams playing an important role in facilitating networking opportunities and delivering collaborations. For instance, the FBC exemplifies the value of ISCF in supporting collaborations (Box 1).

Box 15. Challenge spotlight on collaboration and partnership¹²¹

Faraday Battery

- **Aims:** The FBC aims to support the growth of a strong battery business in the UK through the development of battery technologies that are cost effective and high performing.
- **Impact on collaboration and partnership:** The Challenge has significantly contributed to battery-related research in the UK through their emphasis on collaborative research. This is evidenced by the sharp increase in the number of publications with UK and international partners. A similar increase can be observed in industry–academia collaborations as well. For example, the collaboration with Aerospace Technologies Institute contributed to advancements to automotive-focused battery supply chain, assisting in the transition to electrification.
- **Enablers:** The Challenge fostered partnerships across sectors in several ways. First, collaboration was an essential component of funding available under this Challenge. Second, it bridged the gap between prospective partners by enabling greater coordination between academic and industrial stakeholders, sensitising them to others’ priorities. These relationships are further strengthened by regular cross-sectoral engagements, as necessitated by FBC funding mechanisms. From the perspective of industrial partners, the Challenge incentivised their engagement, reducing costs of negotiating and coordinating a partnership through its common frameworks. While these mechanisms have facilitated collaborations, Brexit poses uncertainty and newer challenges to collaborations within the international value chains.

Events and engagement activities delivered through the ISCF acted as a critical platform for networking and collaborations.

Examples of these engagement opportunities include networking events, workshops, webinars, living labs and platforms to deliver training activities and events that facilitated knowledge exchange and dissemination across Challenges.¹²² For example, the 2019 Global Business Innovation Programme (GBIP) Singapore mission and the numerous AI for Services network in-person and online events.¹²³ At the time of writing, the network has resulted in 496 introductions and 15 collaborations since 2021. Promotion of these events by key players, such as the Department for Business and Trade (formerly Department of International

¹¹⁹ Transforming Foundation Industries (Interim); Medicines Manufacturing (Final); Faraday Battery (Interim).

¹²⁰ Industrial Decarbonisation (Interim).

¹²¹ Faraday Battery (Interim).

¹²² Manufacturing Smarter Innovation (Interim); Audience of the Future (Final); Transforming Food Production (Interim); Future Flight (Interim); Digital Security by Design (Interim).

¹²³ Next Generation Services (Final).

Trade), improved engagement of businesses.¹²⁴ Use of communication processes and developing new models for delivering training reduced technical, technological and commercial barriers around decarbonisation and facilitated collaboration.¹²⁵ A more substantive assessment of these activities will be conducted in the final phase of this evaluation via a network analysis drawing on data from Knowledge Transfer Network and Delphi (Annex D).

Box 16. Challenge spotlight on engagement activities to enhance collaboration¹²⁶

Future Flight Challenge

- **Aims:** The Future Flight Challenge aimed to consolidate technologies in electrification, aviation systems and autonomy to create new modes of air travel and capability. It involved three areas of safe integration and operation of drones, advanced air mobility and regional aircraft, and advancements in electrification and autonomy.
- **Impact on engagement activities:** Encouraging collaboration within and across flight sector organisations underpinned the key objectives of the Challenge. It achieved this goal through activities, such as knowledge-exchange sessions, workshops, webinars, networking events, working groups, newsletters and cross-government forums. These sessions offered a platform for consistent engagement between organisations, helping them overcome the existing communication gap plaguing industry-government relations. It also contributed to the establishment of new clusters and regulatory frameworks, paving the way for future growth in the Challenge-relevant sectors.

Increased engagement among competing businesses, smaller companies and academia was noted across the Fund.

At baseline, most participants in ISCF Challenges reported prior business-business collaborations; business–academic collaboration was more variable with relatively high levels of collaboration in healthcare and digital security as compared with relatively low levels in the data, AI and nuclear sectors.¹²⁷ While there were difficulties experienced across some Challenges in establishing collaborations between businesses of various sizes due to disagreements on priorities and culture, and competing against other sizeable opportunities or competing interests,¹²⁸ ISCF played a role in removing these barriers and supporting common ground. For example, the Data to Early Diagnosis Challenge noted that, while initial collaborations tended to be across businesses with mutual interests and in geographical proximity,¹²⁹ collaborations facilitated by the Health Data Research Hubs established under the Fund increased collaborations between major competitive industry players.¹³⁰ This represents an improvement from baseline, where business-business collaboration in healthcare was perceived as difficult.¹³¹

¹²⁴ Audience of the Future (Final).

¹²⁵ Industrial Decarbonisation (Interim); Audience of the Future (Final); Transforming Construction (Final).

¹²⁶ Future Flight (Interim).

¹²⁷ ISCF [Baseline Report](#).

¹²⁸ Robotics for a Safer World (Interim); Industrial Decarbonisation (Interim); Audience of the Future (Final).

¹²⁹ Transforming Foundation Industries (Interim); Medicines Manufacturing (Final); Future Flight (Interim).

¹³⁰ Data to Early Diagnosis (Interim).

¹³¹ ISCF [Baseline Report](#).

The ISCF also enabled collaborations between small firms and academic partners,¹³² businesses of different sizes,¹³³ and with customers and end users.¹³⁴ In particular, the IDC noted that businesses at all levels were involved in collaborations, while Robotics for a Safer World reported 57% of the projects under the CR&D strands and 21% of the demonstrator strand displayed collaborations across different sizes of organisation. The Fund was acknowledged to have resulted in increasing investment opportunities and access to funding – the latter was particularly beneficial to smaller companies, with positive impacts on the company profile and reputation.¹³⁵

While it is clear that the ISCF has notably fostered growth and maturing of collaborations and development of numerous collaborations, further investigation into enabling mechanism will be required in the next phase of the evaluation.

The ISCF enabled multi and interdisciplinary research highlighting a systems approach to problem solving.

Cross-sector collaboration and partnerships are key to the advancement of a connected innovation ecosystem, particularly the development of new partnerships that add diversity to existing networks. At baseline, levels of MIDRI in ISCF awards were comparable to those across IUK and UKRI at the time, with 13% of identified ISCF baseline publications linked to more than one field of research and an average of 1.16 fields of research associated with publications in the set.¹³⁶ It should be noted that Challenges perceived MIDRI as not being well-defined¹³⁷ and, to date, no Challenges have quantitatively measured MIDRI. However, many Challenges qualitatively discuss MIDRI having increased due to ISCF, particularly referencing cross-sector collaborations.¹³⁸

At this interim stage, MIDRI in the ISCF has primarily been enabled through collaboration across sectors and clusters.¹³⁹ Examples include the HyBird project, which brought together different disciplines and industries, such as software development, business and infrastructure contracting (RAI¹⁴⁰ collaboration with Costain and BeTomorrow),¹⁴¹ and the Data to Early Diagnosis Challenge, which promoted collaborations

¹³² Medicines Manufacturing (Final); Industrial Decarbonisation (Interim).

¹³³ Digital Security by Design (Interim); Smart Sustainable Plastic Packaging (Interim); Robotics for a Safer World (Interim).

¹³⁴ Next Generation Services (Final).

¹³⁵ Data to Early Diagnosis (Interim); Driving the Electric Revolution (Interim); Faraday Battery (Interim); Next Generation Services (Final); Transforming Food Production (Interim).

¹³⁶ ISCF [Baseline Report](#).

¹³⁷ Digital Security by Design (Interim)

¹³⁸ The Commercialising Quantum Technologies report, for example, states that "[c]ollaborations are most likely to be multi-disciplinary. Companies that offer design services (electronic, photonics, software etc.) are likely to be involved in new collaborations."

¹³⁹ Faraday Battery (Interim); Prospering from the Energy Revolution (Interim); Audience of the Future (Final); Transforming Foundation Industries (Interim); Smart Sustainable Plastic Packaging (Interim); Transforming Construction (Final).

¹⁴⁰ RAI: Robotics and Artificial Intelligence.

