

A woman with long dark hair, wearing clear safety glasses and a grey polo shirt, is looking towards the camera. She is holding a circular, glowing yellow light fixture. She is standing inside a large, complex industrial machine with several yellow panels and metallic components. The machine has various vents and circular openings. The background is slightly blurred, focusing on the woman and the machine's interior.

Jisc

# Research and innovation sector strategy

2021 - 2023

February 2021

All quotes within this document are taken from the Jisc organised virtual focus groups, which took place in summer 2020 under Chatham House rules.

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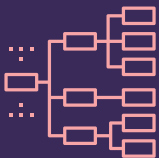
# Strategy in summary



## Theme 1: Supporting a new national data infrastructure for research

Never before have research and innovation been so dependent on infrastructure, on the capacity of network, security, connectivity and access management. This dependency will continue to grow.

**We commit to supporting a new national data infrastructure for research, underpinned by our existing Janet Network, cyber security, cloud and data infrastructures and will coordinate the implementation of a flexible set of solutions for institutions and research collaborations.**



## Theme 2: UK research analytics: understanding systems, cultures, resources and decision-making

The data produced through the processes of research management could be used on a greater scale to transform research systems, cultures and decision-making. Exponentially upgraded analytical capacity is needed to build the strategic capabilities of UK research.

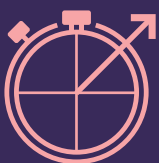
**We will examine the potential for a new UK research analytics platform and service, enhancing our existing analytics capabilities.**



## Theme 3: Recording the UK's 'research estate' in support of a UK-wide research capability

The ability to identify, deploy, share and re-use physical and intangible assets that comprise the research estate are central to delivering efficiencies, the civic agenda, levelling up, open research and achieving net-zero. These assets also include the significant infrastructure which gives access to research, including content, library and archival collections.

**We will explore expanding the well-established digital approaches to the management and use of these assets.**



## Theme 4: Accelerating the achievement, delivery and monitoring of the journey to open research

Open research extends beyond the boundaries of open access articles to all research outputs, including metadata, data, code, algorithms and software, as well as the processes of research itself. It will continue to be a high priority for the UK research base, for funders and for Jisc.

**We commit to helping the UK embrace the full potential of open research by removing barriers, embedding open practices and developing infrastructure to support this potential.**



## Theme 5: Applied research and knowledge exchange: supporting commercialisation and deployment

The interconnected systems producing world-class research and innovation are increasingly reliant on shared and secure infrastructure to enable their growth. The breadth of academic-industry collaborations and commercial spinouts from academic research is set to grow.

**We commit to further supporting the acceleration of the impact of and knowledge exchange from research commercialisation through the enhanced use of shared research infrastructure.**



## Theme 6: Rapid innovation in research management and active research

Research integrity, reproducibility and reuse, evaluation and assessment, new and inclusive forms of excellence and the responsible use of metrics are all areas that offer significant potential for greater efficiency and interoperability.

**We commit to exploring and building on innovative approaches in research management, including enhanced system interoperability, common data repository standards and metrics aggregator models.**



## Theme 7: 'Research 4.0' and realising the art of the possible

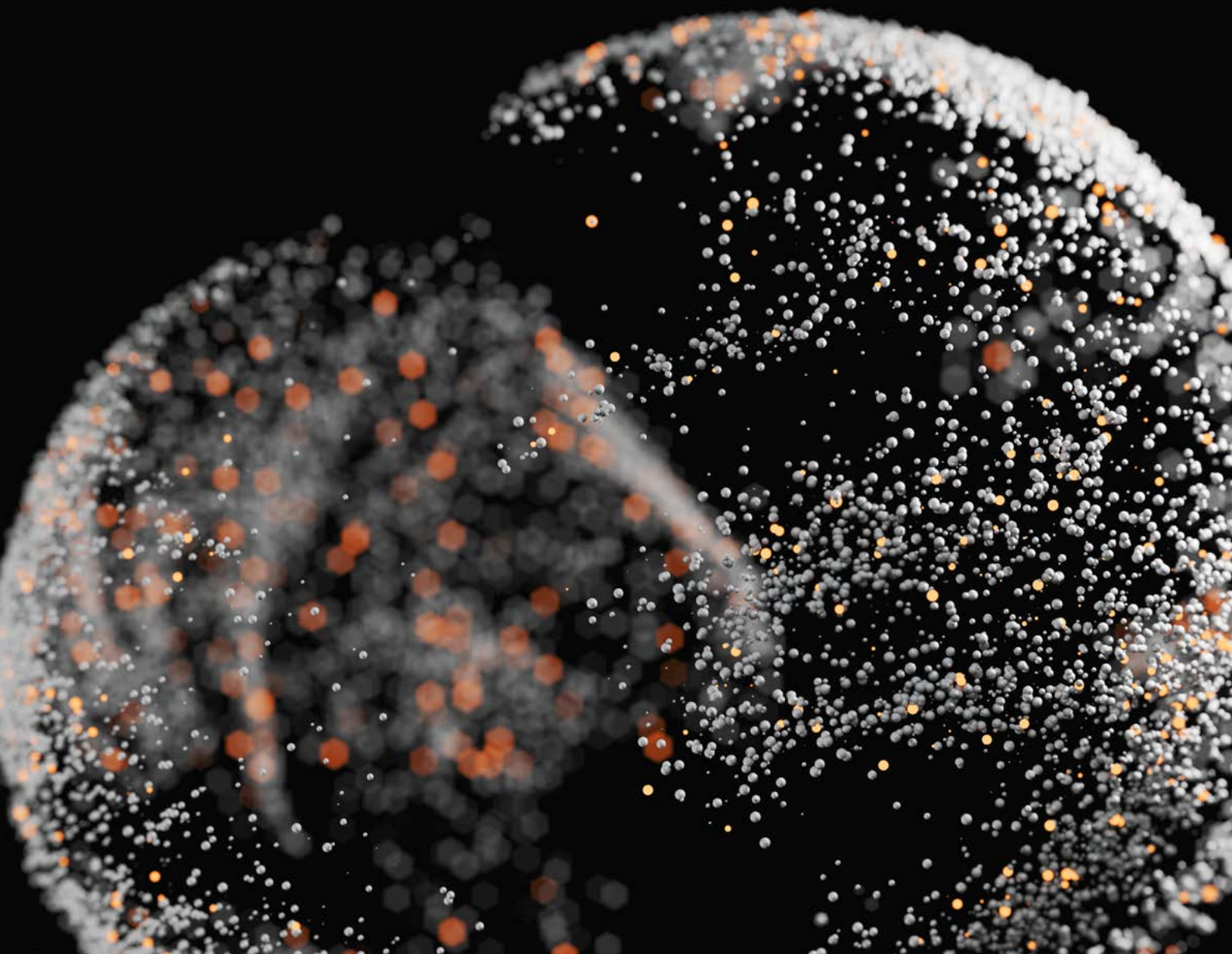
Advanced technologies such as artificial intelligence, robotics, 5G, quantum computing and biotechnologies are set to impact the UK's world-leading research and innovation sector in the years ahead in ways yet to be imagined.

**We propose a technical enablers programme focusing on exemplifying leading-edge specialisms and a 'research reimaged' programme to better understand this future potential with and on behalf of our members.**

## Foreword

We believe that education and research improve lives and that technology can improve research.

Now, more than ever, the power of research and innovation are evident: UK research programmes and international collaborations are at the forefront of tackling global challenges, from Covid-19 vaccines to the climate crisis.



We are proud to be a trusted partner of UK research and researchers. We are a major provider of research infrastructure and services, and a partner in and authority on the use of network, cyber security, cloud, data, licensing, content and discovery to support research.

