The TALENT Commission

Technical skills, roles and careers in
UK higher education and research

Sophie Able, Horticultural Technician,
John Innes Centre

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Foreword:
Lord Sainsbury of Turville, settlor of the Gatsby Foundation

I have long believed that technicians are one of the keys to unlocking innovation and harnessing emerging technologies. Their expertise in their subject area, and their knowledge of equipment and resources, is unparalleled – and leads to constant improvements which drive science and technology forwards.

But even just a few years ago, building a highly trained technician workforce was not a priority in the UK. It has been a pleasure to watch how initiatives such as the Technician Commitment, and now the TALENT Commission, have transformed the situation so that the immense value of technicians is now realised.

I am particularly pleased to see the Commission encourage investment to expand technician apprenticeships and host T-level industry placements. By recruiting through these technical routes, higher education and research institutions can futureproof the next generation of technicians.

Once we have technicians in research and higher education, we need to retain them, and so I echo the Commission's report in calling on employers to build clear career pathways for technicians. Without them the sector will continue to lose valuable people whose expertise is not easily replaced.

My Gatsby Foundation has championed the work of technicians in higher education, research and all other sectors, for many years. The ambition and vision of the TALENT Commission should be applauded, and I look forward to seeing how its excellent recommendations can be put into practice across the board.

Foreword:
Professor Sir John Holman and Kelly Vere MBE

The technical community is critical to higher education, research and innovation. Our country's world class universities and research institutes would not be able to function without the skills, expertise and experience of our technical colleagues.

Yet as a sector, we have not shone a bright enough light on this vital community. Consequently we have a lack of knowledge, understanding and strategic insight into the technical roles, skills and careers that ensure our sector flourishes. There is a key disconnect in how we discuss technical roles. All too often, there is a narrative that seeks to separate technical and academic skills – but this does not reflect the reality of how academics and technicians work together.

This report is the culmination of almost two years of research and insight into technical skills, roles and careers in the higher education and research sector. It provides the foundation for new strategic understanding of our vital technical community, with new data and that we hope will set high standards of evidence that can be built on in the future.

Our vision is that the UK will be a global superpower in science, engineering, and the creative industries, enabled by its technical capability across academia, research, education and innovation. We want to see technical skills, roles, and careers recognised, respected, aspired to, supported, and developed. This report makes a series of recommendations for how we can achieve this vision.

We are grateful to Research England, part of UKRI, for funding this work. We also thank our team of Commissioners for their wise guidance and positive engagement, our wonderful, dedicated project team and the many research participants we engaged with throughout this research. We are indebted to you all.

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Introduction
The TALENT
Commission's Mission

Technical expertise is critical to the success of UK research, innovation and higher education, and in turn vital to the growth of the UK economy.

Technical colleagues across our sector underpin the primary activities of universities and research institutes (RIs), creating the foundations for technical excellence in research, teaching, knowledge exchange and innovation. Many technicians are researchers and teachers in their own right, teaching and training students at every level.

There are estimated to be between 30,000 and 50,000 technicians across this workforce. This community has a vast range of job titles, including technicians, skills specialists, research technology professionals, technologists, experimental officers, archivists, laboratory managers and more.

Despite their vital role, the technical community has frequently been described as an 'invisible workforce' and is a relatively understudied occupational group, both here in the UK and globally. Roles in the UK are ill-defined, and little is known about current and future technical skills requirements.

Often in our sector we talk about emerging technologies and the 'shiny kit' we need to drive innovation, but rarely do we consider the people – the expert technical skills, roles and careers required to enable the use of these technologies. It is crucial we examine the technical capability required to fulfil the government's ambition to increase investment in research and development (R&D). The UK can only become a superpower in science, engineering and the creative industries if we understand, and then invest in, the technical talent, expertise and know-how required to meet this ambition.

Antony Tibbetts, Technical Team Leader, Manchester Metropolitan University

In 2017, in recognition of these issues, the sector launched the Technician Commitment, which has generated significant momentum and galvanised activity to ensure increased visibility, recognition, career development and sustainability of technical skills, roles and careers across the 100+ signatory and supporter institutions. Universities and RIs have published plans to meet the Technician Commitment's core aims, while institutional activity is beginning to show evidence of positive change. The initiative has encouraged and supported collaborative activity, and regional consortia and networks have taken the opportunity to work together to advance that culture for the technical community.

This is fantastic progress, but there is still much to do. Nationally, we suffer from a lack of strategic insight into the technical capabilities of our sector. There is also a paucity of literature, data and knowledge of the technical community.

TALENT, a transformation programme funded by Research England and partners, and awarded to the Midlands Innovation consortium of universities, is leading change to advance the status of, and opportunity for, the technical community.

To address the gaps in our understanding, TALENT launched this national policy commission, chaired by Professor Sir John Holman, to generate new knowledge and insights into the UK's technical workforce.

Convened in 2020, the TALENT Commission includes technician representatives, vice-chancellors, and representatives from learned societies and funding bodies. Among many topics, we have looked at the contributions technicians make to higher education (HE) and research, how technicians are funded, explored perceptions, recognition and representation of technical roles, examined career pathways and progression routes, and, crucially, looked at their future skills and training needs so as to enable the realisation of the sector and the government's future ambitions for UK research and innovation.

This evidence has been generated through a range of methods. The Commission has conducted the largest-ever national survey of technical staff in UK higher education and research, analysed a range of sector data and hosted focus groups, interviews and roundtable discussions with a range of stakeholders.

This resulting report shares our findings with the wider sector and sets out a vision for a future where technical skills, roles and careers are recognised as essential for research, education and innovation within the sector, and therefore, for the sector's contribution to society as a whole. We set out a number of working principles and recommendations and urge stakeholders to engage with these to help enact this vision.

We must work collaboratively to ensure the UK has the technical capability and capacity it needs to deliver the best outcomes for research, innovation and education. The COVID-19 pandemic has shown the power of the UK's research base and the importance of maintaining and strengthening it for the future. Technical skills must be at the heart of that ambition.

The UK can only become a superpower in science, engineering and the creative industries if we understand, and then invest in, the technical talent, expertise and know-how required to meet this ambition.

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Executive Summary

About this report

The TALENT Commission was launched in July 2020 to address the paucity of insight and knowledge about the technical skills, roles and careers seen across UK higher education and research.

It is a key strand of work of the wider Research England funded TALENT project, awarded to the Midlands Innovation consortium of universities with a view to advancing the status and opportunities experienced by the technical community in UK higher education and research.

This report is the result of 20 months of research and stakeholder engagement. In addition to collating existing evidence, for example through literature reviews and secondary analysis of existing data, the Commission has generated a wealth of new evidence through a range of methodologies. This includes the largest survey of UK technical staff working in higher education and research ever undertaken, a range of focus groups with the technical community and additional commissioned research projects on topics including funding and future technologies.

The report outlines a vision, accompanied by a set of principles and 16 overarching recommendations. These 16 recommendations are then presented, with further detail, to target specific stakeholder groups. Together, these recommendations highlight the collaborative nature of the work that is needed to ensure the UK has the technical skills and expertise required to be a global superpower in research, education and innovation.

The rest of the report is structured into the following key sections:

○ The Importance of Technicians and their Contributions to UK Higher Education and Research
○ Technical Staff within the UK Policy Landscape
○ Characteristics and Trends of the Technical Workforce
○ Funding Technical Roles
○ Technical Career Pathways, Progression, Professional Development, Succession and Sustainability
○ Perception, Recognition and Representation of Technical Staff
○ Emerging Technologies and Technical Skills Required in Research
○ Technical Staff as Teachers
○ Technical Partnerships within the UK
○ Conclusion
○ Appendices

Commissioners

The TALENT Commission is led by an independent Chair, Professor Sir John Holman, and a team of Commissioners, supported by the TALENT Commission project team.

Sir John Holman
Chair of the TALENT Commission

Nigel Towers
Head of Strategy, Marketing and Sales, Thales Alenia Space UK

Rory Duncan
Director, Talent and Skills, UKRI

Helen Pain
Chief Executive, Royal Society of Chemistry

Anne-Marie Coriat
Freelancer

Kirsty Edgar
Head of Research for the School of Geography, Earth and Environmental Sciences, University of Birmingham

Nishan Canagarajah
President & Vice-Chancellor, University of Leicester

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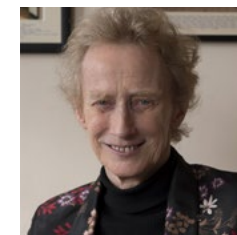
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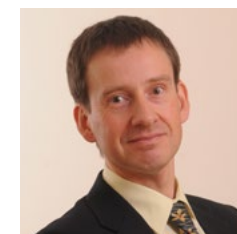
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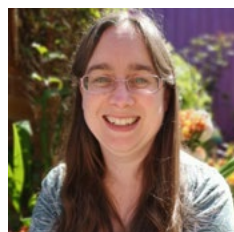
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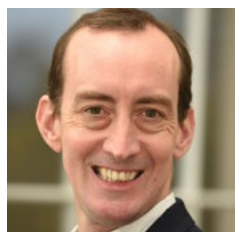
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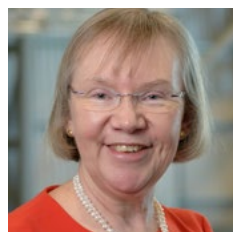
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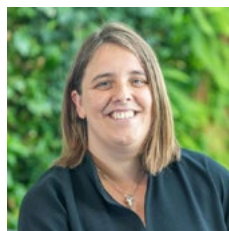
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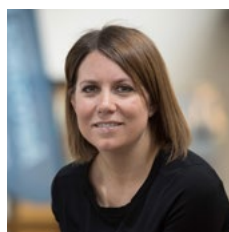
Kelly Vere MBE

Francis Wragg

Neil Armstrong, Master of the Research Vessel, Newcastle University

Methodology

This report is informed by a wide range of evidence generated and analysed by the TALENT project team with additional support from commissioned independent researchers. Alongside desk research and general stakeholder engagement, some of our key sources are highlighted below.

