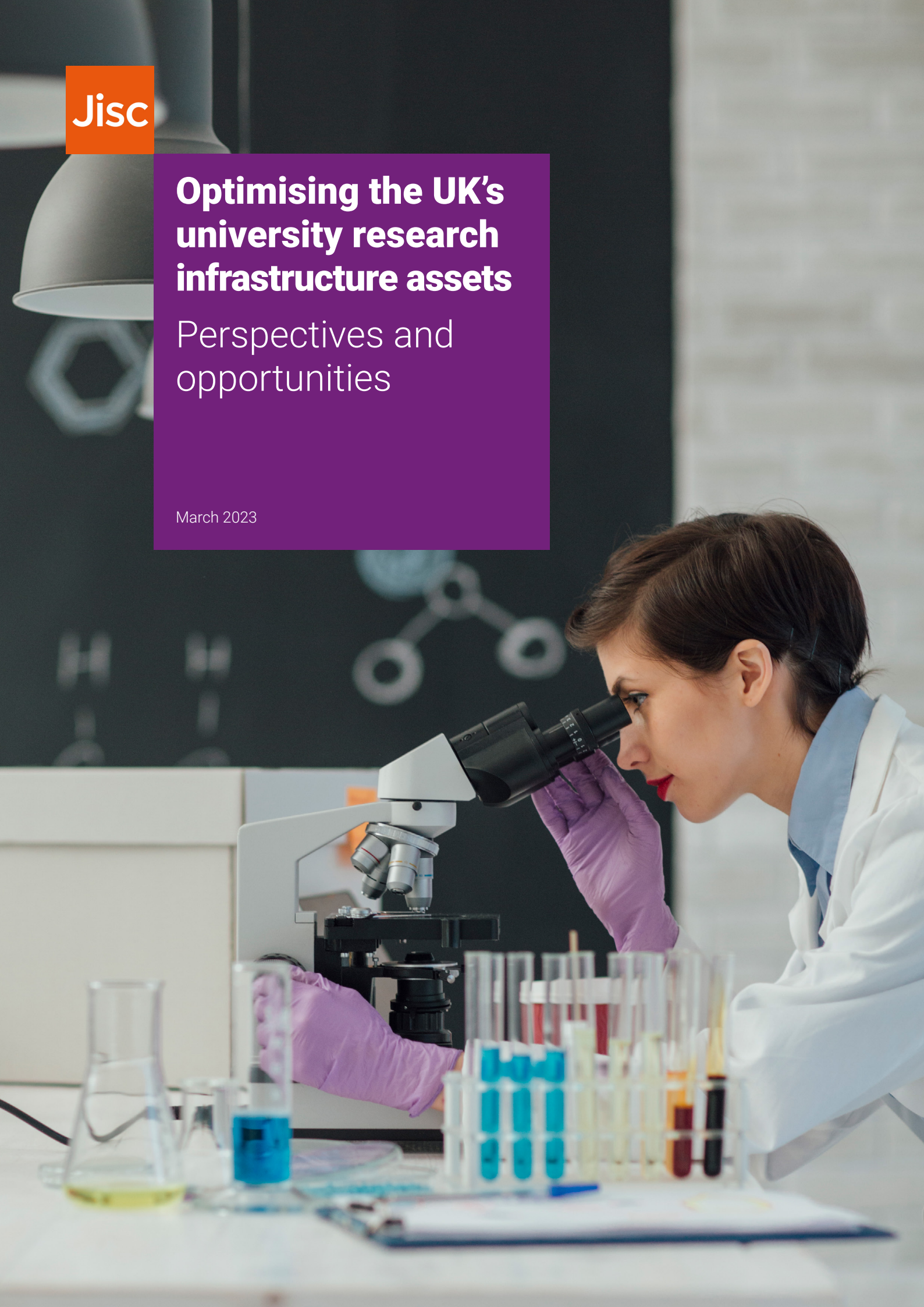


Optimising the UK's university research infrastructure assets

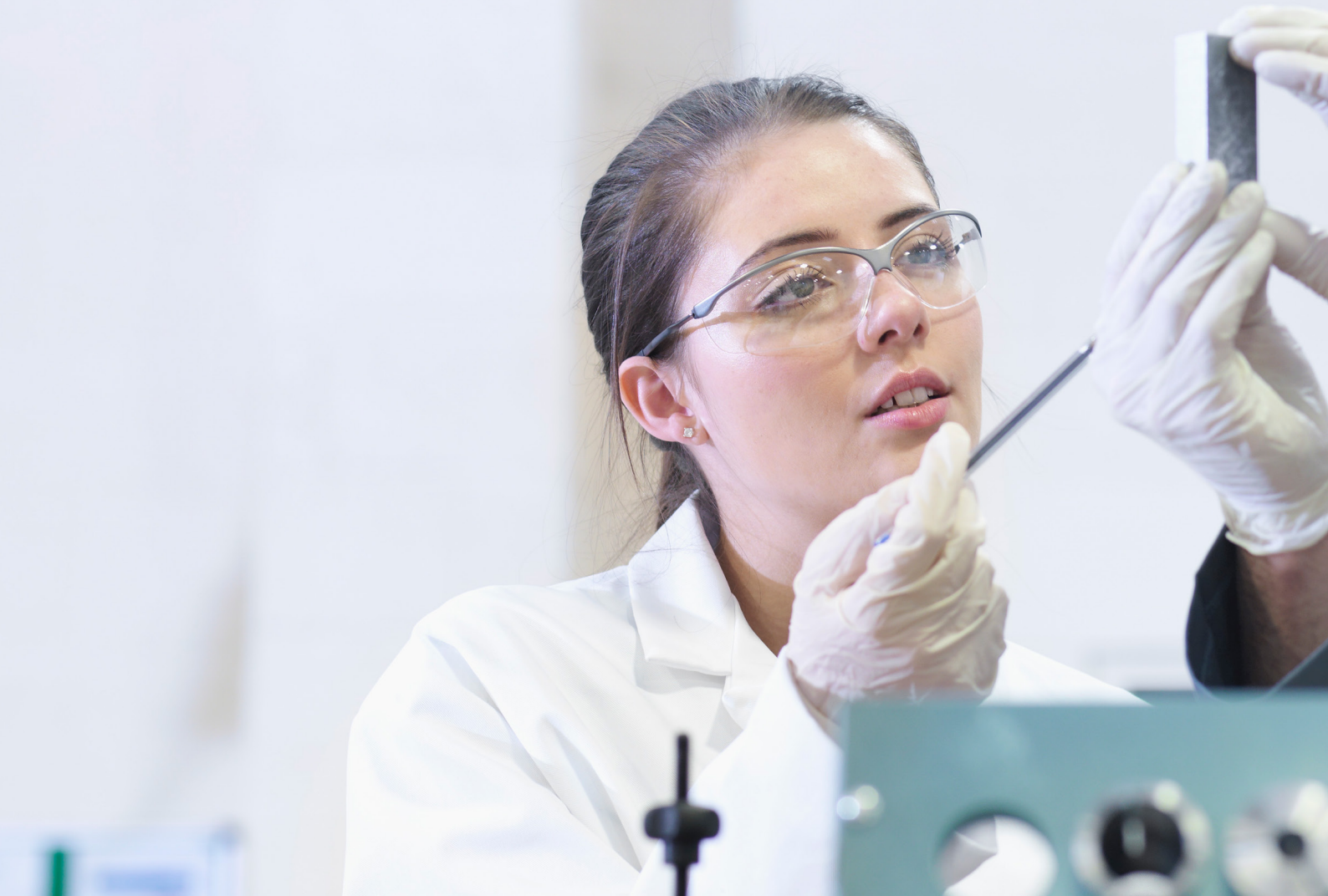
Perspectives and opportunities

March 2023

Contents

Introduction

The UK's university research infrastructure assets underpin the research and innovation that attracts investment and develops skills. These assets support the commercialisation of research and development (R&D) and the impact and knowledge exchange that enriches economies and communities. They greatly enhance the student experience by helping to develop research technical skills and enabling specialist teaching.