Our research and innovation sector support is rooted in our position as the UK's national research and education network (NREN), providing infrastructure and facilities including the **Janet Network**. Janet is essential for research and innovation, connecting UK higher education institutions and research establishments to the rest of the digital research world, securely moving huge volumes of research data and providing the high-speed digital foundation for collaborative research.

We aim to ensure that the contribution we make to the UK research and innovation sector continues to grow. Our approach will be to protect and enhance valued areas of activity, such as in the network, content and library space, and continue to extend our focus across the research lifecycle.

Our research and innovation sector strategy sets out how we will continue to support the sector over the next two years, empowering researchers and research consortia in developing fundamental, applied and practice-based research and translating it into knowledge exchange, and economic and social impact.

In the strategy we identify seven key themes. The themes focus on where we are uniquely placed to act in the continued development of technology, digital and data approaches, and advice and guidance to support their effective implementation.

We are focused on supporting the UK research and innovation sector to achieve its priorities. We engaged with and listened to the research community to inform the direction of this strategy and the activities on which it will focus, convening an inclusive and open digital research community to ensure that our strategy is fundamentally sector informed. We will continue that engagement to ensure an evolving, comprehensive and representative approach.

Our vision is for the UK to be world leaders in technology for research. This research strategy lays the foundation for realising that vision.

**Paul Feldman**

CEO, Jisc

**Liam Earney**

Executive director, digital resources

## Introduction

The UK is a critical international research and innovation collaborator and partner in finding solutions to the greatest and most pressing global challenges. UK higher education institutions are among the best in the world for research and innovation.





Never before has research been so central in guiding the direction of people's lives and the UK research and innovation sector is increasingly agile and collaborative in responding.

Within an existing context of evolving policy and funding changes, Covid-19 has placed unprecedented new demands on the sector, which correspondingly need creative approaches and new lenses to guide its collective response.

Our role in extending the deployment and reach of technologies, data and digital

approaches is central to supporting the UK research and innovation sector to remain resilient, sustainable, inclusive and collaborative, and to continue to develop excellent research.

Here we set out our strategic approach to supporting the sector over the next two years. We see this strategy as a starting point and the basis on which we will continue to support research and innovation.



# Contexts

Our strategy has been developed within the context of international and national political, social, health, environmental and economic developments that are impacting the UK, its nations and the international research and innovation sector systemically, comprehensively and at pace.

Within the UK, strategic and policy developments are increasingly focused on research and innovation.

## The UK policy context includes:

- The UK government's [Research and Development Roadmap](#), which sets out the government's vision for science, research and innovation and offers a set of priorities focused on innovation, impact, talent, infrastructure, place, internationalisation, equality, diversity and inclusion
- The roadmap builds on the UK government's [Industrial Strategy](#), which sets out its ambition to invest 2.4% of gross domestic product (GDP) in research and development (R&D) by 2027 and identifies ideas, people, infrastructure, business, environment and places as the five foundations of productivity improvement. It also lays out grand challenges such as Artificial Intelligence (AI) and Data, Economy, Clean Growth, Future of Mobility and Ageing Society
- The UK government's [National Infrastructure Strategy](#) which sets out plans to transform UK infrastructure in order to level up the country, strengthen the union and achieve net zero emissions by 2050

- The Department for Digital, Culture, Media and Sport's [National Data Strategy](#) and the aim to support the development of the UK's data economy and ensuring public trust in data use

- The UK government's [focus on reducing bureaucracy](#) and the aim to streamline and simplify its processes and reduce the burden on research and innovation
- The UK government's [R&D Place Strategy](#), which will seek to build on local potential so that all regions and nations of the UK benefit from a R&D-intensive economy
- UK Research and Innovation (UKRI) [Corporate Plan](#) to achieve its vision of a flourishing, world leading research and innovation system and the outcomes of the UKRI [Open Access review](#)

## Scotland

- The [Scottish government's Scotland Inward Investment Plan: Shaping Scotland's Economy](#), with the ambition of ensuring science and research in Scotland remain cutting edge and excellent in global terms

- The Scottish Funding Council's [Strategic Framework 2019-2022](#) ambition for Scotland to be the best place in the world to learn, educate, research and innovate

### Northern Ireland

- The Northern Ireland Department for the Economy's [ambition](#) to develop and sustain a higher education research sector that holds a strong position within the UK and beyond and makes a major contribution to economic and social wellbeing

### Wales

- The Higher Education Funding Council for Wales' [Research and Innovation: The Vision for Wales](#) ambition to deliver a thriving community of challenge, change and achievement that will meet economic, social and civic ambitions across Wales, the UK and the world
- The outcomes of the consultation on the [Commission for Tertiary Education and Research \(Wales\) Bill](#) on the establishment of a new arms-length sponsored body with responsibility for the entirety of post-compulsory education and training (PCET) and research in Wales

### International

Research and innovation is an international enterprise and the connectivity between countries is an essential part of the UK research and innovation context.

We have a representative function for UK research in a range of international groups, including [UUKI](#), [GÉANT](#) board of directors and CEO Forum, [Knowledge Exchange](#), [OA2020](#) and [European University Association \(EUA\)](#).

This engagement helps ensure that UK research community needs are protected and also provides an opportunity for UK expertise and capability to be promoted in an international setting.

The international context includes:

- The UK government's [International Research and Innovation Strategy](#), which sets out how the UK will collaborate internationally to tackle global challenges and support economic growth.
- Access to the European Commission's [Horizon Europe](#) programme and replacement for EU structural funds
- International efforts to achieve full and immediate access to research output such as [Plan S](#) and [OA2020](#)

We engage with research and educational networks internationally and with [GÉANT](#) (research and education networks), [EGI](#) (research computation and cloud providers), [EUDAT](#) (research data services) and [OpenAire](#) (open access services).

Through international engagement we benefit from international network transits, access and management federations including [eduroam](#), cyber security alerting. We also ensure the international interoperability of our services and the promotion of our members' interests in influencing the development of research services and policies at the international level.

## How we support research

We are the UK further education and skills, higher education and research sectors' not-for-profit organisation for digital services and solutions.

We support UK research and innovation through the coordination of a corpus of technologies and by enhancing end-to-end research lifecycle management. We are recognised as a major provider of research infrastructure and services, a trusted partner and, in our areas of expertise, an authority on the use of technology to support research.

We are the UK's national research and education network (NREN), providing infrastructure and facilities including the [Janet Network](#), connecting all UK universities and key research establishments to the rest of the digital research world and providing the high-speed digital foundation for collaborative research. Eighteen million users in education and research organisations, science parks and public sector bodies rely on the Janet Network to stay connected through:

### Capacity

Exchanging vast amounts of data in seconds. Janet currently carries three petabytes of data each day.

### Scalability

Whether it's a research-intensive organisation connected at 100Gbits/s or a smaller institution running 1Gbits/s, we monitor usage and manage capacity planning.

### Global reach

To key education and research network facilities and cloud providers (including Amazon, Microsoft, Google and Apple), key content providers (BBC, Facebook, Netflix, Akamai) as well as supporting international collaborations.

### Not only does Jisc provide Janet, we support the research and innovation sector through:

- Access and identity management services, cyber security and distributed denial of service (DDOS) mitigation, providing trust and protection
- Brokerage and peered connectivity to public cloud services
- Providing library infrastructure supporting access and discovery of high-quality digital content and collections
- Negotiating publishing agreements needed to support academic research: with over 50% of UK research output covered by a Jisc agreement, we're making a sustainable transition to open access a reality
- A coordinated portfolio of open access and content discovery services, making compliance with open access policies more efficient and affordable
- Opening-up access to Digital Collections and archives to support researchers during Covid-19
- Data curation, analytics and management services
- Research and development services and co-design models for innovation

# 4Gbit/s

## Janet data network

As part of our Covid-19 response, the Janet infrastructure enabled the transfer of a 5TB Covid-related dataset between the European Bioinformatics Institute (EBI) and Imperial College London in less than three hours at a data rate of around 500MB/s (4Gbit/s).