National survey of UK technical staff

A national online survey of UK technical staff was launched in February 2021, remaining open for 4.5 weeks. The survey comprised 60 questions and took approximately 20 minutes to complete, covering a range of topics. The survey garnered 1766 usable responses from respondents across 90 different UK universities and 16 UK research institutes. Respondents were from a range of subject disciplines, including science, engineering, and the creative arts. While open to all technical staff in the UK, the majority of respondents were from higher education institutions (90%), with fewer from research institutes (9%) or other institutions (1%).

Higher Education Statistics Agency (HESA) data

HESA staff records (2012/13-2019/20) were used for secondary quantitative analysis of UK HE technical workforce characteristics and trends. HESA collect raw staff record data from 160+ subscribing UK HE providers on an annual basis, grouped by academic year.

Online focus groups (UK technical managers)

Following the national survey of UK technical staff, three focus groups were held with UK technical managers in March 2021 to further explore topics relating to challenges within recruitment and retention of UK technical staff. In total, 27 participants took part across the three groups, representing 22 different institutions, including representatives from a range of disciplines areas.

Online focus groups (wider UK technical community – all roles)

Following the national survey of UK technical staff, a series of nine focus groups were held with UK technical staff in July 2021 to further explore a range of themes raised within the survey. Key themes explored included value, visibility, recognition, and representation of technical staff within UK HE and research. Each focus group (four to seven participants) lasted approximately 90 minutes. 44 participants took part across nine groups, representing 24 universities and RIs, including representatives from a range of discipline areas.

Survey of students and non-technical staff

Following the national survey of UK technical staff, a shorter online survey of UK students and non-technical staff was launched in summer 2021 to explore how non-technical staff and students perceived the role and value of technicians within their places of work and/or study. The survey comprised 16 questions, took approximately eight minutes to complete, and garnered 1026 usable responses. Respondents covered a range of role types and discipline areas.

Call for views and evidence

An open call for views and evidence was launched in early 2021. A total of 12 responses were submitted from individuals, institutions, and professional bodies within the sector.

Commissioned research studies

Three standalone independent studies helped to inform the findings within this report. These studies explored topics around funding, partnerships within the UK HE and research landscape, and emerging research technologies, utilising a range of methodologies including desk research, surveys and stakeholder interviews.

Acknowledgements

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Our Vision, Principles and Recommendations

Our overall vision:

The UK will be a global superpower in science, engineering, and the creative industries, enabled by its technical capability and capacity across academia, research, education and innovation. Technical skills, roles, and careers will be recognised, respected, aspired to, supported, and developed.

What this will look like – our principles

- Strategic planning and insight ensures the sustainability of technical skills across the sector, ensuring technical skills and roles meet the demands of emerging technologies and research areas, and an evolving education landscape

- Understanding and recognition of the diversity and complexity of technical roles and their contributions, with parity of esteem of skills, knowledge and expertise on par with other staff groups in the sector

- Robust reporting of demographic data for technical staff by their employers that facilitates a sector-wide understanding of the scale and characteristics of the UK technical workforce and any developing trends

- The UK technical community is diverse and inclusive at all levels, across all roles and disciplines. Opportunities are available for people from all backgrounds to realise their potential

- The funding landscape supports and enables opportunities for the technical community, and is transparent, easily understood, and accessible

- Technical careers are visible, understood, and aspired to, with clear career progression and professional development opportunities. Multiple well-understood and appropriate entry routes are available into a variety of technical careers throughout the sector

- Opportunities and mechanisms are available to move between career pathways and across sectors

- Technical staff are included in, and can influence, strategic planning and decision-making in their organisations and across wider sector initiatives

- Organisations work together in strong partnerships between higher education, research institutions, further education, and industry, and ensure the provision of high-quality training and career development for the technical community.

- Inclusion and awareness of technical roles, skills, and careers is apparent in policymaking, with connectivity across all policy areas relevant to the UK technical workforce

- A national body represents technicians and technologists, providing a coherent voice for this broad and diverse community, working with and advising government, funding bodies, learned societies, trade unions and other organisations

How we can get there – our recommendations

R1 **Employers of technical staff, funders, and government departments (e.g. BEIS, DfE) should employ a strategic approach to ensure the sustainability and appropriateness of technical skills and careers, at both a local and national level.** This includes succession planning in individual organisations, investment in a new pipeline of technical talent and horizon scanning new and emerging technologies and skills. Institutions should follow the good practice of institutions including King's College London, the University of Bristol and the University of Nottingham, in appointing a strategic lead for technical staff and skills in the organisation to lead this agenda, in collaboration with technical managers. Funders should provide resource to ensure the development and training of technical professionals, boosting skills, knowledge, and career development; and building capability and capacity in the UK to meet future pipeline needs.

R2 **Funders and employers of technical staff in higher education and research should recognise the blurring of boundaries between technical and academic roles. They should provide opportunities and mechanisms to move between career pathways and across sectors.** This aligns with the Government's *Research and Development (R&D) People and Culture Strategy* which will provide support for flexible, cross-sector training programmes to encourage more movement & collaboration between academia, industry and the third sector.

R3 **Employers of technical staff should collect, report and analyse data on their technical workforce, with careful consideration of those roles at the interface with academic roles. To enable sector level understanding, a new, simple, and fit-for-purpose classification for technical roles should be developed.** For example, this could be developed as part of the recently proposed BEIS annual R&D workforce survey. For HE institutions, we call on HESA and its regulators (OfS, HEFCW, DfENI, SFC) to ensure such data are mandated, collected, and made available for technical staff roles. This should include capture of numbers of technical staff delivering teaching and learning activities, as well as those delivering research.

R4 **Employers of technical staff, funding bodies, and learned societies should undertake targeted and specific action to address the equality, diversity and inclusion (EDI) challenges facing the technical community.** Along with the inclusion of technical staff in broader EDI initiatives, we strongly encourage interventions, at a sector and institutional level, to address the low numbers of technicians from Black, Asian and ethnic minority backgrounds, along with the lack of women in technical leadership roles. Specific interventions are also required to tackle discipline-specific EDI challenges. EDI charters (e.g. Athena Swan, and the Race Equality Charter), and the institutions that engage with them, should ensure inclusion of technical staff.

R5 **Funders and employers of technical staff should provide clear and consistent guidance to ensure technical contributions are costed appropriately and eligibility requirements for existing funding opportunities should be reviewed to ensure inclusion of technical staff where appropriate.** For example, funders of research and development should provide clear and transparent guidelines on how technical staff can be costed onto grants and guidance on the roles that technical staff can hold on grants should be considered. The review of Full Economic Costing, as recommended in the Government's *Research and Development (R&D) People and Culture Strategy,* should ensure that the inclusion of technical staff on research grants is not disadvantaged relative to other staff roles in the research ecosystem.

R6 **Employers of technical staff, funders, and sector bodies (e.g. professional associations and learned societies) should support outreach and public engagement activities regarding technical careers in local schools and colleges to increase visibility of technical career opportunities to young people.** A good example of such activity is the Gatsby Charitable Foundation's Technicians Make It Happen campaign, which highlights the varied technical career opportunities available across all sectors.
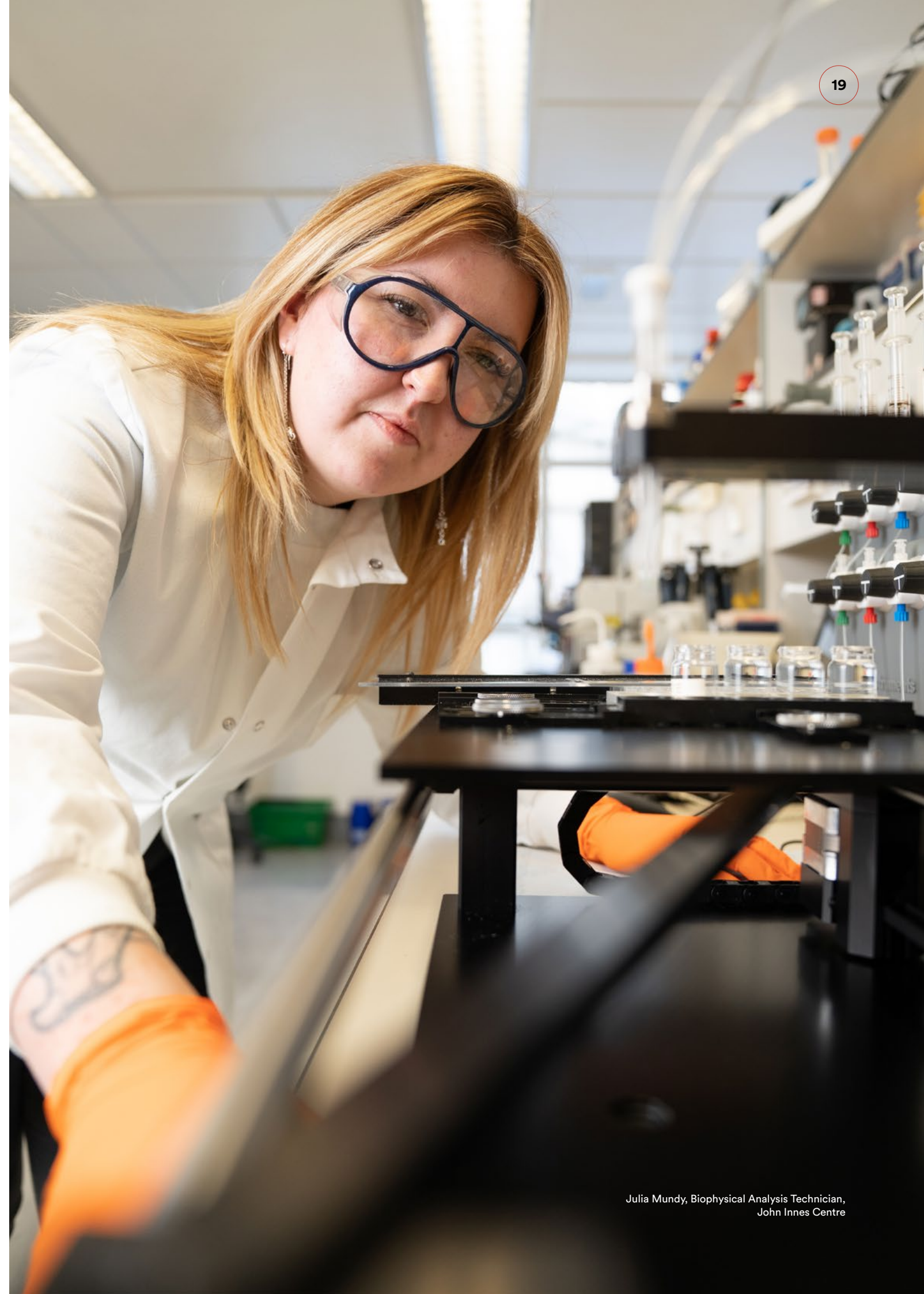
Julia Mundy, Biophysical Analysis Technician, John Innes Centre

R7 Employers of technical staff should broaden access to technical careers in the sector by utilising and expanding entry routes to include both vocational and academic pathways. We urge employers to invest in apprenticeship and trainee technician programmes, and to host work placement schemes for technical qualifications where possible (e.g. T-level placements in England). We encourage funders to support and facilitate investment in new generations of technicians through the creation of funding opportunities to support technical traineeships. Funders should encourage applicants to include new apprenticeship positions on bids for major infrastructure investments. The Apprenticeship Levy should be better used to train technicians, and pooled Levy sharing across organisations should be explored.