¹⁴¹ Robotics for a Safer World (Interim).

among research institutions (Genomics England), public sector (NHS) and software platforms.¹⁴² In some instances, collaborations led to interdisciplinary rather than multidisciplinary working, where collaborators would work jointly on a complex issue, with knowledge sharing between partners helping to progress the research.¹⁴³ In contrast, multidisciplinary collaborations, where collaborators contributed their distinct areas of expertise, enabled a systems approach to tackling Challenges.¹⁴⁴ For example, the Innovating Next Generation Services through Collaborative Design project, part of the Next Generation Services Challenge, brought together expertise in design thinking, machine learning, management innovation and professional services, to examine the added value of AI technologies to mid-market accounting and law firms.¹⁴⁵

Collaborations through the ISCF have fostered innovation and commercialisations.

Collaborations – and in particular cross-sectoral collaborations – had notable outputs, leading to new tools or technologies, and linking up value chains to facilitate bringing these products to market and staying ahead of competition.¹⁴⁶ There were acknowledgements across Challenges that the Fund had accelerated innovation and the scaling of project outputs.¹⁴⁷ For example, large R&D collaborations between major players in the pharmaceutical industry (GlaxoSmithKline (often shortened to GSK) and AstraZeneca)¹⁴⁸ have helped accelerate innovation and commercialisation,¹⁴⁹ while academic–business collaborations also improved commercialisation and deployment of technologies developed within hubs, increased stakeholder collaboration, and increased private funding from industry partners.¹⁵⁰ Collaborations through the Fund have also resulted in increasing investment opportunities, enabled through signalling government commitments to investment and de-risking (discussed in Chapter 3).¹⁵¹ This has, in turn, led to ongoing collaborations and further bids for projects with Innovate UK.¹⁵² Commercialisation and investment are discussed in greater detail in sections 2.1 and 3.1, respectively.

¹⁴² Data to Early Diagnosis (Interim).

¹⁴³ Future Flight (Interim); Transforming Food Production (Interim); Digital Security by Design (Interim).

¹⁴⁴ Next Generation Services (Final); Prospering from the Energy Revolution (Interim).

¹⁴⁵ Next Generation Services (Final).

¹⁴⁶ Commercialising Quantum Technology (Interim); Medicines Manufacturing (Final); Digital Security by Design (Interim).

¹⁴⁷ Transforming Foundation Industries (Interim).

¹⁴⁸ Medicines Manufacturing (Final).

¹⁴⁹ Transforming Foundation Industries (Interim); Next Generation Services (Final); Medicines Manufacturing (Final); Prospering from the Energy Revolution (Interim); Transforming Food Production (Interim).

¹⁵⁰ Robotics for a Safer World (Interim); Industrial Decarbonisation (Interim); Digital Security by Design (Interim); Data to Early Diagnosis (Interim); Medicines Manufacturing (Final); Next Generation Services (Final); Smart Sustainable Plastic Packaging (Interim); Transforming Foundation Industries (Interim); Transforming Food Production (Interim); Prospering from the Energy Revolution (Interim).

¹⁵¹ Data to Early Diagnosis (Interim); Driving the Electric Revolution (Interim); Faraday Battery (Interim); Industrial Decarbonisation (Interim).

¹⁵² Industrial Decarbonisation (Interim); Driving the Electric Revolution (Interim); Next Generation Services (Final); Digital Security by Design (Interim).

Through the mechanisms discussed in sections above, the ISCF has resulted in the establishment of research hubs (such as the GKN Automotive Advanced Research Centre, the DSBD Challenge Engineering and Physical Sciences Research Council Hub and the Centre for Doctoral Training in Industry and Commercial Property Insurance) and other knowledge-sharing platforms and dissemination activities.¹⁵³ These hubs have contributed to an increase in employment and skills development and employment in the R&D, with qualitative evidence of the industry–academia partnership in the WGS UK Biobank project leading to an improvement in research capability and capacity.¹⁵⁴ Although additionality cannot be assessed at the Fund level, Robotics for a Safer World provided clear anecdotal evidence of additionality as a result of the co-investment stimulated through government investment.¹⁵⁵

In sum, the ISCF has been successful in fostering a significant number of collaborations and partnerships across businesses and academia and across sectors, enabled through governance structures, programme support and engagement activities. Outputs have included increased investor confidence and knowledge dissemination, leading to cross-sectoral and MIDRI research, enhanced innovation and further investments. Further evaluation of the mechanisms of success, identifying ongoing relationships, could be useful in the near and long term to identify how the ISCF has contributed to lasting collaboration and partnerships.

4.2 Recognition and prestige

Evaluation question:

- To what extent have institutions and clusters participating in the ISCF Challenges been recognised for their expertise within the UK and internationally?

Key summary of ISCF overall impact on recognition and prestige

- Individual Challenges have been recognised at the national and government-level, but it is premature to discern the extent of this influence at the Fund level. For example, the UK Biobank WGS project is regarded as the gold standard for population genetics research, while other Challenges are playing an emerging role in impacting policy. International recognition was limited but enhanced by the COVID-19 pandemic, which brought public and governmental awareness to the fore for Healthy Society Challenges.

Table 12. Mapping of Fund-level metrics against metrics in Challenge evaluation reports (see Annex E, Table 17, for Challenge-level summaries from evaluation reports).

Challenge	Metrics in scope?	Evidence found in report?
Audience of the Future	Y	Y
Medicines Manufacturing	N	Y*
Data to Early Diagnosis	N	Y*

¹⁵³ Audience of the Future (Final); Manufacturing Smarter Innovation (Interim); Transforming Construction (Final); Driving the Electric Revolution (Interim); Next Generation Services (Final).

¹⁵⁴ Faraday Battery (Interim); Data to Early Diagnosis (Interim).

¹⁵⁵ Robotics for a Safer World (Interim).

Commercialising Quantum Technology	N	N
Digital Security by Design	Y	Y
Next Generation Services	N	Y*
Manufacturing Smarter Innovation	N	N
Robotics for a Safer World	N	N
Transforming Foundation Industries	Y	Y
Prospering from the Energy Revolution	N	Y*
Industrial Decarbonisation	Y	Y
Transforming Construction	N	N
Transforming Food Production	N	Y
Smart Sustainable Plastic Packaging	Y	Y*
Driving the Electric Revolution	Y	Y
Faraday Battery	Y	Y
Future Flight	Y	N

*Metric not included in the framework, but evidence found in the report

While some of the Challenges funded through the ISCF have had an impact on recognition and prestige, there is little evidence to date on the recognition of the ISCF as a Fund.

Dissemination of research through publications and at national events has increased recognition of the Fund and Challenges throughout the UK, with both projects and resulting centres of excellence gaining national recognition.¹⁵⁶ Individual Challenges have been recognised at the national/government-level. For example, the UK Biobank WGS project is regarded as the gold standard for population genetics research,¹⁵⁷ while the FBC has developed a burgeoning role in influencing government policy and collaboration, although more still needs to be done to significantly impact the agenda.¹⁵⁸ With respect to the WGS project, this represents further recognition in a field where the UK was considered a world leader at baseline.¹⁵⁹

International recognition of the Challenges has been limited: from the evaluation reports available only four Challenges were shown to have been recognised internationally.¹⁶⁰ Notably, the World Economic Forum

¹⁵⁶ Data to Early Diagnosis (Interim); Smart Sustainable Plastic Packaging (Final).

¹⁵⁷ Data to Early Diagnosis (Interim).

¹⁵⁸ Faraday Battery (Interim).

¹⁵⁹ ISCF [Baseline Report](#).

¹⁶⁰ Industrial Decarbonisation (Interim); Data to Early Diagnosis and Precision Medicine (Interim); Prospering from the Energy Revolution (Interim); Medicines Manufacturing (Final).

recognised Net Zero Humber (IDC) during their international cluster initiative.¹⁶¹ Challenges of the Healthy Society cluster were recognised internationally, with Challenges described as global standards for research. However, Challenges under this cluster benefited to some extent from the COVID-19 pandemic, which increased the visibility of genomics capabilities within the UK internationally and highlighted a need and way forward for the genomics for research and healthcare delivery. As more Challenges reach completion and more outputs are produced that increase the visibility of the Challenges, further international recognition and prestige may be achieved.