# 3x

## Cyber Essentials certification

Our annual cyber security survey gives us a full understanding of members' needs and expectations in order to provide relevant cyber security products and support. Findings show that the proportion of UK universities achieving National Cyber Security Centre (NCSC) Cyber Essentials certification has trebled since 2018. We help members proactively manage cyber security threats and respond quickly to security issues.

# +400,000

## Free historical texts

Non-subscribing members had free access to, for example: Historical Texts with more than 400,000 texts from four key collections and Journal Archives with more than 600 journal backfiles from eight publishers' archives including ProQuest, Oxford University Press, Cambridge University Press, and Taylor and Francis.

# +20

## Open Access agreements

In 2019/2020 our negotiations secured more than 20 open access (OA) transitional agreements, increasing the percentage of UK research output covered by UK funder compliant arrangements to around 50% with 156 institutions (96% of HEIs) now having at least one transitional agreement. Our agreements with publishers have reduced sector expenditure and increased the number of articles being published OA.

Member story:

# Digitising collections opens up whole new areas for research

The UK's researchers, learners and teachers now have free access to a new digitised collection of rare content from university archives and special collections. King's College London's Charles Wheatstone collection will be digitised as part of the project. The content to be digitised offers rich insights and opportunities to develop new avenues for research.

You can read the full story [here](#).

*"In many ways this is a collection that tells the story of the making of the modern world, and we'll be able to make this story available to researchers who might not be able to come to London to visit us."*

Katie Sambrook, head of special collections and engagement, King's College libraries and collections

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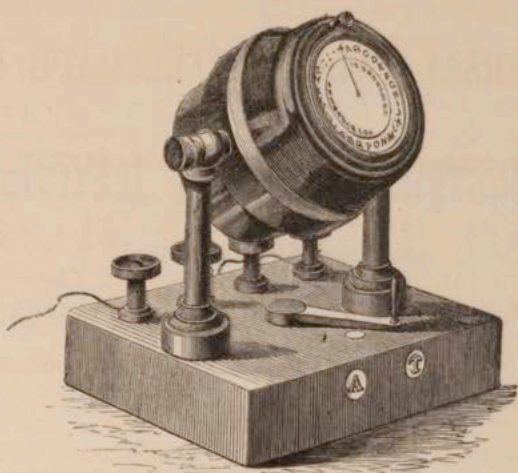
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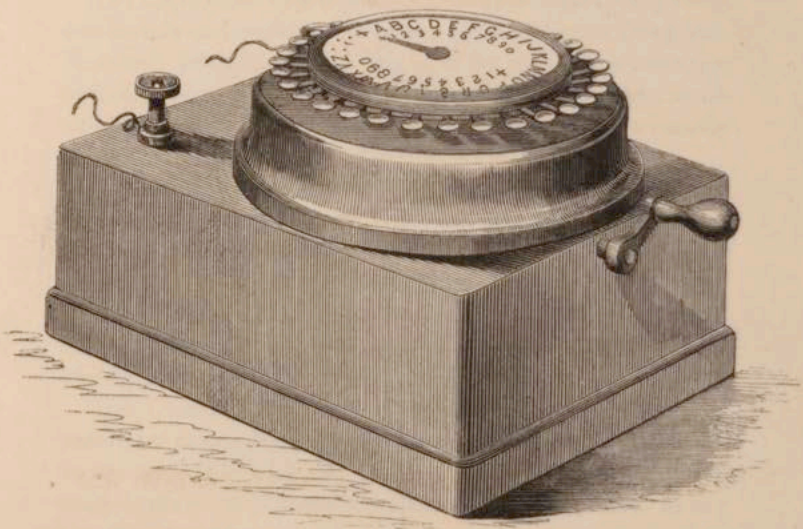
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THE INDICATOR.



THE COMMUNICATOR.

# The strategy

Our research and innovation sector strategy 2021-2023 sets out the key priorities we identified through our engagement with the sector, the themes that guide the strategy and the activities we will take towards its realisation.

In a time of unprecedented challenges and in the changing context of UK government and sector policy, our research and innovation sector strategy describes how we will maintain and extend our alignment with the technology, digital and data needs of the UK research and innovation sector. It also sets out how we will inspire transformation in the sector's use of technology to enhance research.

We define research and innovation broadly. Our strategic focus encompasses fundamental, applied and practice research, embracing research in all its forms, wherever it is located including research in the further education sector. We include research careers, from research management, enablement and technical specialisms, to early-stage and established research careers, as well as including the impact and knowledge exchange implicit in all research.

We will maintain and extend our alignment with the UK research and innovation sector through engagement using a range of mechanisms. We will continue to hone our focus on where we are optimally placed to act from the perspective of, and in support of the sector we serve.

## Supporting sector priorities

Our research and innovation sector strategy is designed to evolve with, be informed by and inform the sector through sustained engagement with researchers, research leaders, managers

and enablers, representative organisations and funders. It must do so with and in support of the wider public, voluntary and commercial sectors that undertake, design and use research.

We acknowledge that digital resources and capacity can vary and identify a critical need to support the sector in sustaining and developing the fundamentals for the longer term. We also acknowledge the importance of our role in supporting the sector to capitalise on the opportunities offered by leading edge technologies, demonstrating the new possibilities they offer for technology, data and digital approaches to undertaking and supporting research and innovation.

We have convened a group of pro-vice chancellors for research from a diverse range of UK institutions as our research strategy forum, with the remit to advise on our strategic direction in the support of research and innovation, and to help shape our strategy.

During 2020 we also held roundtables with the [Royal Society](#), [British Academy](#), [Royal Academy of Engineering](#), [Research England](#) and [Universities Scotland](#) and members of the research strategy forum to complement and extend the input of researchers and research managers and enablers, funders, membership bodies and partners into the future direction of our strategy.



We have convened an inclusive and open **digital research community** to continue and extend our engagement with the broader research community, ensuring our research and innovation sector strategy remains sector informed. We aim to continue this engagement to ensure an evolving, comprehensive and representative approach.

Our engagement validated the following research and innovation sector priorities and these priorities informed the direction of our research and innovation sector strategy and the activities on which it will focus:

#### **Equality, diversity and inclusion**

Embedding equality, diversity and inclusion across the research ecosystem, creating routes for better access to careers, celebrating diverse role models, and convening and growing diverse and inclusive research and innovation communities in ways that also recognise the diversity of the UK's HEI sector.

#### **Excellence**

Enabling excellent fundamental, applied and practice research and innovation in an increasingly interdisciplinary environment, supporting new definitions of excellence as they evolve.

#### **Expertise needed and developed by the research and innovation sector**

Supporting researchers to enhance their skills, enabling mobility across sectors and internationally, team-based research and a positive research culture.

#### **Financial sustainability and resilience**

Protecting the research budget, reducing and sharing costs, attracting investment, working in partnership, diversifying revenue to increase resilience and optimising the ways funding flows through the sector.

#### **International**

Strengthening and identifying new opportunities for international collaboration, providing a research environment that encourages international investment and staff mobility and benefits from compatible international policy, regulation and infrastructure.

#### **Knowledge exchange and impact**

Translating fundamental, applied and practice-based research into knowledge exchange and economic and social impact in collaboration with the wider public, voluntary and commercial sectors which undertake, design and use research.

#### **Place**

Strengthening collaboration, building networks to increase capacity across the UK and support institutions that are growing their research capability to make a positive difference to the towns, cities and regions in which they are located.