R8 Employers of technical staff should ensure inclusion of technical expertise within end-to-end recruitment processes when hiring for technical roles. This should include utilising technical expertise when compiling role profiles, advice on where to advertise and technical input or representation on recruitment panels.

R9 Employers of technical staff should ensure visibility of clearly defined career pathways and progression routes, with accurate and standardised job descriptions for technical roles. Pilot activity should be considered by employers of technicians to explore new opportunities for progression routes akin to those available for academic roles.

R10 Employers of technical staff, funders, and sector bodies (e.g. professional associations and learned societies) should ensure provision and access to a range of professional development opportunities tailored to technical roles and careers. For example, technical role-specific training courses, mentor-mentee programmes, placements and shadowing opportunities. There should be support from employers and professional bodies to ensure that technical staff can gain professional registration in recognition of their skills and expertise (for example, through the Science Council and Engineering Council licensed bodies, or via accreditation through AdvanceHE fellowships). Equity with other staff groups is key: for example, the Researcher Development Concordat recommends a ring-fenced 10 days' pro rata per year for professional development. Funding bodies should ask in grant applications and post-hoc assessment exercises (e.g. REF and future equivalents) about the professional development opportunities for technicians employed on or supporting research projects.

R11 Employers of technical staff, publishers and other sector bodies (e.g. professional associations and learned societies) should ensure the contributions of technical staff are visible and recognised. Building on the principles of Contributor Roles Taxonomy (CRediT), publishers should include a required step in the submission process that specifically asks prospective authors to state how they have recognised the contributions of technical colleagues in their manuscript. Higher education institutions should ensure technical staff can be formally recognised as supervisors on student projects where appropriate and develop technical teaching career pathways for technical staff who are leading and developing teaching and learning. Institutions should create opportunities to raise the visibility of technical staff and their roles within the workplace, for example, through institution-wide showcase events. Learned societies and professional bodies should build engagement with the technical community by ensuring existing opportunities, conferences and events are inclusive and relevant to technicians and formally support the Technician Commitment. The Future Research Assessment Programme should consider all roles within the research and development ecosystem and explore how teams can be recognised and rewarded.

R12 Employers of technical staff, funders and sector bodies (e.g. professional associations and learned societies) should ensure technical staff sit on appropriate institution- and sector-level decision-making committees and boards to ensure these groups reflect the community they represent and to provide diversity of views and expertise. This should be through a seat where possible, or through a designated technical advocate where more appropriate. Employers of technicians should be inclusive of technical staff when discussing sector policy developments, both internally and externally.

R13 Employers of technical staff should form partnerships with organisations and initiatives that provide technical and vocational training (e.g. Catapult Centres in the UK and Institutes of Technology in England) to ensure sharing of knowledge and skills, to facilitate the identification of skills needed to deploy emerging technologies, and to inform the development of suitable future training syllabi. Universities and research institutes should work together to deliver technical training on a regional or discipline-specific basis and to provide network opportunities for the sharing of technical expertise.

R14 Government policymakers should ensure the inclusion of technical staff in consultations on sector-level policy, for example through invitations to roundtables and consultations. This could be through inclusion on discussion panels or by reference in external conversations and consultative responses. Sector stakeholders should work with the wider Technician Commitment network of 100+ organisations (and/or the new entity proposed in R16) to provide a unified voice to government on key policy areas impacting technical skills, roles and careers. Professional bodies and learned societies should ensure policy discussions and consultative responses reflect the entirety of roles within their membership.

R15 Technical staff should engage positively with current and future opportunities that are available to them. Technical staff and those working with them should raise awareness of opportunities for the technical community. Managers of technical staff should inform and support their teams, encourage participation and celebrate successes.

R16 The TALENT Commission advises the creation of a new collaborative entity, provisionally to be called the UK Institute for Technical Skills & Strategy [working title] that builds on the multi-stakeholder approach of the Technician Commitment, to represent and provide a conduit to the technical community, advising government, sector initiatives, funding bodies and other organisations. We advise that the new entity works closely with the professional bodies and membership organisations to which technical staff belong to ensure connectivity, voice and visibility for the technical community.

Miriam Arrulo, Technician - Biosciences and Chemistry, Sheffield Hallam University

04

Targeted Recommendations for Key Stakeholder Groups

This section expands on our 16 overarching recommendations, providing more detailed and specific recommendations for several key stakeholder groups: government and policymakers; professional bodies and learned societies; funders; employers of technical staff; and the UK technical community.

Government and Policymakers

Government has a vital role to play in determining the future of the UK's technical workforce. It provides the framework for academic and vocational pathways into technical careers and develop and to deliver policy that impacts all staff within research, innovation, and education workforces.

Uptake and enactment of these targeted recommendations will support government and government departments to deliver on their aim to establish the UK as a global superpower in research, innovation, and education.

Targeted recommendations	Benefits for delivering these recommendations
Ensure connectivity and alignment between government departments (DfE and BEIS in particular) and their initiatives regarding technical skills, workforces, and related policy areas.	This will ensure efficiency, effectiveness, and common understanding of initiatives impacting the technical workforce, and therefore the wider research, innovation, and education landscape.
Support funders and institutions to facilitate a strategic approach to the sustainability of technical skills and careers through investment in new generations of technical talent. Support activity to enable horizon scanning of new and emerging technologies and skills.	This will support enactment of the BEIS *R&D People and Culture Strategy*, to build the research, innovation, and education workforce the UK needs, by attracting, developing, and retaining current and future generations of UK technical talent, and creating a positive and inclusive environment for them to thrive in.
Building on the BEIS *R&D People and Culture Strategy*, utilise the proposed workforce survey to support the development of a new, simple and fit-for-purpose classification for technical roles in higher education, research, and innovation at all levels.	This will develop strategic insight and understanding of the entirety of the UK workforce within research, innovation, and higher education (including contributions to both teaching and research), to ensure the right technical skills and capabilities are available now and in the future to enable the UK to be a global superpower in science, engineering, and the creative industries.
Explore the possibility of adjustments to the Apprentice Levy to allow flexibility regarding how it can support upskilling of technicians across organisations.	
For Higher Education institutions, we call on HESA and its regulators (OfS, HEFCW, DfENI, SFC) to ensure technical workforce data are mandated, collected, and made available for sector-wide analysis. This includes the reinstatement of mandatory workforce data submission for contracted technical staff, recently removed for providers in England and Northern Ireland, and will also require continued support of UKRI, RE, and DfE. We also call on HESA to introduce a Technical Staff Employment Function marker, equivalent to the Academic Employment Function marker currently in use, to help identify technical roles most pertinent to teaching higher education students and/or delivering research outputs.	
Support and engage with the development of a new collaborative entity, provisionally to be called the UK Institute for Technical Skills & Strategy [working title].	This will ensure policymaking discussions are inclusive of, and reflect the diversity of, the wider workforces within research, innovation, and education, informed by access and engagement with a new national collaborative entity, provisionally to be called the UK Institute for Technical Skills & Strategy [working title].
Ensure inclusion of the technical voice within consultations on sector-level policy – for example, through inviting representatives or advocates to roundtables and consultations.	

Professional Bodies and Learned Societies

Professional Bodies and Learned Societies play a vital role in supporting, developing, and representing the UK's technical workforce as part of the wider research, innovation, education, and professional workforce communities. They provide professional standards, opportunities for professional development, and build and facilitate professional networks within a particular discipline or sector. They also represent their community during policy discussions with government.

Uptake and enactment of these targeted recommendations will support Professional Bodies and Learned Societies to diversify their membership, ensure representation of their broad communities and provide a strong collective representative voice on discipline-specific policy.

Targeted recommendations / Benefits for delivering these recommendations

Targeted recommendations	Benefits for delivering these recommendations
Formally support and engage with the Technician Commitment and the new collaborative entity (provisionally to be called the UK Institute for Technical Skills & Strategy [working title]), to provide a unified voice to government when discussing sector and policy developments. / Actively pursue engagement with the technical community.	This will provide opportunities to diversify membership and increase the number of accredited professionals, by providing access to a wider network of technical professionals across UK higher education and research. This will also increase the influence over a wider workforce and ensure broader adherence to professional standards.
Work to address equality, diversity, and inclusivity considerations for technical staff through implementation of targeted technician-specific initiatives and/or their inclusion within sector-wide initiatives. Acknowledge that workforce characteristics of technical communities are often not uniform (e.g. reported differences by discipline area), with different approaches potentially needed for different technical communities. / Support outreach and public engagement around technical careers. / Ensure provision and access to professional development opportunities and training for technical staff, including professional registration.	This will build the research, innovation, and education workforce the UK needs, by attracting, developing, and retaining current and future generations of UK technical talent, and creating a positive and inclusive environment.
Ensure representation of technical staff on boards and committees, either through a designated seat or through a technical advocate.	This will ensure such groups more accurately reflect the community they represent. By representing a wider demographic and larger workforce within a given discipline, this ensures more appropriate and impactful representation within policy development processes, and increases meaningful advocacy for specialist areas and disciplines.
Ensure conferences and events are inclusive of technical staff.	This will improve connectivity between communities and workforces within specialist disciplines, and shared exchange of diverse skills and experiences.
Support appropriate inclusion of technical staff as authors, co-authors, or contributors on published papers and presentations, including clear guidance for appropriate inclusion at relevant stages.	This will help create a positive and inclusive environment, recognising the contributions of everyone within their specialist and/or professional community.