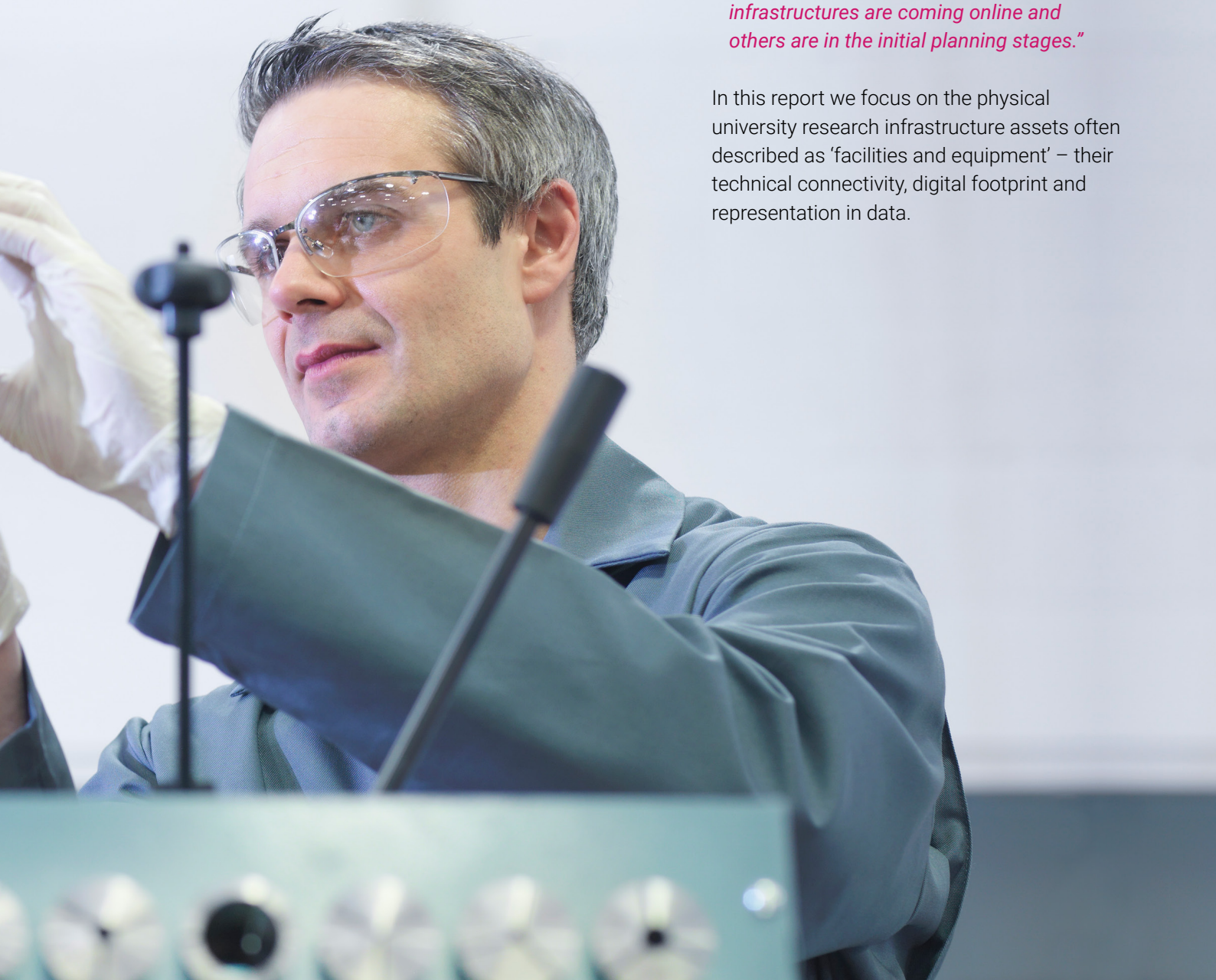
This summary report brings together a range of perspectives from the UK's higher education, research and innovation sector and stakeholder organisations. It highlights some opportunities for collective approaches to optimise the use, sharing, efficiency and sustainability of research infrastructure assets, from the perspective of stakeholders in universities, regional consortia, funders and sector bodies from across the UK. It is intended as the beginning of a conversation and is for anyone interested in the opportunities we have identified.