#### **Reducing bureaucracy**

Streamlining and simplifying processes across research management and enablement, supporting systemic reductions in bureaucracy and reducing the burdens placed on researchers.

#### **Research culture and careers**

Ensuring wellbeing, aligning strategies and culture, maintaining compliance, responding to the evolving research agenda, and using data and indicators responsibly.

#### **Responsible and ethical research**

Ensuring high-quality and robust practice across the research lifecycle so that research is ethical and responsible, has integrity and is trustworthy, reproducible, transparent and open, and conducted in secure settings.

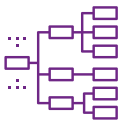
## Our strategic themes

Our research and innovation sector strategy aims to support well-timed, iterative activity that produces a coherent set of supported products, services, advice and guidance in themed areas that are meaningful to the sector.

We have identified seven key themes. The themes aim to enable us flex around them, to identify and validate the right thing at the right time for the UK's research and innovation sector. The themes focus on where we are uniquely placed to act in the continued development of technology, digital and data approaches, supporting the research and innovation sector to meet its priorities.

**Theme 1:**

Supporting a new national data infrastructure for research.

**Theme 2:**

UK research analytics: understanding systems, cultures, resources and decision-making.

**Theme 3:**

Recording the UK's 'research estate' in support of a UK-wide research capability.

**Theme 4:**

Accelerating the achievement, delivery and monitoring of the journey to open research.

**Theme 5:**

Applied research and knowledge exchange: supporting its commercialisation and deployment.

**Theme 6:**

Rapid innovation in research management and active research.

**Theme 7:**

'Research 4.0': realising the art of the possible.



## Supporting a new national data infrastructure for research

Never before has doing research been so dependent on infrastructure, on the capacity of network, security, connectivity and access management from which to operate. This dependency will continue to grow. The ability to scale is everything.

We propose a new national data infrastructure to support research. Underpinned by the [Janet Network](#), cyber security and our national access and authorisation infrastructure, we will support the coordination of a flexible set of services for institutions and multi-partner research consortia.

We will provide high-capacity, secure environments to support UK research ambitions around the ever-increasing volumes of research data within and across disciplines. We will offer a set of flexible, on-demand trusted technical components for active research. These components will be closely coupled to network, security, connectivity and access management (including cloud) analysis tools as well as those for moving, managing and storing data.

Research teams will no longer need to liaise separately with providers to access the best mix of technical and digital components for

publicly funded research projects and collaborations, which can be costly and inefficient. The opportunity exists to not only support research with leading-edge technologies, data and digital approaches but to save the sector money doing so. The infrastructure would support the protection of intellectual property, and the UK to maintain its technological leading edge.

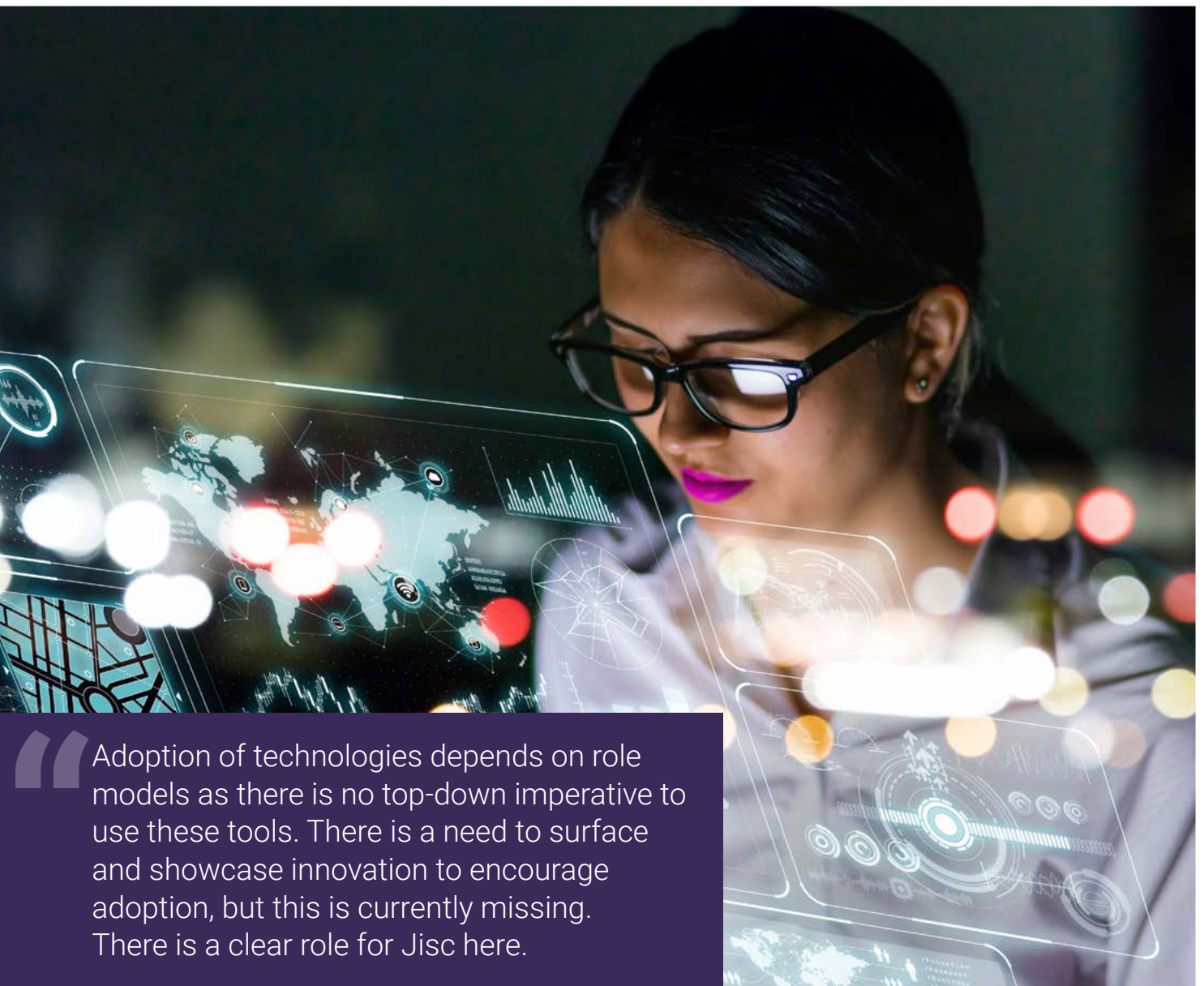
It will offer economies of scale and enable interdisciplinary approaches by consolidating expertise and building capacity, and reducing technical debt in the research ecosystem. It will support the goal of increasing the UK's expenditure on research and development (R&D) to 2.4% of gross domestic product (GDP) by 2027 by underpinning one of the five key foundations of the [UK government's Industrial Strategy: that of "a major upgrade to the UK's infrastructure"](#).

It will also support the [UK government's Research and Development Roadmap](#) ambition to "develop our digital research infrastructure capability – data, supercomputers, software, and people – by building an internationally leading national digital research infrastructure."

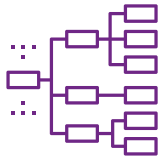
We offer a number of cloud services and free resources such as a step by step guide to cloud. In 2019/2020, in response to Covid-19, we offered free technical support, consultancy and clinics, helping higher education institutions adopt cloud delivery and better reach their research staff and students while off campus.

We have investigated this area in technological and commercial depth with the assistance of several research-led universities as well as commercial technology and solution providers.

As a result, much is already known about routes to implementation.



“Adoption of technologies depends on role models as there is no top-down imperative to use these tools. There is a need to surface and showcase innovation to encourage adoption, but this is currently missing. There is a clear role for Jisc here.”