Funders

Funders have have a vital role influencing the future of the UK's technical workforce, not least because they provide the framework for individual employers and professional bodies to follow when engaging with technical workforces, allocating resources, and assigning priorities.

Uptake and enactment of these targeted recommendations will help funders deliver on their aim to fund activities that will generate impact within research, innovation, and education by helping to generate a workforce and culture that fulfills its potential more successfully. They will also help establish sector-wide improvements in workplace culture, positivity, inclusiveness, long-term sustainability, talent retention, and minimizing skills loss.

Targeted recommendations / Benefits for delivering these recommendations

Targeted recommendations	Benefits for delivering these recommendations
Provide transparent guidelines for how technical staff can be costed on to grants.	This will ensure more accurate and realistic attribution and allocation of resources required for a project to be delivered on time and on budget.
Ensure the review of Full Economic Costing considers appropriate inclusion of technical staff on grants, ensuring any future process incentivises accurate costing of technical staff within the research ecosystem.	This will ensure accurate consideration of the technical capability needed to deliver projects and advance research and innovation.
Support and facilitate investment into technical apprenticeships and traineeships. / Encourage grant and/or funding applications for major infrastructure investments to include new apprenticeship positions.	This will help the current UK workforce reach their full potential to deliver outstanding research, innovation, and education systems in the UK.
Support outreach and public engagement activities specifically for and/or including technical staff. / Encourage availability and uptake of professional development opportunities tailored to technical staff. Ask in grant applications about professional development opportunities for those technicians who support these projects. / Provide resources to support the training and development of technicians and technical staff.	This will also help build the technical workforce the UK needs for the future, by attracting, developing, and retaining current and future generations of UK technical talent, and creating a positive and inclusive environment for them to flourish.
Fund initiatives to target equality, diversity, and inclusivity considerations specific to technical communities, and require inclusion of technical staff within relevant funded sector-wide initiatives.	This will create a thriving, positive, and inclusive culture within UK research, innovation, and education, with the opportunity for all to contribute and benefit.
Ensure that the Future Research Assessment Programme considers how all roles in R&D are recognised and rewarded.	This will provide a working environment that enables the whole workforce, including the technical workforce, to flourish and develop. / This will create a more accurate picture of the impact that funding delivers, and encourages the entire workforce to use their skills across research and innovation.
Ensure opportunities for technical staff to be included on grant panels, boards and committees etc.	This will ensure advisory and decision-making groups are more representative of the whole workforce across R&I, provide diversity of expertise and insight, and helps fact-check proposals in terms of practicalities, cost, and technical resources required.
Support the Technician Commitment and the new collaborative entity (provisionally to be called the UK Institute for Technical Skills & Strategy [working title]), when formed.	This will provide access to a wide network of technical professionals across UK HE and research, across a range of disciplines. / This will allow funders to engage with a coherent technical voice alongside relevant discussions with government and policy professionals.
Support the collection, reporting, tracking and analysis of data on technical workforces.	This will help develop strategic insight and understanding of the entirety of the UK workforce within R&D, innovation, and higher education, to ensure the necessary technical skills and capabilities are available now and in the future to enable UK R&I to generate impact.

Employers of Technical Staff

Employers of technicians and technical staff are vital to ensuring the continued development and sustainability of the technical skills base in the UK. They determine frameworks for visibility and recognition of staff contributions and create and have impact upon general workplace culture. Employers determine the entry routes to technical careers and influence professional development opportunities and retention.

Uptake and enactment of these targeted recommendations will support employers of technicians to deliver their short- and long-term strategies by building a thriving, positive and inclusive workforce at all levels, who deliver to their full potential to enable excellence in research, innovation, education, infrastructure and civic contribution.

Targeted recommendations | Benefits for delivering these recommendations

Targeted recommendations	Benefits for delivering these recommendations
Work to address any equality, diversity, and inclusivity considerations for technical workforces through implementation of targeted technician-specific initiatives, and/or ensuring inclusion within wider all-staff initiatives, such as those linked to Athena Swan and the Race Equality Charter. Acknowledge that workforce characteristics of technical communities are often not uniform (e.g. reported differences by discipline area), with different approaches potentially needed for different communities.	This will help create a thriving, positive, and inclusive workplace culture, with the opportunity for all to contribute, benefit, and be celebrated.
Review how staff contributions are recognised and rewarded at department- and institution-level, and whether inclusivity exists across all job families.	This will help create a thriving, committed, and inclusive workplace culture, with the opportunity for all to contribute, benefit, and be celebrated.
Encourage appropriate inclusion of technical staff as authors, co-authors, or contributors on published papers and presentations, including providing clear guidance for appropriate inclusion at relevant stages, and sharing examples of inclusion within newsletters etc.	This will help non-technical staff within the institution better understand and reflect on the contributions that technical staff make, and how their skill and expertise could be better utilised in future.
Provide transparent guidelines for how technical staff can be costed on to grants, sharing examples of best practice.	This will help unleash the full potential of all individuals within an institution.
Enable opportunities for technical staff to be considered as co-investigators, co-supervisors, for grants or projects.	
Encourage and support events for visibility, outreach, and public engagement specifically for and/or including technical staff. Including e.g. showcase events, conferences, public engagement, open days, visits to local schools and colleges, T-level placements (in England), and work experience placements.	This will help non-technicians, general public and potential future technicians better understand roles, skills, and careers available within technical pathways.
	This will enhance sharing of best practice throughout departments and institutions, helping to develop a more innovative, positive, and effective workforce.
Support and/or deliver the collection, reporting, tracking and analysis of data on employer- and sector-wide technical workforces. For HE institutions: we call on you to submit staff records to HESA for all of your contracted technical staff (even those in England and/or NI for whom this is no longer mandatory, as of 2018/19). For all institutions: we call on you to track the size and make-up of your technical workforces.	This will help develop strategic insight and understanding of the entirety of the institution - and sector-wide workforce within R&D, innovation, and higher education, to ensure the right technical skills and capabilities are available now and in the future. While acknowledging that the boundaries between job families are becoming increasingly blurred in certain circumstances, these recommendations are still a necessary step to reach improved understanding of technical workforces, and are an improvement on the system currently found throughout the sector: a very well-defined Academic workforce; a reasonably well-defined administrative and/or managerial workforce; and a poorly understood technical workforce.
Support the development and implementation of a new, simple, and fit-for-purpose classification for technical roles in higher education, research, and innovation at all levels, such as by creating a new job family specifically for technical roles, separate from academic, administrative, or any other job family.	
Take a strategic approach to the sustainability of technical skills and careers, and appropriate succession planning through horizon scanning and identifying current and potential future skills gaps.	This will help to ensure sustainability of skills within the technical workforce at department and institution level, building the research, innovation, and education workforce the employer needs.
Appoint an institutional strategic lead, e.g. Director of Technical Skills, to lead this agenda.	This will help non-technical staff within the institution better understand the contributions that technical staff make, and can make in future, enabling more strategic and effective approaches to supporting technical roles.

Employers of Technical Staff

Targeted recommendations | Benefits for delivering these recommendations

Targeted recommendations	Benefits for delivering these recommendations
Expand entry routes to technical roles and careers by encouraging applicants from both vocational pathways and academic pathways.	This will build the research, innovation, and education workforce the employer needs, by attracting, developing, and retaining current and future generations of technical talent, and creating a positive and inclusive environment.
Invest in apprentices and trainee technician positions, hosting placements for qualifications (e.g. T-Levels in England) and work experience placements for local schools and colleges.	
Utilise the Apprenticeship Levy for training and developing technical staff.	
Consider piloting new opportunities for progression via Technical Specialist pathways, and/or provide opportunities and mechanisms for staff to move across career pathways and job families.	This will ensure the employer has the necessary skills and expertise in place to develop research innovation and education, and achieve a positive experience for staff and/or students at all levels and seniorities.
Ensure provision and protected time for training and professional development, supporting technical staff to take advantage of development opportunities, such as technical training, placements, and/or professional registration. Define a minimum yearly allowance of days for technical staff to undertake professional development.	
Ensure inclusion of technical staff and/or technical expertise within end-to-end recruitment processes when hiring for technical roles. This should include utilising technical expertise when compiling role profiles, advice on where to advertise, and technical input on recruitment panels.	This will help alleviate short- and long-term challenges for recruitment, retention, and succession of an employer's technical staff, and will help develop loyalty and positivity within a workforce that can reach its full potential.
Ensure visibility of clearly defined career pathways and standardised job descriptions for technical roles and careers. Standardised job descriptions will likely have baseline commonalities, plus flexible opportunities for specialisation where needed. Ensure diverse inclusion of technical expertise during process and any reviews thereof.	
Ensure representation of technical staff on department-, faculty-, and institution-level decision-making committees, boards, panels, and similar groups, through either a dedicated technical seat or designated technical advocates within senior leadership and/or existing members. This includes processes and committees to develop institution-wide strategies and long-term goals.	This will ensure discussions that influence decision-making and policy development at an employer or sector level are inclusive of the diversity of thought and expertise necessary to contribute to healthy debate and effective decision-making.
Ensure considered inclusion of technical staff within all relevant communication channels and initiatives.	
Encourage formation of partnerships with organisations and initiatives that can provide technical training and wider technical networks. These partnerships can help to facilitate delivery of more technician-specific training across or within disciplines, and provide further opportunities for placements, secondments, equipment and knowledge exchange, and sharing of best practice.	This will build networks and embed collaboration across organisations.
Sign the Technician Commitment and engage with its initiatives and network of signatories.	This will enable knowledge exchange across department, institution, and discipline boundaries, and encourage innovation, continued learning and sharing of best practice.
Be inclusive of technical staff and their considerations in conversations on sector-policy developments.	This will help increase the impact of an employer's civic contribution at local-, regional- and national- level, as well as having measurable impact on frameworks such as REF.
Support technical staff to contribute to and/or attend government events and initiatives to develop policy.	This will ensure more accurate representation, greater diversity of expertise, and higher effectiveness of developed solutions when influencing local-, national- and sector-policy development in general, and particularly so with policies especially relevant to the technical profession and expertise.