What do we mean by university research infrastructure assets?

The Royal Society defines research infrastructure assets in a **snapshot of research infrastructures** as:

> *"…facilities, resources and services used by the research community to conduct research and promote innovation. They come in an array of forms and sizes, from large facilities and specialist equipment to e-infrastructure networks, libraries and collections. They are found right across the UK and might be physical or virtual, situated in a single location or distributed across multiple sites at home and abroad. At any one time, old infrastructures are being decommissioned or upgraded, new infrastructures are coming online and others are in the initial planning stages."*

In this report we focus on the physical university research infrastructure assets often described as 'facilities and equipment' – their technical connectivity, digital footprint and representation in data.

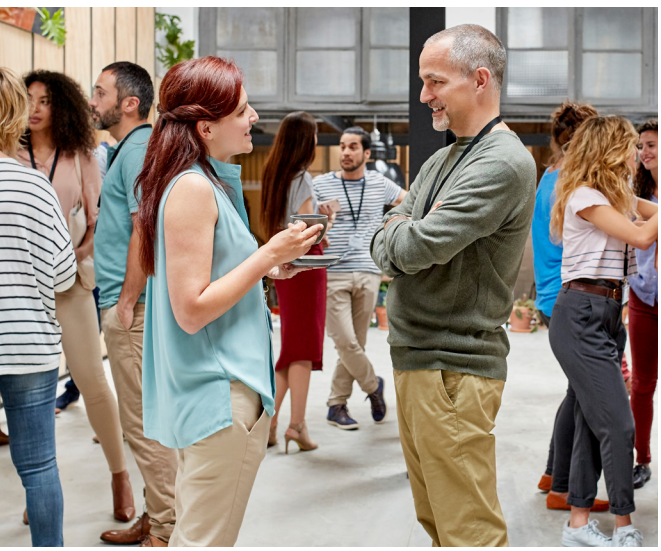


Background and rationale

The UK research and innovation policy landscape continues to change at pace. There is a growing emphasis on the importance of ensuring equality, diversity and inclusion in the research and innovation system; recognising the full participation and contribution of everyone in team-based research; place-based agendas; and the increasing priority of multi-disciplinary and multi-sector research in response to urgent societal challenges.

This report responds to the need for rapid adaptation to; political and economic change, increased costs and pressures on national and international research funding as well as research security, environmental imperatives and reducing research bureaucracy.

Here we focus on the necessity for university research infrastructure assets to be viewed as a collective asset, to enable them to extend their vital underpinning role in collaborative research and innovation, across the UK and internationally.



Jisc and partners' role

Research projects funded by UK Research and Innovation (UKRI) are required to contribute to the Equipment data asset register managed by Jisc, although the platform is not limited to UKRI-funded research infrastructure assets.

Following a modernisation of the platform, now is the time to identify the optimum portfolio of tools and services for addressing the challenges and capitalising on the opportunities offered by the UK's university research infrastructure assets for the medium to longer-term. Jisc has convened a stakeholder group that includes regional consortia, research laboratory leads, research management professionals, stakeholder organisations and funders to offer perspectives, take this future look and guide the next steps.

In 2022, UKRI funded this activity to support the development of optimal operational, policy and strategic responses to the growing focus on environmental, innovation, culture, skills and place-based agendas for the UK's university research infrastructure assets investments.

This is a first look at some of those opportunities.

Acknowledgements

We would like to thank members of the stakeholder group who generously gave their time, expertise and insights, leading the direction of the report.

List of contributing organisations

We look forward to continuing the focus on optimising the UK's university research infrastructure assets with the stakeholder group over the coming months and adding new members to the group to take forward this work.