## UK research analytics: understanding systems, cultures, resources and decision-making

Exponentially upgraded analytical capacity is needed to build the strategic capabilities of UK research. Reliable intelligence is necessary to support reduced bureaucracy, inform talent strategies, underpin resource management, improve research culture, support levelling-up and enhance research impact.

There is a valuable opportunity for the data produced as a result of research management processes to be used on a greater scale to transform research systems, cultures and decision-making.

We propose a UK research analytics platform and service: [data.ac.uk/research](https://data.ac.uk/research). We will develop substantially enhanced analytical capacity in order to build the strategic capabilities of UK research systems and propose a sustainable infrastructure for research analytics, owned by the sector and encompassing both open and enterprise offers.

As a sector-owned body we are uniquely placed to capitalise on the potential of research analytics and enable the UK to capture the value it holds. The UK government's [Research and Development Roadmap](#) includes the ambition to take forward the [National Data Strategy](#) and *"improve the access to trusted data resources at local and regional levels to improve the availability of evidence at those levels to give local leaders what they need to build robust R&D ecosystems."*

A national research analytics service could serve the public good in terms of creating

critical mass from open data as well as enterprise models and mirror the open data revolution in local authority settings and across government and offer the necessary sector intelligence for maximising the economic, environmental and societal impact of research.

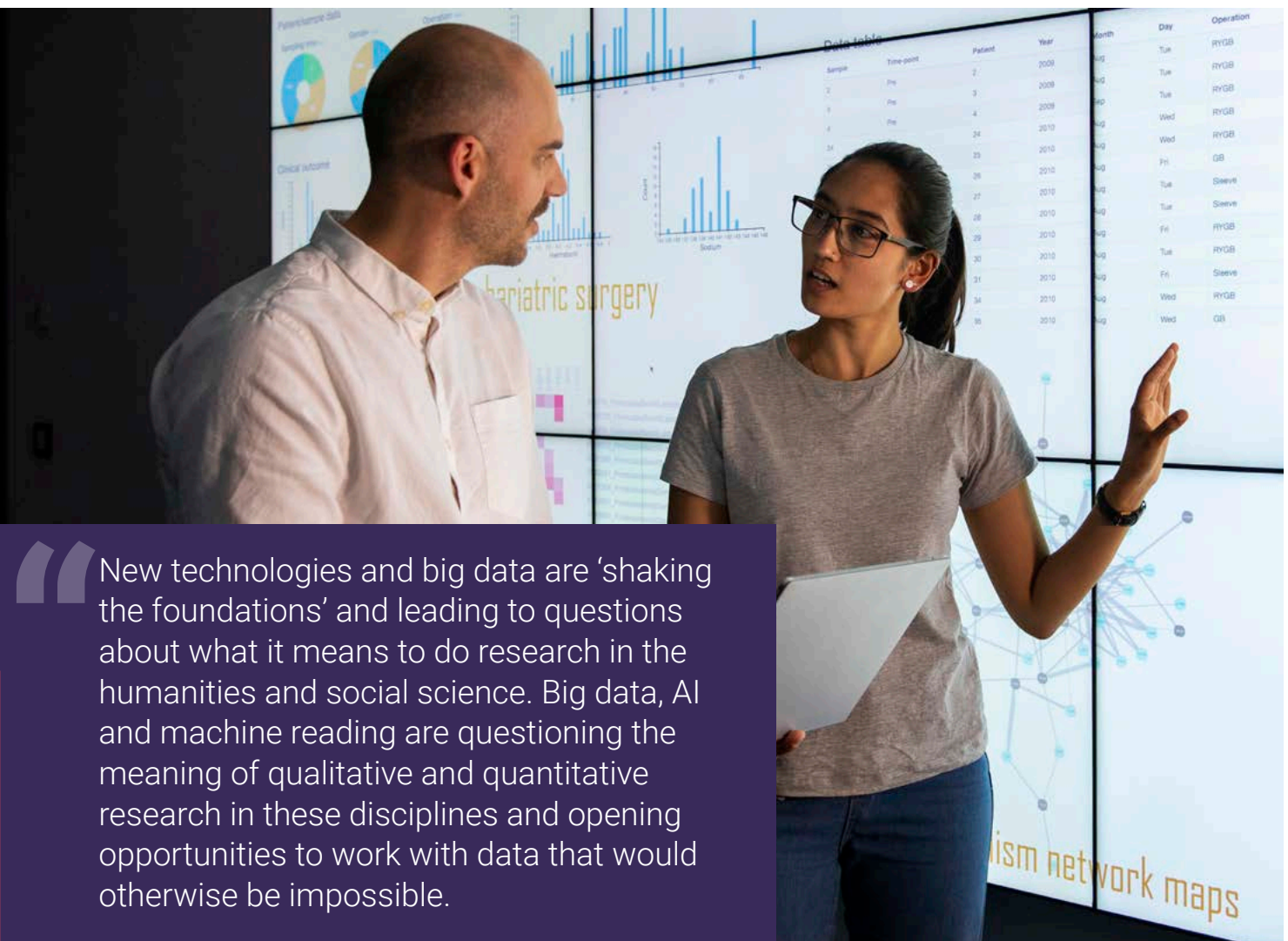
We aim to support the use of reliable, ethical and, above all, high utility data about research. To embed that capacity in business as usual is a key objective in delivery of the [UK government's National Data Strategy](#): *"Data is knowledge. By having access to more of it, combined with the ability to analyse it through modern techniques, we get greater insight into what works and what does not – both in terms of selling products and services, and in terms of making our own processes and practices more efficient. Data therefore has the potential to significantly*

In 2018/2019: We developed a series of data visualisations of the Knowledge Exchange Framework (KEF) metrics, and the [kef.ac.uk](https://kef.ac.uk) webpages, working in a co-design approach with Research England. Research England manages the KEF exercise for English higher education providers, and the visualisations and web pages will enable it to disseminate KEF data to the higher education sector.

*enhance economic competitiveness and productivity across the UK economy."*

**Our Analytics Labs** have shown that, with the right conditions, research institutions, funders and others can collaborate to develop and use data effectively. This proposal builds on that model. We aim to support the development of

the capacity of a whole systems approach in terms of the clear potential for sector intelligence, offering the opportunity for creating new commercialisation opportunities, stimulating open innovation and enhancing resilience and efficiency in the research process.



“New technologies and big data are ‘shaking the foundations’ and leading to questions about what it means to do research in the humanities and social science. Big data, AI and machine reading are questioning the meaning of qualitative and quantitative research in these disciplines and opening opportunities to work with data that would otherwise be impossible.



## Recording the UK's 'research estate' in support of a UK-wide research capability

The ability to identify, deploy, share and re-use physical and intangible assets that comprise the 'research estate' such as equipment and kit, software and content, IP and instruments, are central to delivering efficiencies, the civic agenda, levelling up, open research and achieving net-zero.

These assets also include the significant infrastructure which gives access to research, including library and archival collections. We are exploring expanding the well-established digital approaches to the management and use of these assets.

Our members have highlighted the potential that lies in being able to identify research assets. *"If another crisis arises we need to know what we have. Do all institutions draw the information together systematically?"*

With our Library Hub and Archives Hub services we already have experience of aggregating, managing and enhancing large datasets detailing the physical and digital collections across UK university libraries, museums and special collections.

We propose enhanced digital approaches to enable the sector to manage its research estate as efficiently as possible. We offer the technical infrastructure to enable higher education institutions and research consortia to curate their research-funded physical and intangible assets digitally and comprehensively.

We will assess the potential to develop open metadata schema and persistent identifier

models to record the research estate, with automated data-harvesting and open code approaches.