The Technical Community

Technicians and technical staff can play a vital role influencing the future of UK research, innovation, and education. They can inspire current and future generations of technical talent to realise their potential within technical careers, and help deliver transfer of knowledge, skills and expertise from one generation to the next, ensuring the UK has the technical capabilities, skills and infrastructure needed to enable world-leading research, education and innovation. They can help create the foundations on which future generations of technical staff will stand.

Uptake and implementation of these targeted recommendations will ensure technical staff can contribute to a positive, thriving, and inclusive working environment, and will help reduce or remove pre-existing barriers. The targeted recommendations support the technical community to take advantage of future opportunities as they arise, and to continue to break down barriers to inclusion and recognition within research, innovation, and education sectors.

Targeted recommendations

Benefits for delivering these recommendations

Targeted recommendations	Benefits for delivering these recommendations
Engage with professional development opportunities where available, including both pre-existing and new opportunities for e.g. training, mentoring, professional registration, presenting at conferences and events.	This will advance development of skills and individual careers, as well as ensure similar opportunities continue to be supported and offered in future.
Discuss professional development opportunities with line managers and technical managers, including yearly allowances of days for professional development, and protocols for arranging cover of daily duties if needed.	This will help to ensure sustainability of skills within the UK technical workforce at local-, national-, and sector- level.
Participate in and engage with visibility events and local outreach activities where available, including internal department and institution showcase events, conferences, public engagement, open days, and visits to local schools and colleges.	This will help non-technicians to understand the important and diverse contributions that technical staff make to their institutions and beyond.
	This will help build the research and innovation workforce the UK needs, by attracting, developing, and retaining current and future generations of UK technical talent.
Network within the technical community and share examples of best practice across departments, disciplines, institutions, and sectors.	This will provide a positive, thriving, and inclusive working environment that will enable the technical community and workforce to flourish.
Engage with local and national Technician Commitment initiatives.	
Engage with opportunities to represent technical staff on decision-making committees at department-, faculty-, and/or institution-level, and beyond. These may be pre-existing, new, or future opportunities.	This will help influence local-, national- and sector- policy development relevant to the technical professional.
Engage with the new collaborative entity, provisionally to be called the UK Institute for Technical Skills & Strategy [working title], when formed.	

Kathy Lees, Technical Team Leader, Manchester Metropolitan University

05

The Importance of Technicians and their Contributions to UK Higher Education and Research

Technicians within UK Higher Education and Research

The technical community is critical to the success of UK education, research, innovation and development, and is crucial to the growth of the UK economy.

The UK higher education (HE) and research technical community is a highly skilled workforce with a diverse range of expertise. Technicians underpin the primary activities of universities and research institutes (RI), providing the technical excellence essential for research, teaching and knowledge transfer. Alongside this, many technicians are researchers and teachers in their own right. They also play a fundamental role in the development of the technical skills students require to pursue a career in research, academia and/or industry.

Current data, while limited, suggest there are over 30,000 technical staff working in UK universities across a range of job roles and subject disciplines, encompassing medicine, science, IT, engineering and the creative arts, while the Gatsby Charitable Foundation suggests there are between 1.5 and 2.2 million people working in the UK as technicians across a wide variety of sectors and industries.[1]

The TALENT Commission's focus is the technical community working within UK HE and research. Within HE, technicians are normally classified by human resource (HR) departments as 'support staff', in post to support the research and teaching of academics and/or student learning. They are not typically regarded as university teachers or researchers[2] and, despite the crucial nature of their contributions,[3, 4] technicians wrestle with a lack of status in comparison with academic colleagues.[5]

Who are technicians?

Technician roles have a variety of job titles and descriptions. Roles range from entry level apprentice or junior technician to internationally renowned specialised technical experts or senior strategic managers. The skills required for technical roles therefore come at various qualification levels, ranging from entry levels to level 8 (doctorate). The breadth and depth of technical roles and careers make defining the community challenging. An added complication is technical roles do not always include the term 'technician' in their job title or description.

There have been a number of suggested definitions for the technical community. Common to them all is the emphasis on the practical element of a technician's role:

> *A person who is skilled in the use of particular techniques and procedures to solve practical problems, often in ways that require considerable ingenuity and creativity. Technicians typically work with complex instruments and equipment, and require specialised training, as well as considerable practical experience, in order to do their job effectively.*
>
> Barley and Orr (1997): 12-15; OECD (2002): 92-94; Technician Council (2011) as cited in Lewis and Gospel (2011)[6]

[1] Technicians make it happen. See: **https://www.technicians.org.uk/faqs** (accessed 14 November 2021).

[2] P. A. Lewis and H. Gospel. (2011) Technicians under the Microscope: A Study of the Skills and Training of University Laboratory and Engineering Workshop Technicians. See: **https://www.gatsby.org.uk/uploads/education/reports/pdf/he-techn-final-report.pdf**

[3] The Royal Society. (1998) Technical and research support in the modern laboratory. See: **https://royalsociety.org/topics-policy/publications/1998/technical-support-laboratory** (accessed 14 November 2021).

[4] Evidence Ltd (2004) Highly Skilled Technicians In Higher Education A report to HEFCE. See: **https://www.sheffield.ac.uk/polopoly_fs/1.568318!/file/HEFCE_technicians_in_he_2004.pdf** (accessed 14 November 2021).

[5] K. Vere. (2017) Times are changing for technologists. See: **https://webarchive.nationalarchives.gov.uk/ukgwa/20210322121840/https://mrc.ukri.org/news/blog/times-changing-technologists/** (accessed 14 November 2021).

[6] Barley and Orr 1997: 12-15; OECD 2002: 92-94; Technician Council 2011 as cited in P. A. Lewis and H. Gospel. (2011) Technicians under the Microscope: A Study of the Skills and Training of University Laboratory and Engineering Workshop Technicians. See: **https://www.gatsby.org.uk/uploads/education/reports/pdf/he-techn-final-report.pdf**

> *A person who is trained and/or skilled in the techniques, tools and technology of their subject, who provides the practical application of knowledge, including hands-on support in directly contributing to teaching and learning, research and enterprise activities.*

HEaTED (2018)[7]

In 2018, Research Councils UK (now UK Research & Innovation (UKRI)) provided the following definition of 'technology/skills specialists':

> *Technology/skills specialists maintain and develop new and improved approaches to implement technologies and methodologies to better address research questions. Technology/skills specialists have specialist knowledge and expertise and they often work as part of coordinated teams spanning different disciplines and geographical centres, which work together to tackle contemporary research questions. May include, but not limited to: data scientists, data engineers, archivists, informaticians, statisticians, software developers, audio-visual technologists, technical professional staff and individuals staffing core facilities, across all disciplines.*

Research Councils UK (2018)[8]

This definition conveys the range of disciplines and roles that make up the technical community in research. However, technicians also make considerable contributions to the education and training of students and staff across HE and research.[9] Alongside this, technical staff are also involved in health and safety, sustainability, maintenance, infrastructure, people management and much more. This is recognised in UKRI's recently published Technician Commitment Action Plan:

> *Technicians use their technical expertise and knowledge and their practical, analytical and management skills to make a range of vital contributions to research and innovation, including (but not limited to):*
>
> ○ *Delivering the goals of a research and innovation project*
>
> ○ *Maintaining and developing the environment, standards, resources, materials and facilities needed to deliver research and innovation*
>
> ○ *Teaching others in the design, use and analysis of research techniques and methodologies*
>
> ○ *Managing budgets, procurement and teams directly associated with research projects, equipment, instruments and research resources*

UKRI (2021)[10]

It is clear that technical staff occupy a wide range of roles and have a wide range of responsibilities within education and research, making it very difficult to propose one simple definition. Employers have also found it challenging to produce definitions for their own technical communities. When the Technician Commitment,[11] launched in 2017, asked their signatory organisations how many technicians they employed, this often generated considerable difficulties. Many institutions were unable to identify how they defined the role of 'technician' and therefore how many they employed. As well as underlining how tricky this community is to define, these difficulties suggested the technical community was often overlooked and/or poorly understood by non-technical staff within their own institutions and sectors.

> When asked, many institutions were unable to easily identify or determine how many technicians and/or technical staff they employed.

Case study

Overview of role: Teaching technician
Beytan Erkman, University for the Creative Arts

Beytan is a tutor technician in digital photography and is a technician who teaches.

He was 40 when he decided to fulfil a passion to teach others, by which time he'd already established himself as a professional photographer and consultant. Not having a degree in photography himself, he worked his way up from the bottom, always feeling like he had something to prove. But that drive paid off because it means he brings rich knowledge and experience to his role at the University of the Creative Arts. He is able to teach his students real business skills, share his experiences of success and failure, and equip them with the practical skills they need to leave university 'work ready'.

He spends most of his three days a week during term time teaching students the practice, process and methodology of photography, offering much pastoral care, while the holidays are spent stripping down a printer or trying to find a way to fix a piece of high-value equipment. "It's a fantastic job," Beytan says.

In many cases, this attitude may be a matter of oversight and inherited tradition, rather than conscious intent. If so, simply asking the right questions to the right people could lead to institutions updating outdated or under-inclusive protocols and reporting processes.

To contribute further confusion, some employees who would identify as a member of the technical community may not be considered as such by their employer or their sector – for example, those who started their career as a technician but later transitioned into another job family as their responsibilities evolved. In contrast, other employees who would not consider themselves part of the technical community should do so, according to sector-level understanding – such as IT technicians and specialists.

Further, from our research we also note that some members of the technical community themselves do not favour use of the word 'technician', and would not refer to themselves as such, instead preferring 'technical staff' or a more specific job title. When asked, this was in part due to a perceived negative connotation around the word 'technician' and in part due to the huge range of different roles, skills, and level of experience and expertise which it encompassed.

In this report, we take a broad and inclusive view of the terms 'technician' and 'technical staff' and we recognise and align to existing definitions as outlined above. Rather than contributing a further definition of what we believe constitutes a technical role in HE and research, we also acknowledge that technical roles are diverse, multi-faceted and often positioned on blurred boundaries. While our primary focus is technical employees within UK HE and RIs, we have remained inclusive of the technical community across all disciplines and roles. Through our evidence gathering methods, we have sought to engage with anyone who self-identifies as part of the UK technical community.