- Eastern Arc Academic Research Consortium
- Engineering and Physical Sciences Research Council (EPSRC)
- Heriot-Watt University
- Jisc
- Medical Research Council (MRC)
- Midlands Innovation
- National Centre for Universities and Business (NCUB)
- N8 Research Partnership
- Research England
- Science & Engineering South (SES)
- The GW4 Alliance (GW4)
- Wales Innovation Network (WIN)
- School of Advanced Study, University of London
- UK Research and Innovation (UKRI)
- University of Strathclyde
- Wales Innovation Network (WIN)
- Yorkshire Universities

There are a range of strategic and policy developments from each of the four nations of the UK individually and together which have informed and are relevant to this report:

The stakeholder group welcomes the establishment of the Department of Science, Innovation and Technology (DSIT) and its focus on economic growth and social impact.

This report also aims to support the ambitions of the UK Government's R&D people and culture strategy and the related programme from UK Research and Innovation (UKRI)

The UK Government-sponsored independent review of research bureaucracy

Funder priorities including UKRI's research and innovation strategy 2022-2027

The Scottish Funding Council's strategic plan and focus on building a connected, agile sustainable tertiary education and research system for Scotland

The Higher Education Funding Council of Wales (HEFCW) Vision for Wales and The Northern Ireland Department for the Economy focus on higher education research and knowledge exchange.

The report has been informed by the strategic, policy, governance and management approaches developed by the stakeholder group.

Findings

Significant innovation and diversity exemplify the UK's university research infrastructure assets landscape, along with a high level of coordination and support for access, usage and sharing. But the landscape is complex.

Stakeholders noted that the university research infrastructure assets landscape – and approaches to its management, usage and sharing – vary in terms of resource and capacity and across partnerships and disciplines. They also note significant innovation from funders, regional consortia, institutions, individual research teams and research management processes.

It would be unhelpful for this report to offer recommendations that would require a large investment of funding, time and energy in inflexible or monolithic approaches. The aim is to build on the diversity of potential identified, highlighting the most useful, achievable and impactful routes to sector-wide optimisation.

Stakeholders noted the need for more substantive and inclusive conversations to understand what could be achieved, and from a range of perspectives, noting that this report is the beginning of those conversations.

Optimisation depends on policy and governance, people and culture as much as – more so, perhaps – than data, digital and technology. The opportunities outlined in this report are focused on how the university research sector, funders and partners can convene to capitalise on the opportunities presented across the following themes:


1. Strategy and policy


2. People and culture


3. Funding, costing and charging


4. Digital, data and technology

Stakeholders noted an imperative not to underestimate the importance of the comprehensive contribution of the research infrastructure assets of the four nations of the UK in achieving strategic objectives, within and beyond research and innovation.

> What Jisc's already doing in terms of taking a leadership role and being an advocate and a single voice in the area of equipment is important. So having a unified national voice that can speak on behalf of our universities and consortia to government, to funders will be crucial. So I think (Jisc) should do more of the advocacy piece to enable benefits and those conversations.

1. Opportunities for strategy and policy

Reducing the bureaucracy overhead

Many different approaches to supporting university research infrastructure asset usage and sharing have developed, leading to barriers to collaboration.

Opportunity

Leverage the opportunity of the independent report into reducing research bureaucracy to continue to identify efficiencies that can guide low bureaucracy strategic approaches to university research infrastructure asset usage and sharing, future-proofing against new forms of bureaucracy emerging.

Addressing security strategically

Appropriate security management of university research infrastructure assets is critical at all stages of the lifecycle and underpins effective management and sharing policies, especially as technology to support remote access develops. It is much more efficient and environmentally sustainable for an external supplier to access equipment remotely to support maintenance rather than travel, similarly for a collaborating company to remotely view a measurement being taken rather than travelling to take it in person.

Opportunity

Ensure effective guidance is available to support appropriate security management for university research infrastructure assets. Work together to understand future usage scenarios so that solutions around security management can be developed in a way that meets aspirations for future innovative working.

Embedding environmental sustainability

Environmental sustainability extends far into the landscape of research infrastructure assets, not only in terms of energy use and management, but for travel, the sourcing and recycling of consumables, production processes, maintenance and parts, service contracts, upgrading and disposal, disaster recovery, repair and environmental decommissioning and disposal of research infrastructure assets. Funder stakeholders noted that environmental sustainability and management are now forming the basis of policy approaches, which are becoming more integrated into grant processes.

Opportunity

Develop more collective strategic lenses on the energy efficient and net-zero approaches to the commissioning, management and usage of research infrastructure assets, working with the Association of University Directors of Estates (AUDE), Universities UK (UUK) and other university groups. Universities would benefit from guidance and exemplars of good practice in environmental sustainability and management of research infrastructure assets, including refurbishment, recycling and decommissioning approaches.

"Sustainability of equipment and the infrastructure is also coming under greater scrutiny. The topic of sustainability is appearing in recent UK research council core equipment grant applications and applicants have to consider the sustainability of equipment operation in terms of both the equipment and the support that maintains it. So this is clearly something to which we are now responding."

"There's a lot going on here about that more sustainable footprint when securing equipment and making sure it can be repurposed and reused going ahead."

Ensuring the inclusion of all disciplines

Ensuring the inclusion of the significant arts and humanities research infrastructure in the UK, supporting projects such as the Mapping the Arts and Humanities: Uncovering hidden research infrastructure in the UK project to identify this complex research eco-system.