It will support the [UK government's Research and Development Roadmap](#) ambition to: *"Champion the development of a truly strategic, national laboratory capability and identify opportunities to strengthen their capabilities and ability to collaborate, especially with the private sector, devolved administrations and local civic authorities."*

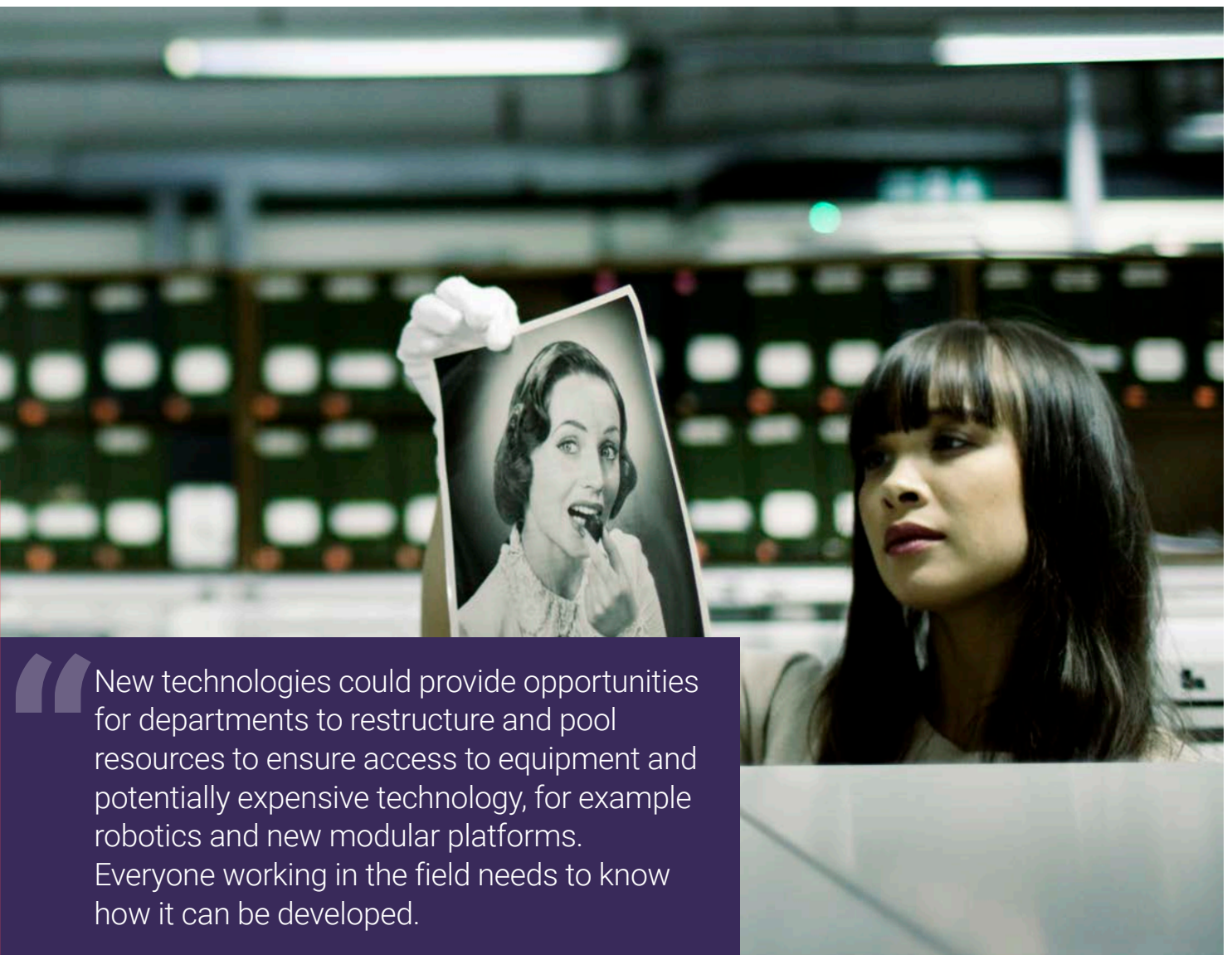
In 2018/2019 we launched Library Hub, a set of services based on the National Bibliographic Knowledgebase (NBK) initiative. It brings together the catalogues of 160 academic and specialist libraries and includes:

- Library Hub Discover: exposes 100+ UK and Irish academic, national and special library collections, including rare and unique materials as well as open access content. It contains 45,780,374 records and now averages over 1 million searches a month.
- Library Hub Compare and Library Hub Cataloguing: collection analysis service and shared cataloguing service for library staff in Jisc member libraries and other NBK contributors and used by a wide range of academic libraries.

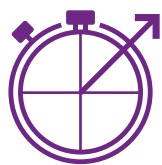


Research assets are part of reporting requirements across the research funding landscape: in the [Research Excellence Framework \(REF\)](#) environment narrative and impact sections, in [Higher Education Statistics Agency \(HESA\)](#) returns and the [Knowledge Exchange Framework \(KEF\)](#) and in higher

education institutions' funding bids to UKRI and beyond. There is the potential to use application programming interfaces (APIs) to interoperate across process requirements and for persistent identifiers to be used to open up active research and associated workflows.



“New technologies could provide opportunities for departments to restructure and pool resources to ensure access to equipment and potentially expensive technology, for example robotics and new modular platforms. Everyone working in the field needs to know how it can be developed.”



## Accelerating the achievement, delivery and monitoring of the journey to open research

Open research will continue to be a high priority for the UK research and innovation base, for funders and for us.

Open research extends beyond the boundaries of open access articles to all research outputs, including metadata, data, algorithms, code and software, as well as the processes of research itself. The benefits of open research are wide-ranging, from improving the integrity and reproducibility of research findings to supporting a more diverse, equitable and inclusive research system.

Our vision is for the process and outputs of all research to be as open as possible, as early as possible, so that the research can provide the maximum possible benefit to all. We are committed to helping the UK embrace the full potential of open research by removing barriers, embedding open practices and developing infrastructure.

Building on our existing capabilities, we aim to support our members and funders in achieving a sustainable transition to open access by:

- Providing all researchers and institutions with ubiquitous access to a compliant and sustainable route to open access publication and providing all publishers, regardless of size or discipline, with a mechanism to enter into an open access agreement that is compliant with needs of funders such as [UK Research & Innovation](#) and the [Wellcome Trust](#)
- Enhancing and delivering services to navigate options for open access

publishing, including [SHERPA](#) and [OpenDOAR](#), monitoring policy compliance and uptake of open access options, and increasing the efficiency of workflows by building capacity, take-up and implementation of persistent identifiers