Historically, there has been very limited academic or policy-oriented discussion or published work about any aspect of the UK technical community, or its make-up. There have been a handful of recent notable exceptions, many of which have been triggered by the recent Gatsby Charitable Foundation-funded Technician Commitment and Technicians Make it Happen initiatives.[12-14]

[7] HEaTED. (2018) See: **https://heated.org.uk/technician-definition-suggestion/** (accessed 23 January 2022).

[8] UKRI. (2020) RCUK Statement of expectations for technology/skills specialists. See: **https://www.ukri.org/wp-content/uploads/2020/10/UKRI-071020-StatementOfExpectationsTechnologySkillsSpecialists.pdf** (accessed 14 November 2021).

[9] P. A. Lewis and H. Gospel. (2011) Technicians under the Microscope: A Study of the Skills and Training of University Laboratory and Engineering Workshop Technicians. See:v**https://www.gatsby.org.uk/uploads/education/reports/pdf/he-techn-final-report.pdf**

[10] UKRI. (2021) Technician Commitment UKRI Action Plan. See: **https://www.ukri.org/wp-content/uploads/2021/02/UKRI-040221-TechnicianCommitmentActionPlan.pdf** (accessed 14 November 2021).

[11] Technicians Make it Happen. See: **https://www.technicians.org.uk/technician-commitment** (accessed 14 November 2021).

[12] P. A. Lewis and H. Gospel. (2011) Technicians under the Microscope: A Study of the Skills and Training of University Laboratory and Engineering Workshop Technicians. See: **https://www.gatsby.org.uk/uploads/education/reports/pdf/he-techn-final-report.pdf**

[13] University of Nottingham (2019) Equality, Diversity and Inclusion (EDI): A Technician Lens **https://www.stemm-change.co.uk/wp-content/uploads/2019/11/Equality-Diversity-and-Inclusion-A-Technician-Lens-web.pdf** (accessed 23 January 2022).

[14] The Royal Society webpages (2021) See: **https://royalsociety.org/topics-policy/publications/2021/research-and-technical-workforce-uk/** (accessed 23 January 2022).

Case study

Overview of role: Core technician
Gemma Charlesworth, University of Liverpool

As a core technician at the University of Liverpool working across two histology labs, Gemma's job can involve 'anything and everything'. It can see her taking out waste, coming into work on a Sunday to change gas cylinders over because an alarm has gone off, finding a replacement freezer if another goes down, or looking after stocks of liquid nitrogen.

Gemma has been heavily involved in research activities throughout her 10-year university career, which isn't an experience all core technicians have. She is also responsible for training students, supporting clinicians and researchers on projects, looking after lab equipment, troubleshooting all manner of issues and helping with research training on equipment.

Over the years, her work has spanned subjects that are worlds apart: molecular biology, histology and the very niche world of micro CT scanning, although today she says her skill set is most heavily based in histology.

"You have to be a little bit adaptable," she says. "I've been involved in tissue culture, PCR running all sorts of different assays – lots of different things in my time, it just depends on what people need at the time.

"Constantly brushing up on techniques is challenging, but it's what makes it really interesting, because it's so varied."

"Fashions come and go in research, and we're here to support the research goals of the institute."

What do technicians do?

Technical roles are very diverse and the tasks within roles are often wide-ranging. These roles include, but are not limited to: research technician, teaching technician, support technician, core facility staff, archivist, IT specialist, workshop technician, technical manager, bioinformatician, research software engineer, creative practitioner and health and safety officer.

Due to their nature, each of these individual roles undertakes a wide range of tasks. For example, laboratory-based technical staff often carry out a range of general, underpinning support tasks to enable both teaching and research, which include autoclaving, waste management, cleaning, stocking laboratories and equipment maintenance. More specialist work across disciplines includes experimentation, electronics and mechanical engineering, teaching and training students and staff, preparation and running samples, animal husbandry and data analysis.

Arts-based technicians support staff and students with technical queries, utilising often niche creative skills and expertise, and also have responsibility for materials, maintenance of kit and health and safety. Technical staff are key to keeping institutions compliant with health and safety and Home Office regulations, servicing equipment, statutory testing, health and safety advice, inspection and documentation, procurement, estates and finance and administrative activities. In addition, many technicians are managers, often with large and complex teams to lead, organise and develop. While this offers an insight into some of the tasks technical staff undertake, it is far from exhaustive and merely touches the surface of this key work group. Figure 2 indicates some of these key areas of responsibility for technical staff within HE and research.

Research Technician

Senior Research Technician

Technical Manager

Clinical Measurement Technician

Head of Technical Services

IT Manager

Core Facility/Technology Technician

Teaching Technician

Studio Technician

Laboratory Technician

Technical Facility Manager

Animal Technician

Technical Officer

Facility Manager

Health and Safety Technician

Research and Teaching Technician

Technical Support Manager

Laboratory Manager

Audio-visual Technician

Director of Technical Services

Research Software Engineer

Bioinformatician

Support Technician

Senior Technical Officer

Workshop Technician

Apprentice Technician

Technical Operations Manager

Archivist

Scientific Officer

Core Infrastructure Technician

Systems Administrator

IT Technician

Laboratory Coordinator

IT Specialist

Figure 1: Examples of job titles held by technical staff within UK HE and research.

Preparing resources and materials	Operating equipment	**Research**	Training staff and students	Data analysis
Preparing resources and materials	Delivering instructions and teaching	**Teaching**	Providing 1-to-1 support and feedback	Pastoral care of students
Arranging servicing	Preventative maintenance	**Maintenance**	Contractor checks	Fault finding
Carrying out audits	Statutory testing	**Health & safety**	Writing risk assessments	Delivering training
Writing tenders	Budgetary planning	**Finance and administration**	Purchasing and procurement	Asset registers
Management of infrastructure	Management of equipment and facilities	**Infrastructure**	Inspecting buildings	Planning new building projects and refurbishments
Inductions and training staff	HR processes	**People**	Pastoral care of staff	Line management

Figure 2: What do technicians do? Seven key areas of responsibility held by technical staff within UK HE and research, plus examples of common contributions for each area.

Contributions of technicians to research

The diverse nature of technical roles means that technicians' input into research is broad. Core technical staff carry out a wide range of duties to facilitate research, such as dealing with essential supplies and ensuring compliance of infrastructure. Electronics and mechanical workshop technicians fix existing equipment, make bespoke ancillary apparatus and build new research technologies from scratch. Technical staff in laboratories provide access and services to research groups and departments, advising on how to prepare samples, run instruments and analyse data. Technical staff in arts studios support material investigation, prototyping and maintain equipment. Dedicated research technicians often support an area of research for a specific group or cluster, preparing equipment and materials, archiving, and carrying out experimental procedures.[15] Many of these tasks could not be performed by academic staff and are the foundations of research. In Section 11 we explore emerging technologies and the technical skills required to deliver within new research areas.

Contributions of technicians to teaching and learning

Technical staff contribute significantly to teaching and learning environments within HE, across a wide range of contexts, levels, and discipline areas. While their involvement within background support is generally well established, though not necessarily acknowledged formally, and their role providing pastoral support to students has recently been reported on,[16] our research suggests that technical contributions to teaching and learning environments in many cases go well beyond 'support'. In Section 12, we explore the extent to which technical staffs' contributions to teaching are expanding (beyond those shown in Figure 2) in an evolving HE landscape, and we use our findings to explore an emerging role of technicians as teachers, with implications for future skills needs and technical training requirements.

Contributions of technicians to training

Technicians regularly train others, either formally or informally. Much of this training can be ad-hoc or day-to-day support, but they also provide structured training programmes. Due to their specialist skill and experience, they train students from undergraduate to PhD level, but also staff, including principal investigators. The training includes, but is far from limited to, the use of research equipment, data analysis, design and manufacturing, computational methodologies and coding, maintenance of infrastructure, and health and safety-related procedures.

Contributions of technicians to health and safety

Technical staff play a vital role implementing and ensuring standards for health and safety across teaching, research and infrastructure. Technical staff are commonly involved with compliance and statutory maintenance, health and safety audits, development of risk assessments, training and signage. In addition, due to a lower staff turnover, they are often those with the most institutional knowledge.[17] Their specialist knowledge is reflected in responsibilities such as ensuring ionising radiation regulations compliance and roles as biological safety officers.

The technical community in UK HE and research is diverse in subject discipline, with breadth and depth of knowledge, skills and expertise. This report provides new insights and understanding into the multi-faceted roles of technicians. We explore a number of areas including how technicians are represented in the current policy landscape, the characteristics and trends within the technical workforce and how technical roles are funded.

We also evaluate current and future developments including technical career pathways and professional development opportunities, recognition and perceptions of technical roles and strategic considerations within research and teaching.

Case study

Overview of role: Specialist research technician Natalie Homer, University of Edinburgh

In a laboratory that operates a number of state-of-the-art mass spectrometers, Natalie, a senior research fellow with a hybrid technical role, has a lot of plates to spin to keep her facility running.

Her team makes sure their work contributes to the University of Edinburgh's academic outputs in two main ways: firstly, by teaching students how to use some of the instrumentation to prepare samples for mass spectrometry; and secondly, they are not a closed lab, they offer a service.

Among those responsibilities, she also has to project manage individual people's studies, and manage student supervision and the team who keep the instrumentation going. "Project management is quite a key part of what I do," says Natalie, "but also we have to make sure we're following validation and accreditation guidelines."

That's not to mention the usual data processing, lab housekeeping, record-keeping and future scoping for new technologies. There is also what Natalie describes as the more "academic" side of her role. This involves writing up research methods to be included in academic papers, contributing to manuscripts and meeting with researchers.

"I probably do two jobs. I think a lot of people in the university feel like this, certainly when you get to a certain level."

[15] P. A. Lewis and H. Gospel. (2011) Technicians under the Microscope: A Study of the Skills and Training of University Laboratory and Engineering Workshop Technicians. See: **https://www.gatsby.org.uk/uploads/education/reports/pdf/he-techn-final-report.pdf**

[16] Science Council et al. (2019) Technicians: Providing frontline and vital support for student mental health and wellbeing. See: **https://www.technicians.org.uk/assets/technician-commitment/pdfs/report-technicians-student-well-being.pdf** (accessed 14 November 2021).