"It's important not to forget the arts and all of this. They have a whole different set of infrastructure around music, dance performance. You know, if you think about the infrastructure that's needed there, just take the music department and equipment that they use, and they always get left out of these pictures."

Opportunity

Ensure that all disciplines are fully represented in response to or in actions arising from this activity with a specific focus on university research infrastructure assets in the arts and humanities and for practice-based research.

Space

"We are consistently worried, always about space. So we're always under pressure. Do we need to keep pieces of equipment, for example, and I do for things that we have a capital register? It's never entirely clear to me how stuff got on it or not on it. Since some expensive things are on it. And some cheap things are on it. I have to say where it is and is it still being used. But it's true that we're not as aware of all the pieces of things that are around us."

Opportunity

Take a collective view on space management to address a range of challenges. Not only is space becoming more expensive, particularly in some regions of the UK, but university research infrastructure assets should be supported to be fully represented in estates strategies.

Taking a place-based connected approach

Decisions about where to locate major assets or add capacity will support the levelling-up agenda. Place-based strategic approaches continue to be considered as critical for building capacity and resilience.

Opportunity

Location remains a factor in access to research infrastructure assets and the opportunity for a networked and skilled infrastructure. A place-based UK-wide university research infrastructure assets strategy should be developed, led by the four nations of the UK.

Aligning with commercial and public sector need

There is the potential for a cross-sector approach to understanding and addressing challenges in finding and accessing research infrastructure assets from the perspective of small and medium enterprises (SMEs), larger commercial partners and the public and voluntary sectors.

Opportunity

To work with the National Centre for Universities and Business (NCUB), Praxis Auril, Innovate UK, Local Enterprise Partnerships and others to bring together and share exemplary approaches to serving multi-sector needs.

"The use case is: I am a small medium sized enterprise. How do I connect to this fantastic world-leading research base? I'm not GSK. I am not Rolls Royce. I don't have dedicated teams where it is effectively in their job description to go and search the research base in the UK and beyond. I'm a small, medium size enterprise. I am working in manufacturing in the west Midlands. How do I even connect to my local university, let alone two universities that might be able to help me?"

Aligning with larger investments and their benefits

Research is becoming increasingly expensive and the level of cost recovery is reducing. Large investments in collaborative research infrastructure assets are becoming more widespread across more groups, aligned with

approaches developed for national investments or UK government scientific research institutes, and more closely linked to a wide range of strategic priorities.

We witness the growing industrialisation of the research infrastructure assets landscape. Increasingly specialised, technology driven, high-capacity, high-value, impact-themed and cross-sector research infrastructure assets are also becoming more widespread. As are large-scale and more frequently remote access research infrastructure assets.

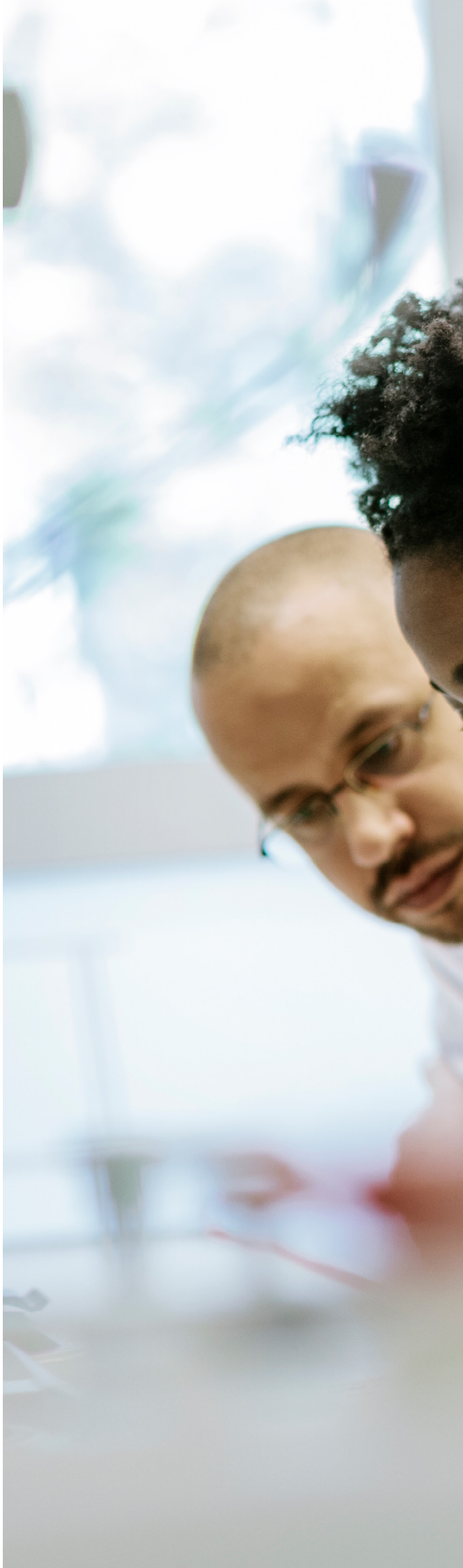
Opportunity
Support a potentially significantly more interconnected university research infrastructure assets landscape, consider and define the potential of more federation approaches.