When it was originally set up, the ISCF had strong government support and policy backing. However, the Industrial Strategy Council has now been disbanded, and the ISCF branding gone unused, leading to a loss of the collective ISCF identity, which has affected the ability to deliver recognition and prestige.¹⁶² In addition, the continuous change in policy priorities that the UK has seen in the past 5 years has hindered the ability to build on the ISCF's legacy nationally and internationally.¹⁶³ This could serve as a learning opportunity on shielding funds, such as the ISCF, from significant changes to the public sector.

¹⁶¹ Industrial Decarbonisation (Interim).

¹⁶² ISCF Interim Impact Workshop.

¹⁶³ ISCF Interim Impact Workshop.

5. Economic impact

This chapter presents findings relating to economic impact. The focus of economic impact is on emerging Challenge-level evidence relating to impacts on business performance, productivity and the regional distribution of these benefits. Fund-level econometrics and VfM¹⁶⁴ analysis will be conducted at a later stage post-Phase 4 of the evaluation.

5.1 Economic impact

Evaluation questions:

- To what extent have the ISCF Challenges supported the growth of UK businesses and created new markets, or enabled increase of UK's share in global market in their respective sector?
- What has been the increase in gross value added (including the creation of new products and services in relevant sectors and/or the creation of new markets)?
- What has been the productivity change (capital, labour or combined)?
- While the ISCF is place-agnostic, to what extent have the economic impacts of the ISCF been widely distributed across the UK?

Key summary of ISCF overall impact on economic impact

- Evidence from the self-reported Challenge-level data indicates that ISCF has had a positive economic impact so far, increasing turnover for participating organisations and creating new markets. Where measured, average increases in turnover have ranged from 70% to 175% between Challenges. The extent to which these impacts are assessed against a counterfactual group (e.g. unsuccessful applicants) or expressed in gross value added (GVA) terms varies between Challenge-level evaluation reports. Evidence on these metrics is still being collected and is in development; the final stage of the evaluation will explore these impacts further. Overall, ISCF has enabled the successful development of new products and services in the UK, with 11 Challenges reporting on the creation of at least 73 new products or services across Challenge.
- Further evidence on economic impacts, which can take time to materialise, is likely to come from final Challenge evaluations, and will also be explored at Fund level through future econometric analysis of the impact of ISCF on business performance. Where possible, a consistent measurement system and use of counterfactuals in the Challenge evaluations would ensure greater comparability of findings across Challenges. It has not at this stage been possible to assess realised impacts of ISCF on productivity, given the time lags involved in generating productivity impacts and the lack of evidence in existing Challenge-level evaluations. Only one Challenge (AOTF) was able to attribute increases to productivity to participation in ISCF.
- Geographic distribution of economic impacts is hard to measure, and no Challenges had tracked this metric. In addition, workshop participants noted that funds may not always be spent or operationalised in the same location as where they were received.

¹⁶⁴ HM Treasury, *The Green Book* defines VfM as the value of socio-economic impacts relative to the costs of delivering a given intervention.

Table 13. Mapping of Fund-level metrics against metrics in Challenge evaluation reports (see Annex E, Table 18, for Challenge-level summaries from evaluation reports).

Challenge	Metrics in scope?	Evidence found in report?
Audience of the Future	Y	Y
Medicines Manufacturing	Y	Y
Data to Early Diagnosis	Y	Y
Commercialising Quantum Technology	Y	Y
Digital Security by Design	Y	Y
Next Generation Services	Y	Y
Manufacturing Smarter Innovation	Y	Y
Robotics for a Safer World	Y	Y
Transforming Foundation Industries	Y	Y
Prospering from the Energy Revolution	Y	Y
Industrial Decarbonisation	Y	Y
Transforming Construction	Y	Y
Transforming Food Production	Y	Y
Smart Sustainable Plastic Packaging	Y	Y
Driving the Electric Revolution	Y	Y
Faraday Battery	Y	Y
Future Flight	Y	N

The ISCF has had a positive economic impact, increasing turnover for participating organisations and creating market opportunities in new sectors.

Participation in ISCF has positively impacted turnover for participating organisations.¹⁶⁵ Participation has contributed to generating new avenues for revenue through development of new products, services or

¹⁶⁵ Audience of the Future (Final); Medicines Manufacturing (Final); Next Generation Services (Final); Robotics for a Safer World (Interim); Commercialising Quantum Technology (Interim); Smart Sustainable Plastic Packaging (Final).

customers.¹⁶⁶ For instance, AOTF participants gained a larger absolute increase in the median turnover than unsuccessful applicants over the course of the Challenge (£128,000 vs £20,000, including grant funding), equating to an average percentage increase in turnover of 175%, compared with 75% for unsuccessful applicants – a marked increase from the baseline measurement, which noted that ‘two out of five ISCF-funded businesses derived no turnover from immersive content or technologies’.¹⁶⁷ Similarly, participants of Robotics for a Safer World Challenge saw a slight increase in their mean turnover of £0.2m, while unsuccessful participants saw a decrease of £0.6m. Other Challenges also reported increased revenues for participants of £74m across all participating firms (Medicines Manufacturing)¹⁶⁸ and £57m (Commercialising Quantum Technology),¹⁶⁹ although counterfactual figures were not provided for unsuccessful applicants in either instance, and these were already high-turnover sectors at baseline.¹⁷⁰

Notably, the impact evaluation of Next Generation Services revealed several ways in which the Challenge influenced participating companies’ economic outcomes.¹⁷¹ For example, the average value of annual turnover for participants increased by £47m between baseline (£69m) and the end of the programme (£116m), while the average annual turnover for unsuccessful participants increased by £15m. £20.4m in companies’ valuation was directly attributable to their participation in the Challenge. Economic returns from new Challenge-supported services, products or process are further expected to contribute to annual combined turnover of £84m.

In one case (AOTF), a Challenge-level evaluation reported on realised impacts expressed in GVA terms comparing supported firms with a counterfactual group of unsuccessful applicants.¹⁷² Supported firms saw an increase in GVA from £36,000 to £100,000 on average (an increase of 183%) compared with an increase from £25,000 to £36,000 for unsuccessful applicants (an increase of 52%). In other cases, Challenge-level evaluations highlighted expected future economic impacts expressed in GVA terms.¹⁷³

Additionality is an important component of economic value and is focused on evidencing the added value of a given intervention compared with what would have happened regardless/eventually. Assessment of additionality is typically conducted by comparing an intervention with a counterfactual. While the ISCF as a Fund does not have an appropriate counterfactual, some Challenges focused on additionality as highlighted above.

¹⁶⁶ Audience of the Future (Final); Next Generation Services (Final); Commercialising Quantum Technology (Interim).

¹⁶⁷ Audience of the Future (Final); ISCF [Baseline Report](#).

¹⁶⁸ Medicines Manufacturing (Final).

¹⁶⁹ Commercialising Quantum Technology (Interim).

¹⁷⁰ ISCF [Baseline Report](#).

¹⁷¹ Next Generation Services (Final).

¹⁷² Audience of the Future (Final).

¹⁷³ Digital Security by Design (Interim); Robotics for a Safer World (Interim).

Market adoption and implementation-readiness can act as a lever or barrier to economic impact.

Some Challenges operate in sectors with long-established productivity barriers and have sought to influence systemic change (such as the Transforming Construction Challenge) albeit where it will be difficult to attribute impact to the Challenge in isolation. Other Challenges operate in more disruptive and emerging sectors and technologies where the ability to attribute economic benefits may in time be clearer.

The realisation of economic impacts requires time and because of the lengthy set-up process for ISCF, programmes are only now beginning to show evidence of economic impact.¹⁷⁴ As the Fund reaches its end, projects will follow on, and new products, services and outputs will be produced, continuing to deliver economic impacts. As technologies progress along the technological readiness scale, new partners, funding mechanisms and markets will become available, contributing to economic impacts beyond this evaluation. Therefore, the realisation of impact will be dependent on the ability to build on the foundations laid down by the ISCF. We highlight a couple of examples in Box.17 on anticipated economic impacts of Challenges based on current trajectory.

Box 17. Challenge spotlight on anticipated economic impact¹⁷⁵

Two Challenges commented on their contribution to the UK and global market share: DSBD, and Robotics for a Safer World (RSW).