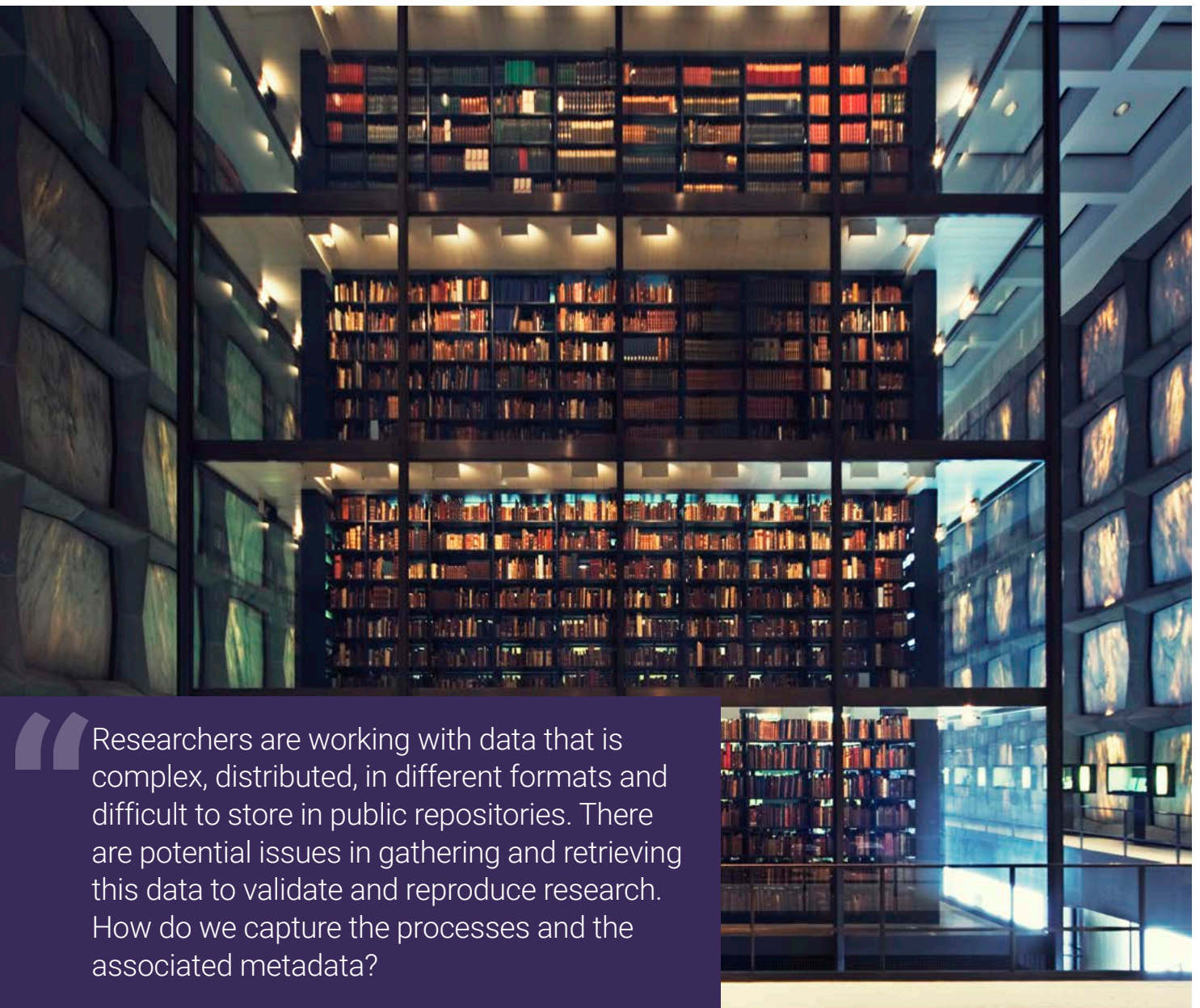
- Increasing the adoption of open access in line with changing policy by information provision, researcher and institutional support, and community engagement
- Supporting the publication of open access monographs, book chapters and edited collections by piloting innovative publishing agreements and developing infrastructure

Moving beyond open access, we will take a holistic approach to working with all key partners and stakeholders to meet the needs of our members and the global research community. As the UK research base continues to face the impact of Covid-19, we will be led by the needs

CORE hosts the world's largest collection of open access research papers and gives equitable access to research to everyone. A not-for-profit service delivered by the [Open University](#) and [Jisc](#), CORE is used and referenced globally. CORE-aggregated content covers all research disciplines and comes from thousands of institutional and subject repositories and journals. In 2019/2020 CORE reached more than 20 million monthly active users.

of the sector in delivering pragmatic and sustainable solutions, including new services that enable and promote open practices throughout the research life cycle, purchasing

frameworks to simplify the procurement of open research services, and community support, advice and guidance.



“ Researchers are working with data that is complex, distributed, in different formats and difficult to store in public repositories. There are potential issues in gathering and retrieving this data to validate and reproduce research. How do we capture the processes and the associated metadata?



## Applied research and knowledge exchange: supporting its commercialisation and deployment

The interconnected systems producing world-class research and dynamic innovation are increasingly reliant on shared and secure infrastructure to enable their growth.

As the UK commits further to removing barriers to innovation, including reducing bureaucracy, introducing flexible funding schemes and increasing skills in research translation and entrepreneurship, the breadth of academic-industry collaborations and commercial spinouts from academic research is set to grow.

We propose that applied research partnerships and the economic and social impact of research commercialisation can be further streamlined through the use of existing research infrastructure. We currently use our infrastructure services to fulfil higher education institutions' priorities across fundamental, applied and practice-based research. However, collaborations and commercialisation moving "off-campus" is creating a vibrant ecosystem of institutions that require the same access to research facilities and advanced infrastructure.

We will explore how the infrastructure can follow the researcher by:

- Continuing to work with the hosts of all publicly funded national research resources including [UKRI](#) infrastructure, public sector research establishments (PSREs), independent research organisations (IROs) and other strategically funded and partner facilities to use the [Janet Network](#) as the UK-wide communications infrastructure for research and innovation

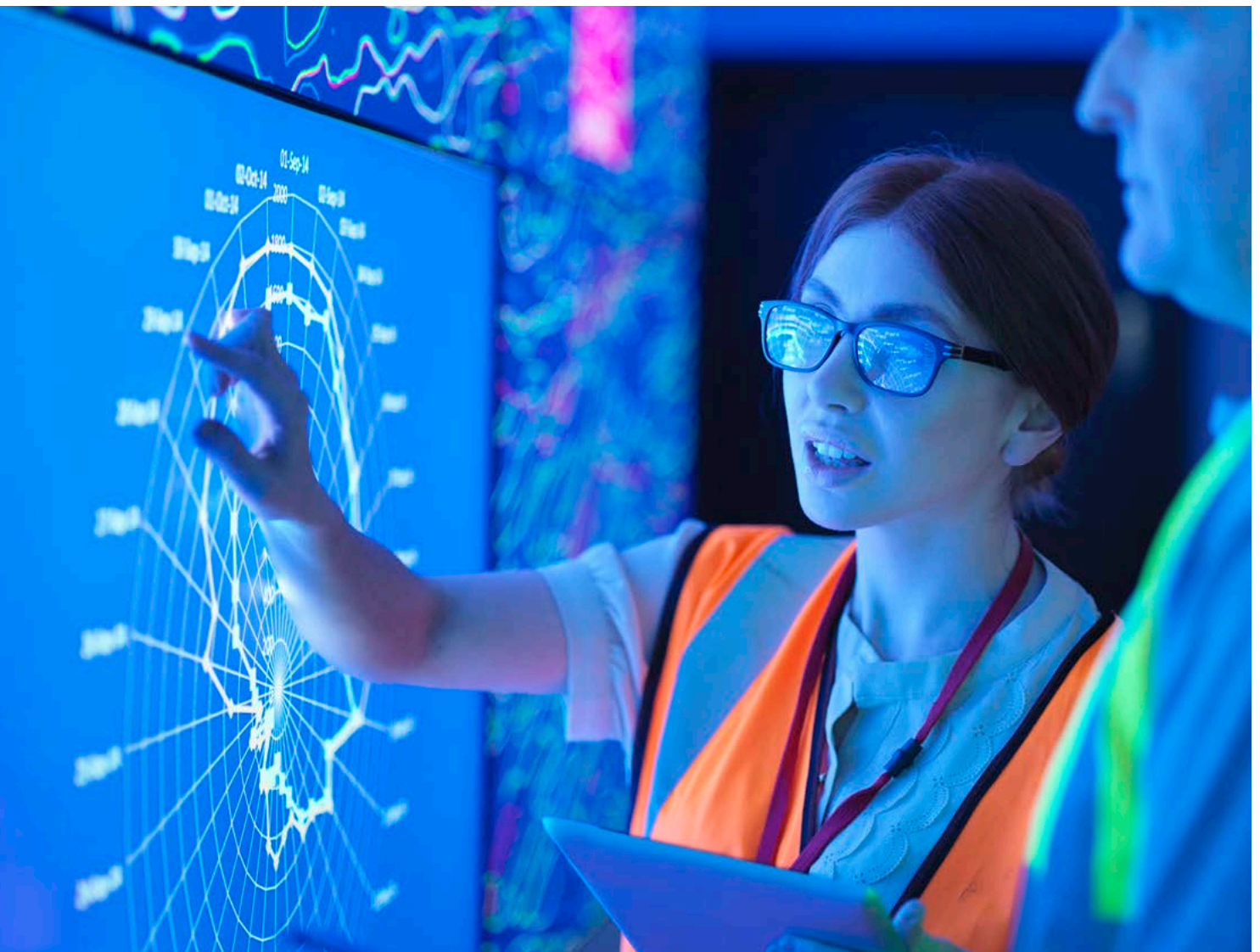
- Partnering with further education colleges, higher education institutions, the funding bodies of the UK and local enterprise partnerships (LEPs) to use our national infrastructure in furthering regional development, including facilitating science parks, innovation centres and developing innovation clusters. In support of the [UK Industrial Strategy](#) and [Research England's Strength in Places Fund](#), we are actively engaging with charitable and industry research organisations as potential partners in the development of their research and innovation infrastructure