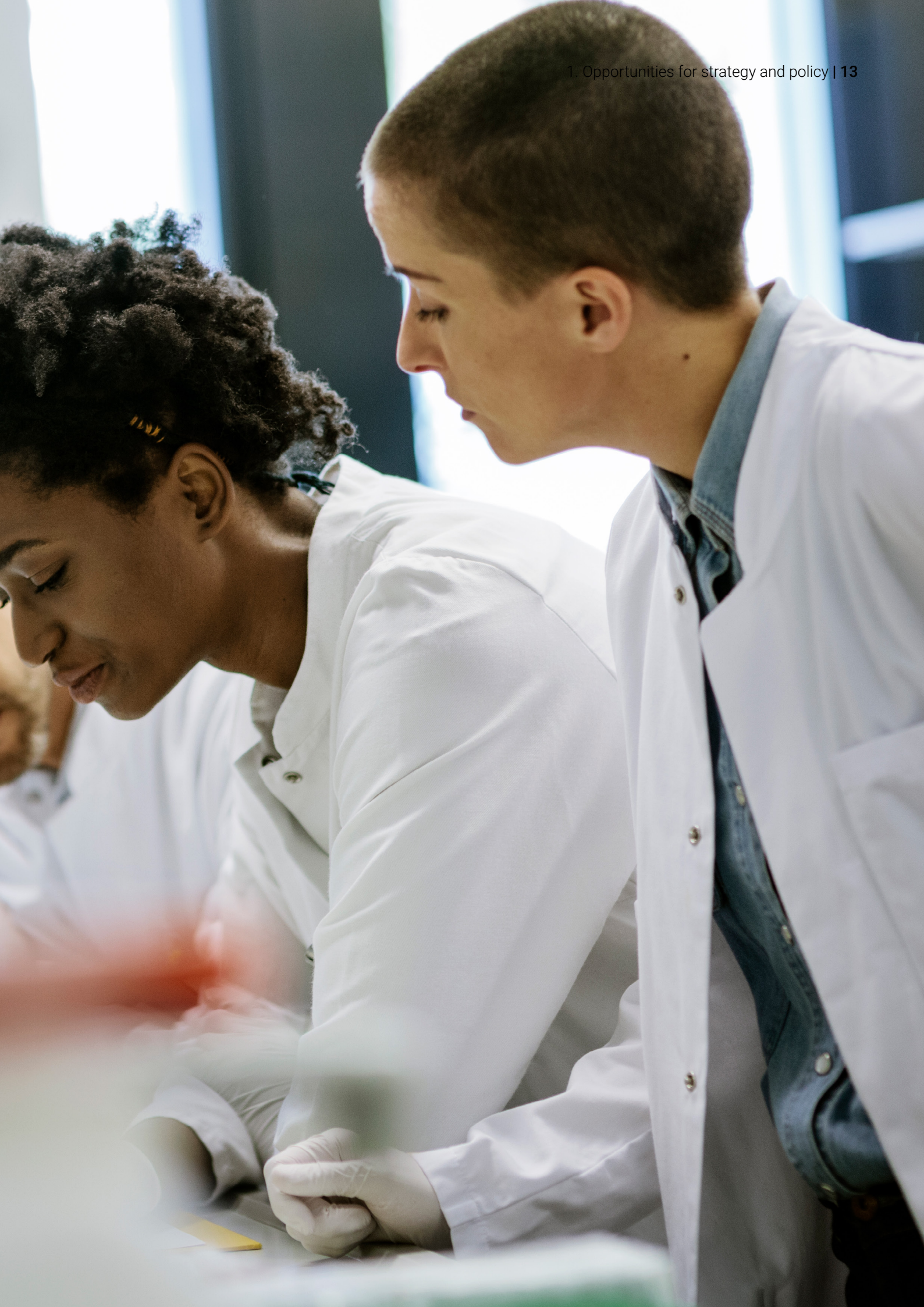
> *"We have centrally run facilities, which is about making sure (they are) professionalised (and) that we achieved the economies of scale that we need to make sure (they are) cost effective and that you have sufficient, critical mass of technical expertise to create the expertise you need for this type of advanced research infrastructure."*

Convening good practice and looking to innovate collectively

There is an opportunity to share and embed good practice much more widely, akin to the strategic revolution in open research, with the potential for the development of long-term roadmaps focused on sector optimisation in the university research infrastructure assets sharing space.

Opportunity
Convene more widely accessible collective approaches to all the existing good practice around collaboration developed by universities, the forming of networks, innovation and a range of access and sharing routes with the objective of increased efficiency, sustainability and innovation.





2. Opportunities for people and culture

Stakeholders noted that a range of exemplary approaches related to supporting people with research infrastructure asset management, access, usage and sharing have been developed by governments, funders, institutions, regional consortia, research partnerships and sector bodies, examples of which are presented as case studies in this report. They also noted a range of challenges.

Equality, diversity and belonging

Continued specialisation has led to research partnerships becoming established with growing research infrastructure assets bases, consolidating research capital through previous success in bidding and research assessment mechanisms. They then act as magnets for attracting additional resources around specialist hubs – and a baked-in pipeline of investment to support them. Increasing specialisation can have negative consequences for equality, diversity and belonging. It can reduce access to research infrastructure assets, career development and research impact for minoritised people, groups and communities, and the consequent socio-economic-cultural benefit of diversity in research and innovation. A number of initiatives are being developed to address the negative impact on equality, diversity and inclusion, including via the UK Government's people and culture strategy and the publication of excellent applicant and grant award diversity data from UKRI focused on success rates in bidding from the perspective of equality, diversity and belonging.