Digital Security by Design

- **Aims:** The DSBD Challenge supports enhancements to the UK's digital infrastructure through the development of secure hardware and software systems. DSBD aims to create a safer digital environment and promote a proactive approach to cybersecurity across various sectors.
- **Anticipated economic impact:** The success of the programme will largely depend on the market share of operating systems that adopt the new technology. Given the limited number of widely used operating systems and Arm's dominance in mobile processor design, only a few companies need to implement the technology to gain significant market share. It is expected that adoption of DSBD technologies by any two of the three major operating systems would lead to 60% of the UK market share.

Robotics for a Safer World

- **Aims:** The RSW Challenge aims to enhance R&I in advanced robotics and autonomous systems. Its objective is to improve human safety by removing the need for humans to work in hazardous or hard-to-reach environments.
- **Anticipated economic impact:** Individual projects can also have a substantial economic impact. The Challenge has supported such projects as RADBLAD, a climbing robot with an X-ray system that can inspect wind turbine blades in a non-destructive manner. For this project, initial estimates forecast consortium revenue and gross profit of £7.9m and £4.3m respectively (5 years post-commercialisation); according to self-reported data, this represents a 1% global market share. Note, the counterfactual for this figure is unknown, but it highlights the large impacts individual projects have had within the wider Challenges.

These figures highlight the potential for ISCF to large market disruption through its new products and services, described in the section below.

¹⁷⁴ ISCF Interim Impact Workshop.

¹⁷⁵ Digital Security by Design (Interim); Robotics for a Safer World (Interim).

Participants of the ISCF have been able to develop new products and services or improve existing services, which have been taken up in the UK market.

Overall, ISCF has enabled the successful development of new products and services in the UK, with 11 Challenges reporting on the creation of at least 73 new products or services.¹⁷⁶ For example, at the interim stage of the Commercialising Quantum Technology evaluation, participating organisations had developed up to 27 products or services.¹⁷⁷ These products are being taken up into the UK market across sectors, with 12 technologies generated through the MMC have already been adopted in an NHS context and one firm had their technology adopted in around 70 sites in the UK and 100 sites overseas (international markets are explored further in the next section).¹⁷⁸

Box 18. Challenge spotlight on new products and services¹⁷⁶

Data and Digital Technology cluster

The Challenges included in the Data and Digital Technology cluster align with the original Grand Challenge Artificial Intelligence and Data Economy, which aimed to put UK at the forefront of AI and data revolution. The Challenges that make up the Data and Digital Technology cluster are outlined in Figure 4. For a summary of Challenge aims, see Table 1.

Impact on new products and services: Several Challenges from the Data and Digital Technology cluster illustrate the impact of the ISCF on the development of new products and services. Two products developed under the AOTF Challenge have already reached up to 68,000 users worldwide. Within the Commercialising Quantum Technology Challenge, 27 new products and services were launched by 16 companies, reaching 150 new customers. The RSW Challenge also showcases an increase in the technology readiness levels of developed products and services, resulting in new patents. At the interim stage, the Data to Early Diagnosis Challenge demonstrated signs of new products and services through 4 AI tools, with an additional 28 in development.

The DER Challenge notes that the development of new products and services could led to sectoral growth.

For example, new combination products (including compound semiconductors) have the potential to provide a single enhanced solution to two different markets, increasing their market share in both. While there is the expectation that the Challenge will have a positive impact on sectoral growth (81% of survey respondents), with 93% of survey respondents expecting the sector to grow, there is currently no evidence of achieved impact.¹⁷⁹ As the Challenges reach their end and new products and services reach the market, more economic impacts are expected to surface.

¹⁷⁶ Audience of the Future (Final); Medicines Manufacturing (Final); Next Generation Services (Final); Commercialising Quantum Technology (Interim); Data to Early Diagnosis (Interim); Prospering from the Energy Revolution (Interim); Digital Security by Design (Interim); Transforming Foundation Industries (Interim); Transforming Food Production (Interim); Smart Sustainable Plastic Packaging (Interim); Driving the Electric Revolution (Interim); Audience of the Future (Final); Medicines Manufacturing (Final); Next Generation Services (Final); Robotics for a Safer World (Interim); Commercialising Quantum Technology (Interim); Data to Early Diagnosis (Interim); Prospering from the Energy Revolution (Interim).

¹⁷⁷ Commercialising Quantum Technology (Interim).

¹⁷⁸ Medicines Manufacturing (Final).

¹⁷⁹ Driving the Electric Revolution (Interim).

While sectoral growth is expected to be achieved following implementation of the ISCF, only one Challenge to date had seen increased UK investment (from £121m at baseline to £182m at programme completion) into the sector following implementation of the programme.¹⁸⁰ Sectoral growth is expected through strengthening UK capabilities in the development of advanced medicines manufacturing technologies, creating a UK supply chain, and increasing financial support for battery development and investment.¹⁸¹ For example, the MMC strengthened the UK's advanced manufacturing capacities and influenced more investments in the medicine production processes.¹⁸²

Products developed under the ISCF are showing early signs of adoption in markets outside of the UK and in new sectors, but this is largely anecdotal and requires a concerted effort or aim under future funding programmes to tap into international markets.

There is early evidence of international engagement in the context of reaching foreign markets. Some Challenges reported new market opportunities abroad for participating organisations, including in the Asia-Pacific region, Africa and the United States.¹⁸³ This evidence is complemented by evidence in export capabilities, where four Challenges reported successfully developing export capabilities (AOTF, Commercialising Quantum Technologies, Industrial Decarbonisation and Transforming Construction; see Box 19), while the Smart and Sustainable Plastic Packaging Challenge has a long-term plan to reach new overseas markets through spin-outs and contracting.¹⁸⁴ Notably, this is not yet Fund-wide, and even within Challenges, there was variance in companies' engagement with foreign markets, with only anecdotal evidence provided.¹⁸⁵ At the interim stage for the Next Generation Services Challenge evaluation, one company was exploring opportunities to expand their technology to Africa, while another company was focused on the UK but with a view of expanding to the United States in the near future and other countries in the farther future. The final report does not provide evidence of whether this was achieved, although one company has reported working with the United States.¹⁸⁶

Similarly, some Challenges have reported growth of the UK market into new sectors. For example, the AOTF Challenge has enabled the expansion of a virtual reality tool beyond the creative industries into the philanthropic sector, providing a system to evaluate whether virtual reality can be used to engage donors with the British Red Cross.¹⁸⁷ Similarly, technologies traditionally used in aerospace are being considered for use in the automotive industry.¹⁸⁸

¹⁸⁰ Audience of the Future (Final).

¹⁸¹ Faraday Battery (Interim); Commercialising Quantum Technology (Interim); Medicines Manufacturing (Final).

¹⁸² Medicines Manufacturing (Final); Robotics for a Safer World (Interim); Next Generation Services (Final); Commercialising Quantum Technology (Interim).

¹⁸³ Audience of the Future (Final); Next Generation Services (Final).

¹⁸⁴ Audience of the Future (Final); Commercialising Quantum Technology (Interim); Industrial Decarbonisation (Interim); Transforming Construction (Final).

¹⁸⁵ Next Generation Services (Final); Industrial Decarbonisation (Interim); Transforming Construction (Final).

¹⁸⁶ Next Generation Services (Final).

¹⁸⁷ Audience of the Future (Final).

¹⁸⁸ Driving the Electric Revolution (Interim).

Box 19. Challenge spotlight on exports¹⁸⁹

Audience of the Future

- **Aim:** The AOTF aims to develop new immersive technologies, including virtual, augmented, and mixed reality, and to conduct research to better understand audiences for immersive experiences in art, culture, heritage, and entertainment.
- **Impact on exports:** The Challenge has contributed to increased revenue from the export of new products and services. At the time of the final Challenge-level evaluation, the average export value for participants had increased from £145,000 at baseline to £304,000 (although there was an outlier of £3m). For unsuccessful applicants, the average final export was lower, reaching £76,000. The Challenge is also contributing to market positioning, with 58% of survey respondents stating that the project has helped protect their current market position. Additionally, 32% reported that it assisted in expanding their market position within the UK, and 21% noted expansion outside the UK. Only 5% of participants did not expect the Challenge to impact their capacity to expand their market position in the UK.