[17] O. Kuzmina, S. Hoyle. 2020. Royal Society of Chemistry. Challenges for Health and Safety in Higher Education and Research Organisations (RSC Publishing) **https://pubs.rsc.org/en/content/ebook/978-1-83916-159-9**

06

Technical Staff within the UK Policy Landscape

> **We want a future where:**
>
> *Inclusion and awareness of technical roles, skills and careers is apparent in policymaking, with connectivity across all policy areas relevant to the UK technical workforce.*

Current landscape

Despite playing a vital role within HE and research, the technical community has historically not been considered within sector policymaking.

A systematic review of government policy documents and publications relating to HE, across all four nations of the UK, demonstrates a paucity of content, information and references to the technical community in universities and RIs.

However, references are present exploring technical education, and in the last five years there has been significant activity regarding reform around technical education and technical skills.

Technical education reform

The 2016 *Report of the Independent Panel on Technical Education*[18] highlighted a national shortage of technicians across all sectors and the challenges this created for raising UK productivity. It recommended significant reforms to ensure individuals can develop the technical knowledge and skills industry needs, through education and training.

The 2019 *Augar Review*[19] of Post-18 Education and Funding addresses the skills gaps at levels four and five – a skills level often referred to as 'technical education'. Levels 4 and 5 include qualifications such as Higher National Certificates (HNCs), Higher National Diplomas (HNDs), National Vocational Qualifications (NVQs) and foundation degrees. The review recommended a substantial increase in capital investment and the creation of a coherent national network of Further Education Colleges (FE Colleges) delivering skills focused on levels three to five.

The 2021 *Skills for Jobs White Paper*[20] proposes reforms to further education, further reinforcing technical pathways to support people in getting the skills required by the economy.

Alongside this increased focus on technical education and pathways, there has been a movement to increase status and opportunity for technical roles in HE and research.

[18] The Independent Panel on Technical Education. (2016) Report of the Independent Panel on Technical Education. See: **https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/536046/Report_of_the_Independent_Panel_on_Technical_Education.pdf** (accessed 14 November 2021).

[19] Post-18 Education and Funding Review Panel. (2019) Independent panel report to the Review of Post-18 Education and Funding. See: **https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/805127/Review_of_post_18_education_and_funding.pdf** (accessed 14 November 2021).

[20] Department for Education. (2021) Skills for Jobs: Lifelong Learning for Opportunity and Growth. See: **https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/957856/Skills_for_jobs_lifelong_learning_for_opportunity_and_growth__web_version_.pdf** (accessed 14 November 2021).

Disconnects in terminology used to describe technicians

The term 'technical workforce' has different meanings across different policy areas. A common understanding of the technical workforce – to ensure connectivity across policy areas – would be helpful.

A consistent challenge is the disconnect between terminology and definitions used to describe the technical workforce in policy work by government, and the work underway in HE and research to advocate and develop technical careers.

In government policy documents, a commonly used definition defines technicians as: "Workers occupying roles that require 'intermediate'– that is, qualification levels three to five skills in science,[21] technology, engineering and/or mathematics. The category encompasses both 'skilled trades', such as laboratory technician and maintenance engineer, and also 'associate professional/ technical' roles."[22]

However, within HE and research, significant numbers of technical staff are educated to qualification levels six, seven and eight, with undergraduate and postgraduate qualifications. In some cases, this level of education may be a necessity – for example, where highly specialised technical experts are advancing methodologies and driving the development of new technologies. In other cases, this could be a result of a lack of level four and five qualified individuals in the recruitment pool, coupled with an increase in the numbers of students accessing a university education. Many recently recruited technicians possess degree qualifications, where perhaps there is not a genuine need for level six qualifications, just a perceived one.

The 2021 *Skills for Jobs White Paper* states: "Our skills system has been very efficient at producing graduates, but has been less able to help people get the quality technical skills that employers want. Only 4% of young people achieve a qualification at higher technical level by the age of 25, compared to 33% who get a degree or above."

Technical skills and careers

In 2017, we saw the introduction of the UK's *Technician Commitment*,[23] a sector initiative funded by the Gatsby Charitable Foundation and hosted by the Science Council to create a culture where technical careers are recognised, respected, supported, developed and aspired to as professional careers in HE and RIs. The Technician Commitment coordinates, drives and evaluates collective action across the sector to ensure visibility, recognition, opportunity and sustainability of technical roles and skills. It aims to influence policy pertaining to technical roles and careers, to advocate for technical skills and careers and be a nationally recognised source of expertise.

Over 100 HE and RI, together with a number of learned societies and professional bodies, have committed to the initiative and are working to advance visibility, recognition, career development and sustainability of technical skills, roles and careers.

This movement has attracted the attention of government. In January 2020, UKRI, the largest funder of research in the UK, was announced as a signatory of the Technician Commitment, setting an expectation that the research organisations it invests in recognise and value their technical workforce and nurture them in reaching their full potential.

July 2020 saw the publication of the *UK Research and Development (R&D) Roadmap*. The roadmap aims to revitalise the UK's whole system of science, research and innovation to release its potential – to unlock and embrace talent, diversity, resilience and adaptability, and to tackle society's biggest challenges. It is inclusive of the technical community and states: "The technical workforce is essential to research and innovation – from contributing new knowledge and developing and maintaining equipment and vital national infrastructures, to training future researchers and innovators. Their role in research and innovation has been undervalued for too long, but this is beginning to change." A key element of the R&D Roadmap is the *People and Culture Strategy*, published in July 2021.[24] The *People and Culture Strategy* has three overarching areas for action: People, Culture and Talent. Its actions and planned activities are inclusive of technical staff.

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[21] Gov.uk webpages. See: **https://www.gov.uk/what-different-qualification-levels-mean/list-of-qualification-levels** (accessed 23 January 2022).

[22] P. A. Lewis (2019). Technicians and innovation: a literature review. See: **https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3405406** (accessed 14 November 2021).

[23] Technician Commitment. See: **http://www.technicians.org.uk/techniciancommitment** (accessed 14 November 2021).

[24] BEIS. (2021) R&D People and Culture Strategy People at the heart of R&D. See: **https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1004685/r_d-people-culture-strategy.pdf** (accessed 23 January 2022).

Timeline

| 2016 | 2017 | 2019 | 2020 | 2021 |

Technician Commitment launched (initiative to advance visibility, recognition, career development and sustainability in HE and research.

The government's UK Research and Development Roadmap launched, setting out the UK's vision and ambition for science, research and innovation.

Post-16 skills plan and independent report on technical education (Sainsbury Review).

The government's technical education reforms, based on the work of Lord Sainsbury's independent panel.

Post-18 review of education and funding: independent panel report (Augar Review).

Skills for jobs: lifelong learning for opportunity and growth.

Sets out reforms to post-16 technical education and training to support people to develop the skills needed to get good jobs and improve national productivity.

The government launched its R&D People and Culture Strategy, a vision and call to action to ensure people are recognised as being at the core of R&D
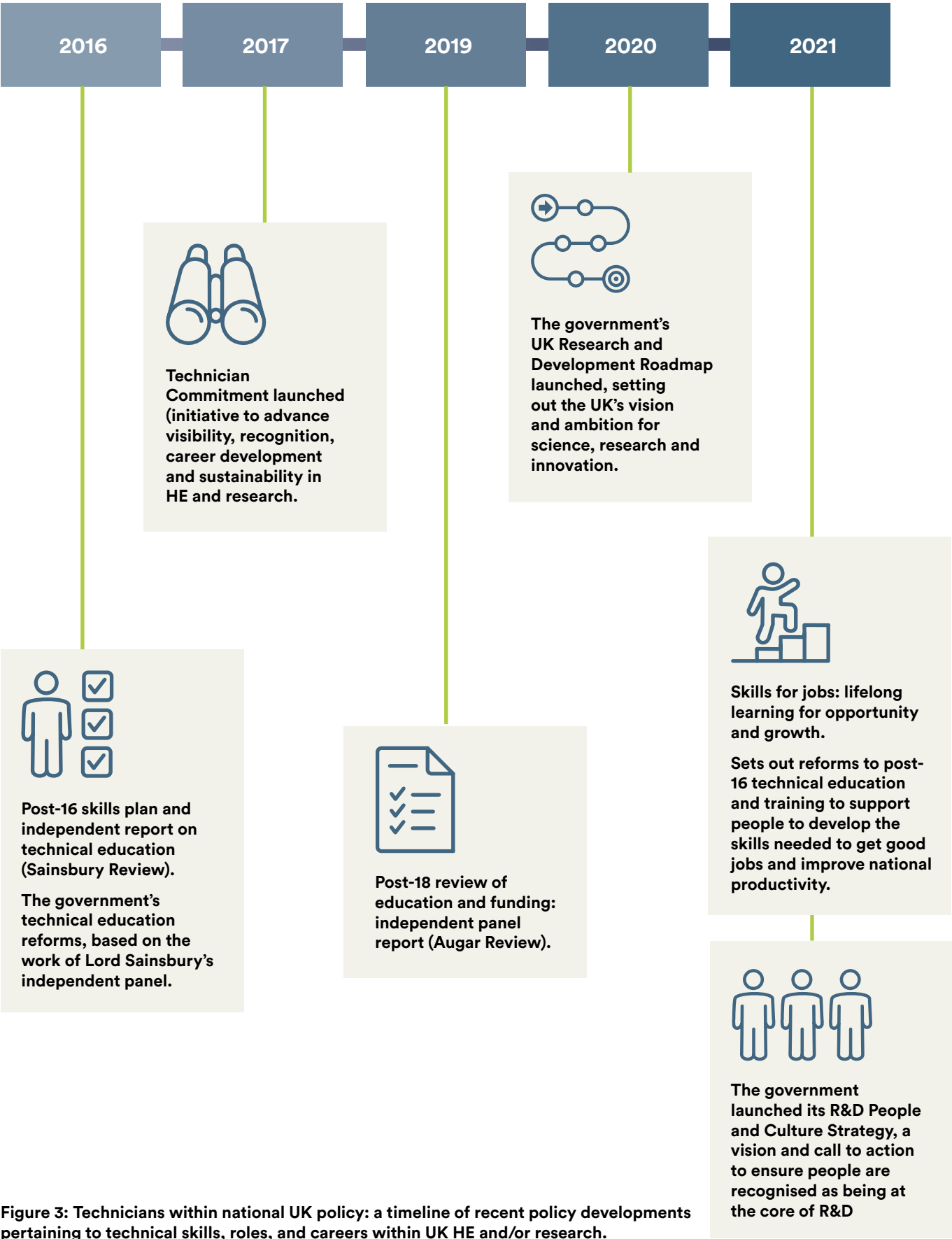
Figure 3: Technicians within national UK policy: a timeline of recent policy developments pertaining to technical skills, roles, and careers within UK HE and/or research.