"Universities (can) have critical mass around big science that allows them to invest millions in large equipment. And it is a virtuous circle that having the larger pieces of equipment allows them to do more, more cutting edge research, which brings in more money, which allows them to invest in large equipment."

Opportunity

Understand and address barriers to access to infrastructure through a much more inclusive conversation with people and groups less likely to receive funding or not be funded at all. Develop a strategy for mitigating the effects of increased specialisation and funding consolidation around research infrastructure assets in specific research partnerships, institutions, disciplines and sub-disciplines targeted at improving equality, diversity and belonging.

Expertise, recognition, career development, retention, sustainability

Ensuring sufficient research technical professional capability remains a challenge within and across research disciplines. Sustainability, managing demand and planning for future capacity needs are matters of growing concern. Funding staff posts for managing research infrastructure assets has been reported to be more challenging than funding the research infrastructure assets themselves. Competition

for skilled research technical professionals is a key barrier to stability, impacting programme timescales. Salary disparities sector to sector risk making research within the higher education sector unsustainable. There is a growing skills gap, and an opportunity around offering rewarding career pathways, peer support structures, recognition and compensation commensurate with the traditional academic route across the sector.

Opportunity
Tap into emerging innovative routes to skills development, such as skills escalators funded by Innovate UK and Local Enterprise Partnerships. These work with schools, further and higher education institutions to ensure that place-based investments are able to build the skills and infrastructure they need in mission-themed areas such as, for example, advanced manufacturing.

"There's a general feeling that it's extremely hard to progress within your current role. As a research technical professional, you often have to move to new job descriptions or new opportunities internally or externally… there's not the same promotion mechanism that academic members of staff have."

"For our research technical professionals, underpinning the sustainability of such work requires a significant investment into the technical skills necessary for both the current and future technical environments."

Research technical professionals' commitment

In response to the Technician Commitment and the work of the Midlands Innovation Research England-funded TALENT project, there has been increasing focus within the sector on the status and opportunity of technical staff in higher education and research. UKRI has responded to this agenda with its own Technician Commitment Action Plan and now research council calls for mid-range equipment are starting to be open to technical professionals as principal investigator. Research technical professionals have not previously been able to apply for funding in their own right but, as the experts who maintain and run research equipment, they are often best placed to apply for infrastructure funding and run it if successful. Mid-range equipment calls from the Biotechnology and Biological Sciences Research Council (BBSRC) and the Engineering and Physical Sciences Research Council (EPSRC) were open to technical professionals in 2022.

"From the staffing perspective, it would be good to have technical staff and experimental officers recognised more through their career structures for their abilities. This is particularly the case at the top end where there are high-performing technical specialists."

Opportunity
Extend and embed strategies for the recruitment, retention and succession of research technology professionals. Develop sustainable and scalable approaches to expertise and skills development and capacity management. Share training and expertise development approaches within and across disciplines, and plan for future needs in terms of technology developments. Look at long-term approaches to embedding skills, for example via Doctoral Training Centres.

3. Opportunities for costing, charging and funding

Costing models for accessing and sharing university research infrastructure assets can vary but the potential for assessing the alignment and planning of costing models is timely.

Wider sharing of consistent approaches to costing and charging can reduce barriers, benefiting cross-disciplinary research. Funding for accessing shared research infrastructure assets also varies and people and groups wishing to access university research infrastructure assets can find processes unclear, inconsistent and uncertain.

More accessible costing models

Costing models typically include requirements to cover health and safety, insurance, access management, research technical professional time and administration, training, energy usage, preparation and tuning, outputs and results management, support, maintenance and repairs, consumables, replacement and licensing and project close, as well as wear and tear. Identifying consistent approaches to total costs, where feasible, supports both accessibility and transparency about affordability. A range of effective approaches to costing and charging for sharing research infrastructure assets have been developed and could be shared.

"There is N8 template that we follow, and that's great across the institutions, across the N8, and that works really well actually."

"Standardisation of what costs really would be an easy win. And I think knowing how much things would cost and then being equal across different universities would allow that sharing. Probably easier said than done."

"I think what we want to do is incentivise more use of the equipment, especially by industry and SMEs. They can't afford it right now."

Opportunity

Develop model costing and charging guidance in modular formats which can be accessed and adapted by different groups, focused on underpinning sharing more widely where there is limited resource to implement them locally.

Cost sharing groups

Value added tax (VAT) requirements present a barrier stakeholders would like to see reviewed. The application of VAT to access university research infrastructure assets can limit the cost effectiveness of some sharing opportunities and, at worst, limit the ability to undertake research. VAT arises where charges to other organisations for use of research infrastructure assets are classified as a service, and subject to VAT, regardless of the nature of the research. Stakeholders also noted challenges around collaborations where different partners and external organisations have different VAT status.

Cost sharing groups have been established by institutions and regional consortia to supply VAT-exempt services. However, as most funded capital equipment is owned by a university, the group itself cannot own equipment and charging organisations outside of the relevant group incur VAT, which limits

sharing to that group alone. External users want to use new technology not previously available to them. Research often moves in unexpected directions, and teams may not have budgeted to access a specific asset including for VAT. Although research and development in industry can currently claim this VAT back, academic research cannot.