In both instances (foreign markets and sector growth), this is Challenge – and project-dependent and as such it is difficult to attribute any of these developments strictly to the ISCF. The RSW Challenge noted that the UK needs to continue investing and building international relationships to keep its market share, in an increasingly growing global market.¹⁹⁰ It is clear from the successful development of new products and services that the ISCF has positive influence on the UK market. Coupled with the evidence in Chapters 3 and 4 relating to international recognition, capacity, and collaboration, we note there is an opportunity for the ISCF and future programmes to engage further with foreign markets. A concerted effort, or distinct Fund-level aim of engaging internationally to enable products reach new and foreign markets could help prioritise this outcome.

Productivity impacts across most Challenges are still in progress and it is therefore too soon to identify consistent realised benefits, but there are positive signs.

As productivity (capital, labour or combined) is impacted in the longer term, current Challenge evaluations (both interim and final) have insufficient evidence on productivity changes, as expected. The lack of evidence limits our ability to provide a definite conclusion on the impact of a Challenge on productivity.¹⁹¹ In addition, for some Challenges, attributing increases to productivity to ISCF was not possible, for example because of the short time frame between activity and the evaluation taking place, and the large set of factors influencing productivity trends that predate the Challenge.¹⁹²

¹⁸⁹ Audience of the Future (Final).

¹⁹⁰ Robotics for a Safer World (Interim).

¹⁹¹ Driving the Electric Revolution (Interim).

¹⁹² Transforming Construction (Final); Transforming Food Production (Interim).

Box 20. Challenge spotlight on productivity and GVA¹⁹³**Audience of the Future**

- **Aim:** The AOTF Challenge aims to develop new immersive technologies, including virtual, augmented, and mixed reality, and to conduct research to better understand audiences for immersive experiences in art, culture, heritage, and entertainment.
- **Impact on productivity and GVA:** While a few Challenges, such as Robotics for Safer World and DSBD, reported on anticipated impact on productivity, only the AOTF Challenge was able to attribute increases in productivity as a result of participation in ISCF. Comparing participants with unsuccessful applicants, the Challenge-level evaluation found a range of benefits, including the median value of R&D investment in immersive content or technologies (£25,000 for treated firms compared with £10,000 for counterfactual firms); GVA (median GVA increase of 183% for participants compared with 52% for unsuccessful applicants); and increases in productivity where output gains were achieved without increasing the number of employees and/or through adopting newer techniques for effective project management and developing their code base.

Transforming Construction

- **Aim:** The Transforming Construction Challenge (TCC) aims to revolutionise the UK construction industry by accelerating the adoption of manufacturing and digital processes, targeting faster project delivery, reduced costs, lower emissions, and increased productivity.
- **Impact on productivity and GVA:** Evidence suggests that the TCC has positively impacted productivity in the construction sector since 2018 although precise quantification or attribution to the Challenge was not possible in the evaluation. Productivity growth was found to have been more rapid in construction-related activities compared with UK-wide productivity since the start of the Challenge, with evidence of increases in GVA per worker in some key sub-sectors, such as the construction of buildings sector, and among engineering consulting firms and larger firms. Detailed evaluation findings also found productivity-enhancing benefits, such as increased speed of delivery. The TCC has surpassed its funding target with a current committed project value of £29.3bn. The TCC Challenge outcomes are hoped to further boost productivity over the next 5–10 years.

Some Challenge-level evaluations examined sector-wide productivity. For example, in the TCC process evaluation report, productivity in the construction sector was shown to have increased since the start of the Challenge in 2018, but it was not possible to attribute this to the Challenge directly.¹⁹⁴

To the extent that ISCF appears to be generating investment benefits (as discussed in Section **Error! Reference source not found.**) and is supporting firm growth in high-productivity sectors, the theory of change suggests productivity benefits could be realised in the future.

Certain parameters of economic impact can be difficult to assess, such as geographical impacts.

Although funding is provided to a certain location, workshop participants noted that the money may not always be spent or operationalised in that location.¹⁹⁵ In addition, the geographical reach of a Challenge's impact will partly depend on the nature of the Challenge; Challenges focused on creating infrastructure

¹⁹³ Audience of the Future (Final); Transforming Construction (Final).

¹⁹⁴ ISCF [Process Evaluation Report](#).

¹⁹⁵ ISCF Interim Impact Workshop.

will, for example, have less far-reaching geographical impact.¹⁹⁶ As a result, Challenge evaluation frameworks therefore did not look to incorporate metrics on geographical distribution of investment and associated economic impacts. While this is expected, we recommend that future funding frameworks track where investment was received, where it was operationalised, and regional economic impacts to appropriately assess the distribution and impact of funds.

¹⁹⁶ ISCF Interim Impact Workshop.

6. Wider societal impacts

This chapter assesses the evidence on long-term impacts that are anticipated from ISCF across a range of sectors and communities. The overarching limitation underpinning this assessment is the lack of emergent impact within the timeframe that has lapsed from the inception of the ISCF, as it is expected that these impacts will materialise over a much long timeframe. Moreover, it is also noted that many Challenge evaluation frameworks did not consider wider societal impacts being within the current scope of evaluations given the timeframe of evaluations themselves. The assessment of long-term impact and its attribution to the ISCF should be a longer-term endeavour for the future through qualitative enquires and utilisation of methods, such as process tracing and outcomes harvesting.

At this stage of the evaluation, we primarily reflect on the proxy measures and lag indicators across health and environment to surmise the potential for future impact. It should also be noted the future realisation of actual impact is dependent on multiple externalities, such as the political context, industrial and growth policies, and the UK business environment.

6.1 Health impact

Evaluation question:

- To what extent has the ISCF contributed to health and wellbeing benefits, including quality of life, life expectancy, reduced health inequalities and reduced healthcare costs?

Key summary of ISCF overall impact on health:

- Longer-term impacts, including quality of life and reduced health inequalities are not measurable at this stage of the evaluation, but significant investment in the Health cluster Challenges has resulted in new infrastructure that has tremendous potential to improve healthcare outcomes in the UK.

Table 14. Mapping of Fund-level metrics against metrics in Challenge evaluation reports (see Annex E, Table 19, for Challenge-level summaries from evaluation reports).

Challenge	Metrics in scope?	Evidence found in report?
Audience of the Future	N	N
Medicines Manufacturing	Y	Y
Data to Early Diagnosis	N	Y*
Commercialising Quantum Technology	N	N
Digital Security by Design	N	N
Next Generation Services	N	N
Manufacturing Smarter Innovation	N	N

Robotics for a Safer World	N	N
Transforming Foundation Industries	N	N
Prospering from the Energy Revolution	N	N
Industrial Decarbonisation	N	N
Transforming Construction	N	N
Transforming Food Production	N	N
Smart Sustainable Plastic Packaging	N	N
Driving the Electric Revolution	N	N
Faraday Battery	N	N
Future Flight	N	N

*Metric not included in the framework, but evidence found in the report

Health impacts materialise over a long timeframe and therefore direct impacts are out of scope for most Challenges.

Health impacts were out of scope for most Challenges, where only Medicines Manufacturing included health impacts in its Challenge evaluation scope (including metrics on number of NHS hospitals capable of administering ATMPs). The workshop with ISCF and industry stakeholders highlighted that health impacts take multiple years to transpire,¹⁹⁷ therefore meaningful measurement is only possible on a longer timescale, even for Challenges within the Health cluster. Given the stage of Challenges, direct impacts on health and wellbeing were not measurable, as expected.

The Fund is anticipated to have a positive impact on health and wellbeing through its support of the development of new infrastructure.

Nevertheless, we found that any mentions of health impacts concerned the development of new infrastructure in manufacturing of vaccines and drugs, improved diagnostics, advanced therapies, and multiple medical technologies within the Health cluster Challenges.¹⁹⁸ These could indirectly lead to impacts on health and wellbeing in the long term (further discussion on new infrastructure impacts in section 6.3). There have also been significant developments in capacity building and skills generation with a particular focus on apprenticeships and upskilling in new technologies in digital health, the NHS, and beyond. Direct R&D investments (Box 21) offer insight into how ISCF investments can generate health impacts and pivot to support emerging healthcare needs.