Technology has, and will continue to, change research teams. They are likely to become larger and more multi-disciplinary in order to compete. The traditional concept of the lone researcher is being challenged, and 'team science' is becoming more important, as it is impossible to find all the required skills in one person. There is also evidence of expertise and resource being shared across teams and collaboration with industry.

- Collaboratively investigating use cases for shared infrastructure with fellow representative bodies focused on knowledge exchange including [PraxisAuril](#), the [Knowledge Transfer Network \(KTN\)](#), the [National Centre for Universities and Business \(NCUB\)](#) and, in Scotland, [Interface](#). This approach includes building on our

track record of enabling shared inter-organisational research project infrastructure including secure storage, high-throughput access to distributed advanced computing resources and dedicated testbed networks





## Rapid innovation in research management and active research

Research integrity, reproducibility and reuse, evaluation and assessment, new and inclusive forms of excellence and the responsible use of metrics are all areas that offer significant potential for new approaches that offer greater efficiency and interoperability.

The UK government's [Research and Development Roadmap](#) has identified: *"An opportunity to shift the research sector to more modern methods of research, which will help cut red tape too. This means embracing modern methods of peer review and evaluation. It also means tackling the problematic uses of metrics in research and driving up the integrity and reproducibility of research."*

We are well positioned to explore, in partnership with the research and innovation sector, approaches that support and potentially integrate a range of innovation projects. These new approaches will offer opportunities to enhance technologies in key areas of research management and culture. The approaches we are exploring include:

- Enhanced system interoperability for research management and exploring the potential for ethical machine-learning approaches to research management to support new and inclusive definitions of excellence
- The development of common data repository standards and machine-learning metadata modelling approaches within and across collections
- Research notebooks for team collaboration; impact portfolios, in particular, in practice research

- Intelligent citation and sophisticated reproducibility from streamed data offering a new route to reproducible research and supporting the development of code libraries
- Metrics aggregator models to plot and enable the surfacing of the metric landscape, supporting new approaches to metrics development and usage.

In 2019/2020 we enhanced our research data management services including:

**Research repository:** a fully managed multi-content repository for research articles, datasets and theses based on open sector standards, aligned with next generation repository behaviours and optimised for discoverability.

**Preservation:** a digital preservation platform that keeps digital files usable over extended periods of time. It supports compliance with funder mandates with simpler data curation and automated workflows.

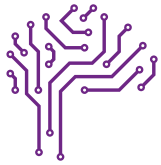
**Research systems connect:** a new interoperability product, under development, which integrates research systems in institutions.

**Research Outputs Repositories Dynamic Purchasing System (DPS):** enables universities to purchase a research repository from a framework of pre-qualified suppliers.



“ The research community has little time to focus effort on ‘how we do research’, and perhaps there is a need for thought around workflows and improved processes. There could be an opportunity for advocacy and influence at a senior level.

“ I’m surprised that we don’t have a grand challenge on electronic tools to understand the research literature. This is a massive space, and perfect for Jisc and would help hugely the efficiency of research.



## 'Research 4.0': realising the art of the possible

What are the technological developments that will transform research environments, enabling research to innovate, push more boundaries, remain resilient and address enduring social and economic challenges?

Advanced technologies such as artificial intelligence, robotics, 5G, quantum computing and biotechnologies look set to impact the UK's world-leading research and innovation sector in the years ahead in ways yet to be imagined.

UK research and innovation are primed to benefit from a step change in the way in which it uses what are termed 'industry 4.0' technologies, within and across disciplines. We see an opportunity to support the implementation of this step change. Areas of focus include:

- Defining the capabilities required for meeting the UK research and innovation sector's need to continue to adapt to, implement and exploit these new forms of technology
- Developing a mechanism to deploy their use in support of collaboration within and across disciplines and borders

Technology is crucial to research productivity, knowledge exchange and economic and social impact. It looks set to continue to develop at an increasing pace, challenging our organisational, financial, human resource and physical support systems to respond.

We propose a technical enablers programme to focus on exemplifying leading-edge specialisms and exploring, in partnership with the sector, how they might be deployed or

extended, integrating technologies into research in new ways. We also propose a 'research reimaged' programme to build on our focus on advanced technologies to date:

- How might the UK research and innovation sector continue to adapt to, implement and exploit these new forms of technology?
- What are the components of research environments (for researchers, research managers and enablers, institutions and funders) that will not change and which technology will always be led by?
- How might we identify research environments that are sufficiently agile, accessible and sustainable?



Across the breadth of the institution, there are people in every discipline wondering how they can make use of new tech. Understanding potential is a barrier and this makes it difficult to get over the first hurdle. We need continuing professional development to make these technologies available to a wider range of people than are currently using them. We need to share expertise on this.



- For autonomous research design, machine learning and artificial intelligence: how will emerging technology support the public interest?
- For harmonising open and commercial technologies: how will sustainable research environments emerge, and what skills will be required to realise them?
- How will leading edge technology inform the development of research environments for the longer term?



“ Covid-19 has highlighted issues around reliance on being present in the lab. Are there ways to use new technology to automate processes and operate remotely? There are already examples of where this is happening, eg protein crystallography, x-ray and neutron facilities, and genome foundries.

Member story:

## How big data could vaccinate the world

A team at the University of Bristol is revolutionising the way vaccines are developed, paving the way for faster and more effective vaccines against diseases for which there is currently no means of prevention.

The scientists at the heart of the project explain how the Research 4.0 tools of big data and cloud computing are changing the way they engineer vaccines – and protect everyone from viruses.

Read the full story [here](#).



*“Half a century ago, many people started to think that infectious diseases had been solved. And we were totally wrong. Infectious diseases have never been more of a problem than they are today.*

*As you conquer some problems with infection, others come up to replace them. And the drugs that can treat these infections stop working as the organisms learn to be resistant to them.”*

Adam Finn, professor of paediatrics at Bristol Children's Vaccine Centre, University of Bristol

## What can we do with the wisdom of many?

Building on Jisc's heritage of seeking to understand and involve members in issues that directly affect them, our new **digital research community** will explore how technology and innovation can help improve current research practices. Sign-up here [jisc.ac.uk/get-involved/digital-research-community-group](https://jisc.ac.uk/get-involved/digital-research-community-group)

Find your Jisc account manage [jisc.ac.uk/contact/your-account-manager](https://jisc.ac.uk/contact/your-account-manager) – we are ready to discuss any, or all aspects contained within this strategy.

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