"There is no consistency or single model that makes this variation of equipment sharing easy or swift...The range of ways through which equipment is funded across universities creates an incredibly complex infrastructure to try and have oversight of."

Opportunity
Review the cost-benefit potential and impact of inter-university sharing to be exempt from VAT and explore innovative ways for an expansion of cost-sharing groups.

New sharing models

There is potential to consider exploring new ways of accessing and using research infrastructure assets short of purchasing the asset and taking on all the requirements for its whole-life management.

"There are some gaps in provision...It could be that we should be thinking of leasing equipment from the manufacturers. There might be other methods of collaboration in fast moving areas where, like you lease a car, maybe we should be leasing. I think innovation is needed there. That might well then spark more innovation in the companies as well… rolling in maintenance contracts and research technical professionals. So that equipment is properly used and properly serviced, always working well and properly calibrated. I think that as we start to share stuff, we, you know, we do already share things with industrial collaborators. They need to know that it is a, everything is running to an ISO standard. And that's probably not always obtainable unless you've got equipment that is well looked after."

"Computational support across multiple modalities is also an area which needs expanding and a regional hub might be appropriate."

Opportunity
For funders to help shape new models for access to and sharing of university research infrastructure assets, innovating to adapt from 'cost to own' to 'cost to run', and 'cost to impact' – a growing imperative as costs to run increase and resources are increasingly pressured.

4. Opportunities for digital, data and technology

There are many excellent examples of digital and data platforms developed by institutions, regional consortia, research partnerships, sector bodies and commercial partners.

Asset registers

These provide a range of innovative functionality to streamline research infrastructure asset management, access, usage and sharing. National investments and high-cost research infrastructure assets have a remit to make available asset registers, service catalogues and routes to access as part of their core function.

"The income, infrastructure and facilities pertaining to research and research impact, include the operational and infrastructure supporting research and impact including technical and support staff, estate and facilities, advanced equipment, IT resources or significant archives and collections."

"Funders increasingly expect to see that processes are in place to maximise the use of funded equipment and these platforms provide the necessary infrastructure to accomplish this. Sustainability of equipment and infrastructure is also coming under greater scrutiny."

"Maintaining an asset or resource such as Equipment data should be wholly supported by the government and UKRI. The site interaction should be revised, made more intuitive and user friendly. It could become the portal that provides the conduit between industry and academia R&D."

Opportunity

Draw together exemplars of asset registers, service catalogues and sharing platforms and convene 'best in class' accessible approaches to understand the potential for their application more widely.

The data opportunity

The need for sustainable, low bureaucracy, well-maintained and sector-wide research infrastructure asset data will continue to grow along with the need to offer an evidence base to support sector-wide approaches to efficiency, usage and sharing, future planning, place and investment strategies, recycling and decommissioning, and energy, costs and environmental management.

Opportunity

Understand the data standards the sector would wish to sustain in the immediate, medium and long-term and ensure that technical developments are consistently conceptualised to be future-proofed.

Persistent Identifiers

The potential for persistent identifiers (PIDs) to enable the development of consistent means of linking research outputs to research infrastructure assets, funding and people is one such area, where cost benefit analyses in terms of research infrastructure assets has not been undertaken and may or may not be worth the bureaucracy.

"In terms of equipment sharing, a clearer system that showcased the 'accessible' capabilities of each institution would be useful."

"Why do we need to go into the same place? Why do we need to pay for those costs that bring us all together? We've moved from a default together to a default virtual."

Opportunity
Assessment of the potential for and benefit of persistent identifiers for research infrastructure assets to enable oversight of the landscape in the round.

Technology assisted approaches

Technology evolves at pace and there are many potential advanced technologies the university research infrastructure asset landscape can and will need to adapt to.

"There's a lot of opportunity for digital and the increase in computational ability, the machine learning, artificial intelligence revolution and so on, I think that's driving a lot of new possibilities for generating new equipment, new instrumentation, new ways of working with and collaborating without necessarily having to get together. Over the last couple of years (we've) made huge use of (it), like we're doing now. And this needs to be rolled into the way we work in laboratories as well. So virtual presence, augmented reality, to some extent virtual reality for training or these sorts of things need to be built in. Make it easy for equipment to stream out the stuff it's doing. I could be talking to you while you're operating the equipment and looking at stuff and we can be seeing stuff that's got to be made seamless, which largely probably is around standards and getting standards for all of this working."

Opportunity
Look to innovative approaches to integrate research infrastructure assets securely but more fully into connected digital settings where feasible, using internet of things technology, greater use of automated management processes, including application programming interfaces (APIs) and machine learning, remote execution technologies and remote labs, which would open routes to de-duplication and enhance collective benefit.

Opportunity
Strategic commercial and sector partnerships could be explored to understand and set out the ways in which private sector organisations are able to support the research sector with accessing, managing and sharing research infrastructure assets at reduced cost and enhanced sustainability.

Find your Jisc account manager jisc.ac.uk/contact/your-account-manager – we are ready to discuss any, or all aspects contained within this report.

Equipment Data harvests and aggregates data from university and research facility equipment catalogues. The platform supports UKRI's Terms and Conditions of grant, which requires *"all new equipment purchased over £138,000 to be registered on the Equipment Data national database"*.

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