¹⁹⁷ ISCF Interim Impact Workshop.

¹⁹⁸ Medicines Manufacturing (Final); Data to Early Diagnosis (Interim).

While it is not possible to tangibly measure the contribution to health impacts at this point in time, it is apparent that the Fund has provided the infrastructure, systems and capacity necessary to drive innovation and improve healthcare outcomes in the UK. We recommend focusing the final phase of this evaluation on understanding the mechanisms of action that could lead to the anticipated impacts.

Box 21. Challenge spotlight on health and wellbeing¹⁹⁹

Medicines Manufacturing

- **Aim:** The MMC has been designed to boost UK medicine manufacturing by developing innovative, sustainable technologies that accelerate patient access, enhance sector resilience, and support economic recovery and levelling up.
- **Impact on health and wellbeing:** Out of 43 projects assessed in the NHS, 14 demonstrated success, with ten showing cost-saving efficacy and four highlighting health benefits for patients. Twelve technologies have been adopted by the NHS, on either a small or large scale, and seven firms expanded their technologies internationally. Some examples of health benefits brought on by the innovations developed as part of the projects include a smart inhaler, which showed one fewer hospital admission per chronic obstructive pulmonary disease patient per year and an improvement in readmission time to 10 months compared with 50 days for control patients. Another project, an app for rehabilitation after surgery, demonstrated a significant increase in quality-of-life health scores compared with the control group. Another company reported that a Phase 3 autologous therapy treating chronic limb ischaemia is expected to benefit approximately 49% more patients, with a reduction in amputation and mortality rates. Most projects funded through CR&D competitions focus on process improvements or non-therapeutic products with indirect patient benefits. Often, sales data or patient reach for these marketed products is not provided, making it difficult to assess their health impacts.

6.2 Environmental impact

Evaluation question:

- To what extent has the ISCF contributed environmental and sustainability benefits, including reduced emissions, progress towards net zero, and growth of the circular economy?

Key summary of ISCF overall impact on the environment

- Quantitative measurement of these impacts is generally only possible over a longer period of time, and the evidence from all relevant Challenges did not measure direct impacts per se for this reason. Environmental impacts were a specific focus for the Challenges in the Clean Growth and Future Mobility clusters, and evidence was captured highlighting a range of mechanisms to achieve net zero and clean energy generation, such as offshore wind farms, use of sustainable materials and reduction in greenhouse gases. However, a consistent approach to measuring long-term environmental impacts is needed to assess the ISCF contribution in the long term.

Table 15. Mapping of Fund-level metrics against metrics in Challenge evaluation reports (see Annex E, Table 20, for Challenge-level summaries from evaluation reports).

Challenge	Metrics in scope?	Evidence found in report?
Audience of the Future	N	N
Medicines Manufacturing	N	N

¹⁹⁹ Medicines Manufacturing (Final); Jones, Medicines Manufacturing Innovation – Job Done or Just Begun?

Data to Early Diagnosis	N	N
Commercialising Quantum Technology	N	N
Digital Security by Design	N	Y*
Next Generation Services	N	N
Manufacturing Smarter Innovation	Y	N
Robotics for a Safer World	Y	Y*
Transforming Foundation Industries	Y	N
Prospering from the Energy Revolution	Y	N
Industrial Decarbonisation	Y	N
Transforming Construction	Y	Y
Transforming Food Production	Y	N
Smart Sustainable Plastic Packaging	Y	Y
Driving the Electric Revolution	Y	Y
Faraday Battery	Y	Y
Future Flight	Y	Y

* Metric not included in the framework, but evidence found in the report

Environmental impacts are in scope in the Clean Growth and Future Mobility sectors, given their focus on clean energy, sustainability and net zero; however, impacts will accrue over time and measurement varies between sub-clusters.

Challenges in the Clean Growth and Future Mobility clusters have broadly included environmental impacts in their remit, and we found discussion of this metric in approximately half of the Challenges' evaluation reports so far. The ISCF has supported multiple projects that aim to reduce greenhouse gas (GHG) emissions through investments in new infrastructure and improve the environmental performance and energy efficiency of built assets and technologies.²⁰⁰ For example, the RSW Challenge the societal impacts include contributing to cleaner energy, which is yet to be fully realised, but the contribution to offshore wind is a positive step and a good indication of impact to come.²⁰¹ Activities undertaken within the TCC could also potentially improve environmental performance of built assets. As of 2021, it influenced £22.8bn of projects on reducing GHG emissions, definitively meeting its initial target of £3bn. More than 70% of survey respondents also reported a positive impact from adopting the Challenge concepts on CO₂ emissions,

²⁰⁰ Transforming Construction (Final); Faraday Battery (Interim); Robotics for a Safer World (Interim); Digital Security by Design (Interim).

²⁰¹ Robotics for a Safer World (Interim).

energy consumption and waste produced on site. With regards to the Sustainable Production and Consumption sub-cluster, the Fund has provided the infrastructure and support necessary to drive innovation, improve outcomes in these areas and align with wider governmental policies, including the Green Recovery Strategy and the UK Plastics Pact.²⁰² Most Challenge evaluations are still in the interim phases, so we expect further evidence to emerge in the final reports.

Box 22. Challenge spotlight on environmental impact¹⁹¹

Driving the Electric Revolution

- **Aim:** The DER Challenge aims to boost UK PEMD production by £5bn by 2025 through industry-academia collaboration, enhancing supply chains, innovation and manufacturing across multiple sectors.
- **Barriers to environmental impact:** The Challenge has not yet impacted environmental policy, which is not unexpected in such a short period. The interim evaluation gathered qualitative perspectives from various case studies, highlighting several barriers that could hinder the Challenge's long-term environmental impact. The UK's policies on semiconductor technology are perceived as sparse and fragmented. This issue is exacerbated by poor communication between departments and slow governmental responses, exemplified by the delayed decision on the Newport Wafer Fab purchase, which are impeding progress.

The absence of a clear framework or national strategy further adds to investor uncertainty. Concerns were also raised about the Challenge's low visibility outside its immediate network and its diffuse focus, which may limit its potential to significantly influence environmental policy and standards, despite its role within the PEMD supply chain. Tailored pathways for involving government departments and PEMD supply chain stakeholders were recommended in the Challenge-level evaluation, to enable impact across sectors.

As was noted for health impacts, environmental impacts are likely to accrue over a longer period of time and require a set of consistent metrics, such as carbon emission reductions enabled and energy generated via clean sources/fuels. However, given that most Challenges are not anticipated to realise such long-term impacts within the lifetime of the ISCF and beyond, the evidence from the Challenges has thus far focused on measuring activities and outputs that could result in said environmental impacts.

Metrics in scope range from direct GHG emissions reductions and indirect reductions enabled through increases in renewable energy infrastructure and reduced energy usage, to impacts on public perceptions and behaviours and impacts on industry (including support for businesses to reduce GHG emissions). The Sustainable Communities and Energy Systems sub-cluster, for example, primarily looks for GHG emissions reductions, energy use reductions and percentage of UK renewable energies deployed. By comparison, the Sustainable Production and Consumption sub-cluster includes metrics on recycling, sustainability and market shares of single-use plastic packaging. While these impacts are emerging, future funding programmes could learn from this, providing guidance and standard procedures for data collection across projects within relevant sub-clusters. As it stands, measurement approaches for environmental impact varied across the Challenges, making it difficult to arrive at an aggregate view of impact realised/expected.

From this evidence, we note that it would be valuable to tailor the evaluation of impact to specific clusters instead of evaluating by impact theme (e.g. environmental impact) across all Challenges, as Challenge aims

²⁰² Faraday Battery (Interim); Smart Sustainable Plastic Packaging (Interim).

result in different types of impact; this would be particularly helpful in a longer-term evaluation tailored for the Clean Growth and Future Mobility clusters and their sub-clusters.

6.3 Infrastructure and services impact

Evaluation question:

- To what extent has the ISCF contributed benefits to infrastructure and services, including broadened access, increased resilience and increased safety?

Key summary of ISCF overall impact on infrastructure and services

- Investments in ISCF Challenges have had notable impacts on the development or refurbishment of infrastructure and services. In the Healthy Society cluster in particular, infrastructure developments can be seen as proxies for wider societal and health benefits, enabling access to new technologies even if they have not yet reached a large implementation phase. Similarly, examples of increased resilience have been provided in the context of COVID-19, when manufacturing capabilities were harnessed to mitigate the challenges posed during the pandemic in vaccine manufacturing, for instance.

Table 16. Mapping of Fund-level metrics against metrics in Challenge evaluation reports (see Annex E, Table 21, for Challenge-level summaries from evaluation reports).

Challenge	Metrics in scope?	Evidence found in report?
Audience of the Future	Y	Y
Medicines Manufacturing	Y	Y
Data to Early Diagnosis	N	Y*
Commercialising Quantum Technology	N	N
Digital Security by Design	Y	Y
Next Generation Services	Y	N
Manufacturing Smarter Innovation	N	N
Robotics for a Safer World	Y	Y
Transforming Foundation Industries	N	N
Prospering from the Energy Revolution	Y	N
Industrial Decarbonisation	N	N
Transforming Construction	N	N
Transforming Food Production	N	N
Smart Sustainable Plastic Packaging	N	Y*
Driving the Electric Revolution	N	Y*
Faraday Battery	N	Y*

Future Flight	Y	Y
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* Metric not included in the framework, but evidence found in the report

The ISCF has had an overall positive impact on infrastructure and services in the UK, through mechanisms that include skills and network development and collaboration.

The Fund has catalysed development of new and existing infrastructure through a number of mechanisms across Challenges.²⁰³ For example, Challenges have facilitated collaborations among businesses, supply chains, academia and the NHS, as well as development of skills and capacity, which resulted in increased knowledge sharing and improved infrastructure and services across many sectors.²⁰⁴ The Fund has also focused on improving existing infrastructure for social good, including disability and accessibility, marginalised groups' access and experiences, digital inclusion in transport, socio-economic inclusion and reducing human exposure to hazardous environments.²⁰⁵

Box 23. Challenge spotlight on infrastructure and services impact²⁰⁶

Smart Sustainable Plastic Packaging

- **Aim:** The Smart Sustainable Plastic Packaging Challenge's objectives are to advance sustainable plastic packaging by reducing unnecessary use, promoting reuse and refill systems, and improving recycling technologies, thereby supporting the UK's clean growth and decarbonisation goals, in alignment with the 2025 UK Plastics Pact targets.
- **Impact on infrastructure and services:** Investments made under the Smart Sustainable Plastic Packaging Challenge have contributed to new services, infrastructural facilities and methods related to the sustainability of plastic packaging. Challenge-funded projects are expected to improve the UK's plastic recycling capacity by 144,000 tonnes each year, in addition to making fundamental contributions to the development of infrastructure for plastic collection.

These efforts have been supplemented by investments in better methods of identifying recyclable plastics, enhancing consumer engagement and utilising AI and other technologies to increase the efficiency of existing recycling technologies. Furthermore, newer developments in the field have led to upskilling opportunities, as 96 individuals associated with Challenge-funded projects have received training.

Developments in infrastructure are showing early signs of wider societal impacts, notably in the Healthy Society cluster and the automotive sector.

Multiple instances of benefits to infrastructure from increased investments have been noted and captured in Chapter 3. For instance, the Fund has increased awareness on digital security, led to security advancements in e-commerce and facilitated small improvements in research skills base by stimulating further investments in the sector. R&I has improved the sustainability of plastic packaging, resulting in new

²⁰³ Smart Sustainable Plastic Packaging (Interim); Data to Early Diagnosis (Interim); Future Flight (Interim); Audience of the Future (Final).

²⁰⁴ Smart Sustainable Plastic Packaging (Interim); Future Flight (Interim); Medicines Manufacturing (Final); Data to Early Diagnosis (Interim); Audience of the Future (Final); Robotics for a Safer World (Interim).

²⁰⁵ Future Flight (Interim); Audience of the Future (Final); Robotics for a Safer World (Interim).

standards and methods for measuring the environmental impacts of the full life cycle of plastic packaging.²⁰⁶ Evidence of investment and development of infrastructure has also been evident across the ISCF through examples provided of investing in the workforce, technology platforms, data platforms and centres of innovation and excellence in the health sector.²⁰⁷

While it is difficult to directly measure whether this contribution to infrastructure and services has translated to broader access, resilience and safety, the indications very much support these outcomes which are likely to be realised in the long term. For instance, this metric was notably in scope in Challenges in the Healthy Society cluster and the automotive sector. Access to new technologies in the health, automotive and energy sectors have been demonstrated even if they have not yet reached a large implementation phase. Similarly, examples of increased resilience have been provided in the context of COVID-19, when manufacturing capabilities were harnessed to mitigate the challenges posed during the pandemic in vaccine manufacturing, for instance. Health impacts resulting from infrastructure developments have been discussed further in Chapter 6.1.

Despite these positive indicators, validation workshop participants noted that timescales and funding for delivery at the ‘implementation phase’ could be amended to maximise delivery impacts. Therefore, we recommend changes to the structure of the Fund to facilitate more focused delivery of impacts by enabling scalability, implementation and uptake where appropriate. UKRI could adopt a tapered funding structure, distributing funds throughout the duration of the project to allocate more funding at the end of the project. In its current format, the ISCF allocates funds to different Challenges in three separate commissioning waves, but funds are not distributed within the Challenges themselves to facilitate this.

Box 24. Challenge spotlight on how infrastructure and capacity investments can impact health and wellbeing²⁰⁸

Data to Early Diagnosis

- **Aim:** The objective of the Data to Early Diagnosis Challenge is to develop and innovate precision medicine to improve early diagnosis and treatment of diseases by focusing on genomics, health data and specialised diagnostic centres.
- **Impact of the Challenge’s capacity investments on health and wellbeing:** Improvements have been made to new and existing infrastructure under the Data to Early Diagnosis Challenge. For example, the National Training Centre has been completed, and new high-tech equipment has been installed at the Royal National Orthopaedic Hospital and the National Pathology Imaging Co-operative (NPIC) Centre in Leeds. Additionally, the launch of the AI Deployment Engine at King's College Hospital is being used in patient care for speedier diagnostics. The Challenge has also shown significant progress in building the Federated Learning Platform, which helps link data from multiple NHS Trusts to enable AI at scale and improve skills and capabilities for genomic and data-driven healthcare technologies. These developments demonstrate the potential impact on health by providing improved facilities and diagnostics to patients. However, direct health impacts will take longer to realise and have therefore not yet been documented.

²⁰⁶ Smart Sustainable Plastic Packaging (Interim).

²⁰⁷ Medicines Manufacturing (Final); Data to Early Diagnosis (Interim).

²⁰⁸ Data to Early Diagnosis (Interim).

6.4 Wider societal benefit

Evaluation question:

- To what extent has the ISCF contributed wider societal benefits, including unexpected and unintended consequences?

Key summary of ISCF overall impact on wider societal benefits

- Common impacts at this point revolve primarily around public perception and attitude changes. In some instances, the ISCF has influenced attitudes and cultural changes towards certain technologies, reporting increased awareness and understanding of their value and challenges. Longer-term behavioural changes and policy direction could be an outcome of this type of influence, especially given the interaction with the public, government, industry and academia.

Table 17. Mapping of Fund-level metrics against metrics in Challenge evaluation reports (see Annex E, Table 22, for Challenge-level summaries from evaluation reports).

Challenge	Metrics in scope?	Evidence found in report?
Audience of the Future	Y	Y
Medicines Manufacturing	N	N
Data to Early Diagnosis	N	N
Commercialising Quantum Technology	Y	Y
Digital Security by Design	Y	Y
Next Generation Services	N	Y*
Manufacturing Smarter Innovation	N	N
Robotics for a Safer World	Y	Y
Transforming Foundation Industries	N	N
Prospering from the Energy Revolution	Y	N
Industrial Decarbonisation	N	N
Transforming Construction	N	Y*
Transforming Food Production	Y	N
Smart Sustainable Plastic Packaging	Y	N
Driving the Electric Revolution	Y	Y
Faraday Battery	N	Y*
Future Flight	N	N

*Metric not included in the framework, but evidence found in the report

Challenges have shown wider cultural and behavioural impacts on public perceptions and attitude changes, facilitated through policy influence.

Beyond the environmental, health and infrastructural benefits, we looked to also capture any instances of unanticipated wider cultural and behavioural change as a result of the work of the ISCF, captured under the term ‘wider societal benefits’. Therefore, the coverage in scope varies greatly between Challenges, and some have produced evidence of wider societal benefits without formally tracking these metrics (e.g. Next Generation Services, TC, DER and Farraday Battery Challenges). These Challenges generally highlight cultural and attitudinal changes and public perception associated with an increased understanding of relevant technologies. For example, the Next Generation Services Challenge noted changes towards AI from an improvement in the understanding of the potential for AI and the skills needed, which has the potential to influence the strategic direction of companies. Attitude changes have also created a scenario of increased adoption into other industry domains, such as insurance firms, mid-market accounting, law firms/legal services and the digital currency landscape (cryptocurrency accounting).²⁰⁹

These types of wider societal impacts are common across the Fund and revolve around changes or gains in public perception and attitude. In some instances, the ISCF has influenced attitudes and cultural changes towards certain technologies, reporting increased awareness and understanding of their value and challenges (public engagement is explored further in Chapter 2). For instance, the DSBD Challenge increased industrial sectors’ awareness of cyber- and digital-security issues and market failures, allowing them to prioritise this as a research agenda.²¹⁰ In general, we found evidence of some positive impact relating to societal attitudes and cultural changes towards certain technologies. These impacts have in part been facilitated through the increased policy influence (progress towards new regulatory standards and legislation), technology adoption mechanisms, industry and public outreach efforts, to name a few.²¹¹

²⁰⁹ Next Generation Services (Final).

²¹⁰ Digital Security by Design (Interim).

²¹¹ Robotics for a Safer World (Interim); Digital Security by Design (Interim).

7. Interim learnings and next steps for final impact assessment

7.1 Learnings and interim recommendations

The ISCF has realised tremendous impact across various technology and industrial sectors by developing new knowledge, services and products and by building capacity and infrastructure through leveraging of industry and academia collaborations and funding. Impacts occur across a range of sectors and disciplines, and these impacts are continuing to emerge.

The process of establishing the Fund and the emerging evidence on enablers and barriers of subsequent impact have generated immense learning, informing the development of the basis for multiple UKRI investments and programmes, such as the Technology Mission Fund and its extension and the work leading into the Horizon Pioneer Innovation Moonshots. UKRI staff have indeed cited ISCF learnings to be paramount in enabling the success of these future investments.

Bearing the emerging impact and lessons in mind, we propose a few interim recommendations. The recommendations will be firmed up in the final impact evaluation of the ISCF.

Improving impact measurement

The ISCF was commissioned using a novel approach, which had not been applied to other government funds at the time. As a result, there were no equivalent programmes to learn from. The following recommendations stem from several learnings taken following the delivery of the ISCF.

1. The structure for commissioning of mission-oriented R&D programmes should be reconfigured into thematic or sectoral missions, mirroring the cluster-level configurations proposed, to ensure a focused impact measurement approach with relevant indicators. Grouping of very diverse portfolios of investment, such as the ISCF, can dilute the impact measurement due to trade-offs being made in capturing high-level evidence versus sector-specific, bespoke measurement approaches. Learnings from the ISCF around this topic have already been applied to the Technology Missions Fund, for example, which is structured in thematic missions. Any commissioning of evaluation should also follow a thematic structure.
2. Timescales for achieving appropriate impacts in mission-oriented funding should align to what is achievable in that given time frame and fiscal cycle; this is particularly important when planning timelines for *ex post* evaluations. It would be beneficial for commissioners, such as UKRI, and Challenge delivery teams to work closely with evaluators to temper and stress test proposed theories of change, measurement frameworks and benefits realisation plans against feasibility of achieving given impact in the proposed timeline. This should determine which aspects of a theory of change should be developed into a measurement framework at a given point and be part of the formal evaluation, which could manage stakeholder expectations. While a theory of change for an investment can be comprehensive, an evaluation approach should be more focused and timebound.

3. While some data collection was mandated by the Fund, the flexibility of the data reporting was not aligned to a Fund-level evaluation, which necessitates aggregation of impacts to obtain a Fund-level understanding of impact. Consistent and mandated data collection should be introduced in the future for Challenge areas where policymakers have already established evidence needs. For instance, consistent measurement of environmental benefits, such as carbon capture and greenhouse gas reductions, should be developed and mandated for given Challenge areas and portfolios of work. Based on this learning, IUK have developed a new impact framework consisting of mandated metrics for all IUK-funded programmes. This framework should be reviewed to ensure that the level of granularity specified in the metrics is appropriate and useable for aggregate impact assessments.

Improving likelihood of achieving impact – within UKRI

1. Changes to the financing model of the Fund could maximise impacts. For instance, allocating funding during the seed stage or using a tapered funding model where funding is allocated in stages could allow use of 25–40% of the overall funds in the first 3 years of the Fund, with the remaining funds to be allocated across the tail-end of the Fund. This could unlock more focused activities to accelerate impact while limiting use of funds while programmes are still bedding in.
2. Further provision of commercialisation support during the Challenge at the centralised Fund level could accelerate impact. While a Challenge-level commercialisation focus and mechanisms of building capacity were present to a varying degree, some of the endeavours could have benefited from a centralised approach or a point person (Chapter 2.1). Where possible, continued support post-completion, such as through an Impact Accelerator-type funding model, would enable the full investment potential to be realised.
3. Further linking of Challenge and Fund personnel with policy and decisionmakers via the established governance structures could support policy buy-in and engagement during the course of a portfolio of work. For example, the MMC Director, alongside the VMIC team, supported the work of the Vaccine Taskforce. This support could provide workarounds to bottlenecks and highlight systemic challenges from industry to relevant decisionmakers. This could also enable a cohesive identity of the Fund and direct links to government strategy, which has been shown to be impactful in other sectors.
4. It would be beneficial for UKRI to invest in legacy building for ISCF by leveraging the communities that have been formed and by maintaining networks and systems established by the multi-year efforts, such as the Quantum Communications Hub, the Validate Network and the Energy Revolution Research Consortium, to name just a few. This could provide an opportunity for UKRI to rejuvenate the ISCF identity in a post-hoc manner and ensure that the knowledge assets generated from the multi-year investment can be accessed and disseminated appropriately. This could in part be achieved through Impact Accelerator awards as per recommendation above; however, a centralised fund focused on ISCF knowledge asset management could be useful in realising ongoing value of the ISCF investment.

5. UKRI should introduce specific targets and measurement requirements for international investment and international talent mobility in future funds if this is of continued importance. UKRI should also provide centralised support tools to facilitate this proactively, for example by supporting navigation of commercialisation processes and offering training and relocation packages to international experts.

7.2 Next steps for final impact assessment

The final evaluation reports for many of the Challenges are yet to be published, and many of the impacts are not fully realised or measurable at the moment. These final reports are anticipated during the next phase and are expected to provide a more complete picture of Fund-level impacts. Any aspects not captured due to unanticipated delays in reports will be mitigated through capture of information via surveys and interviews in specific sectors of the ISCF.

The final phase of the ISCF evaluation will continue to delve into the links between process and impact. The phase will explore the link between process structure and impact and focus on what impacts were thought to have occurred at sectoral level. To do this, we will analyse the final set of Challenge reports for impacts. These will be thematised based on the Fund-level evaluation structure and aggregated at the Fund level.

This phase will also include primary data collection to answer key evaluation questions that remain unaddressed in this phase of the Fund and to probe for aspects of additionally of the ISCF, building on the evaluation framework report.²¹² This will take the form of a survey and interviews, specifically probing for longer-term impacts of Challenges that have finished, as noted in Chapter 6, for example, assessing the legacy of these Challenges and identify trends at the sector level. Analysis of internal IUK monitoring data will also be conducted at the Fund level. Network analysis will be conducted by Frontier Economics to assess interactions and connectivity across the Fund (see Annex D), while a future econometrics and VfM analysis will highlight economic gains and value of the Fund.

²¹² ISCF [Evaluation Framework Report](#).