In summer 2020, in parallel to the publication of the UK R&D Roadmap, Dame Ottoline Leyser was appointed as UKRI's chief executive. She set out a new vision for UKRI, with an emphasis on recognising and valuing all roles within research and innovation, including technicians. A campaign,[25] launched in 2021, sought to profile 101 roles that enable and facilitate research, including technical staff, and UKRI published their Technician Commitment Action Plan in February 2021.[26]

> *Technicians are crucial members of the research and innovation community. Beyond their diverse technical expertise, they inspire, teach and develop others. They have played vital roles on the frontline of the research and innovation community's extraordinary response to the pandemic and they will be equally central in our efforts to build back better, fuelling an inclusive knowledge economy. Our Technician Commitment Action Plan sets out how we will recognise, celebrate and value the many contributions made by technicians to the research and innovation endeavour. This is essential to realise our vision of a research and innovation system in which everyone can thrive.*
>
> Professor Dame Ottoline Leyser DBE FRS, UKRI Chief Executive (February 2021)

The launch of the R&D roadmap, and the new vision for the UK's largest funding body, represent a shift in how technical staff working in HE and research are represented in government policy pertaining to research and development.

Technicians, while vital to HE and research, have until now experienced a lack of visibility in policy discussions and documents. This was reflected in the TALENT Commission's national survey of technical staff, held in early 2021. The technical community overwhelmingly reported feeling undervalued by policymakers and influencers. This is perhaps because there had been no initiative or cause advocating for their importance and inclusion. The creation and subsequent momentum of the Technician Commitment, along with a shift in emphasis across the sector to improve research culture and align it to policy developments supporting equity and inclusion, have begun to change the landscape for the technical community.[27, 28]

There are signs of movement to increase the visibility and representation of technical staff in government policy making. For example, technicians were invited to consultative roundtables on the government's People and Culture strand of the R&D roadmap and are represented on the Challenge Panel of the review of research bureaucracy, launched in March 2021.[29, 30] The Technician Commitment has begun to develop a policy angle, working with policymakers in learned societies and publishing sector reports on 'hot topics', including the role of technicians in supporting student mental health and wellbeing,[31] an in-depth investigation of equality, diversity and inclusion in the technical community within HE and research,[32] and the impact of COVID-19 on the technicians in universities and RIs.[33]

Additional activity by the Technician Commitment on post-Brexit immigration reforms, to support the recruitment of technical staff from the EU and beyond, in collaboration with a number of stakeholders,[34, 35] supported lowering the salary threshold for a skilled worker visa and the inclusion of the role of laboratory technician on the shortage occupation list (SOL).[36]

The policy work developing through the Technician Commitment is encouraging, but the initiative itself is currently time-limited due to being funded by a charitable foundation. Our recommendation is that this work is further supported through the creation of a new collaborative entity, provisionally to be called the UK Institute for Technical Skills & Strategy [working title] that builds on the multi-stakeholder approach of the Technician Commitment, to represent and provide a conduit to the technical community, advising government, sector initiatives, funding bodies and other organisations.

Conclusions

Consideration of technical staff by policymakers in HE and research has formerly been absent. Collaborations advocating the technical profession, alongside recent moves from government to recognise and be inclusive of all roles within HE and research, has prompted a step change in how technicians are consulted and represented in policy discussions and documents, but further progress is needed. Reforms in technical education are positive and welcome, but to realise their full potential and applicability in HE and research, they need to become viable entry routes that feed into HE and research technical career pathways. At present, there is a disconnect between technical recruitment requirements in universities, RIs and technical education routes. For future success these need to be better aligned.

Our recommendations

R14 **Government policymakers should ensure the inclusion of technical staff in consultations on sector-level policy, for example through invitations to roundtables and consultations.** This could be through inclusion on discussion panels or by reference in external conversations and consultative responses. Sector stakeholders should work with the wider Technician Commitment network of 100+ organisations (and/or the new entity proposed in R16) to provide a unified voice to government on key policy areas impacting technical skills, roles and careers. Professional bodies and learned societies should ensure policy discussions and consultative responses reflect the entirety of roles within their membership.

R16 **The TALENT Commission advises the creation of a new collaborative entity, provisionally to be called the UK Institute for Technical Skills & Strategy [working title] that builds on the multi-stakeholder approach of the Technician Commitment, to represent and provide a conduit to the technical community, advising government, sector initiatives, funding bodies and other organisations.** We advise that the new entity works closely with the professional bodies and membership organisations to which technical staff belong to ensure connectivity, voice and visibility for the technical community.

[25] UKRI. (2021) 101 jobs that change the world. See: **https://www.ukri.org/our-work/101-jobs-that-change-the-world/** (accessed 14 November 2021).

[26] UKRI. (2021) Technician Commitment UKRI Action Plan. See: **https://www.ukri.org/wp-content/uploads/2021/02/UKRI-040221-TechnicianCommitmentActionPlan.pdf** (accessed 23 January 2022).

[27] Royal Society. (2020) Research culture. See: **https://royalsociety.org/topics-policy/projects/research-culture/** (accessed 14 November 2021).

[28] Wellcome webpages. See: **https://wellcome.org/what-we-do/our-work/research-culture?gclid=EAIaIQobChMI_sLQh6eK8QIVjN_tCh0K_A-jEAAYASAAEgIIivD_BwE** (accessed 23 January 2022).

[29] BEIS. (2021) R&D People and Culture Strategy People at the heart of R&D. See: **https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1004685/r_d-people-culture-strategy.pdf** (accessed 23 January 2022).

[30] Gov.uk (2021) Independent Review of Research Bureaucracy Interim Report. See: **https://www.gov.uk/government/publications/review-of-research-bureaucracy** (accessed 23 January 2022).

[31] Science Council et al. (2019) Technicians: Providing frontline and vital support for student mental health and wellbeing. See: **https://www.technicians.org.uk/assets/technician-commitment/pdfs/report-technicians-student-well-being.pdf** (accessed 14 November 2021).

[32] Technician Commitment et al. (2020) The Impact on Technicians in UK Higher Education & Research See: **https://sciencecouncil.org/web/wp-content/uploads/2020/08/2020-COVID19-Technician-Report.pdf** (accessed 14 November 2021).

[33] Technician Commitment et al. (2020) I. See: **https://sciencecouncil.org/web/wp-content/uploads/2020/08/2020-COVID19-Technician-Report.pdf** (accessed 14 November 2021). See: **https://sciencecouncil.org/web/wp-content/uploads/2020/08/2020-COVID19-Technician-Report.pdf** (accessed 14 November 2021).

[34] Russell Group,(2017). See: **https://russellgroup.ac.uk/news/international-technicians/** (accessed 14 November 2021);

[35] Royal Society. (2019) £30,000 salary threshold would be detrimental for research and innovation We need an immigration system that welcomes skilled people from overseas. See: **https://royalsociety.org/-/media/policy/Publications/2019/28-05-19-30k-salary-immigration-threshold-explainer.pdf** (accessed 14 November 2021).

[36] GW4 webpages (2020) See: **https://gw4.ac.uk/gw4ward/** (accessed 14 November 2021).

07

Characteristics and Trends of the Technical Workforce

We want a future where:

Robust reporting of demographic data for technical staff by their employers facilitates a sector-wide understanding of the scale and characteristics of the UK technical workforce and any developing trends.

The UK technical community is diverse and inclusive at all levels, across all roles and disciplines. Opportunities are available for people from all backgrounds to realise their potential.

This section provides a detailed overview of the demographics, characteristics and trends of the UK technical workforce.

Current landscape

Pre-existing datasets covering the national technical workforce are extremely limited. Until recently, all publicly funded HE providers in the UK were required to supply detailed annual records about all of their students and staff, including technicians and technical staff, to the Higher Education Statistics Agency (HESA). While the identification of technical employees within these records was not straightforward, in part because many HE providers categorise their technicians in different ways and to different degrees of completeness, this still represented the most complete dataset for any UK technical workforce, reporting on characteristics such as age, gender, ethnicity, nationality, contract type, working pattern, salary and more.

However, a recent change in HESA staff record requirements[37] states that submitting data for non-academic staff is now *optional for any English and Northern Irish HE Provider*. Of the 197 providers reporting staff data to HESA in 2019/20, only 128 returned data about all of their non-academic staff: 27 of these were within Wales and Scotland, where collection remains mandatory. I.e. 41% of eligible English and Northern Ireland HE providers opted out of submitting HESA staff records for technical staff in 2019/20. Subsequently, we identified an 11% single-year drop in reported technical staff population – full-time equivalents (FTE) – as a direct result of this change in reporting requirement, rather than a change in actual workforce number. For example, two large Russell Group universities which opted out each reported over 500 technical staff (FTE) in 2018/19, but less than 20 in 2019/20.

Until mandatory submission of technical staff records is reinstated, HESA records for 2019/20 onwards should be used with caution. For this reason, when using HESA records to explore HE workforces in this section, the 2018/19 academic year will be used for any 'snapshot' discussion, and the 2012/13-2018/19 academic years will be used to explore trends over time.

This exploration builds on previous work around equality, diversity and inclusion within technical workforces in science, technology, engineering, mathematics and medicine disciplines (STEMM), delivered in 2020 as part of the STEMM-CHANGE project.[38]

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[37] (implemented from 2019/20 onwards)

[38] University of Nottingham (2019) Equality, Diversity and Inclusion (EDI): A Technician Lens **https://www.stemm-change.co.uk/wp-content/uploads/2019/11/Equality-Diversity-and-Inclusion-A-Technician-Lens-web.pdf** (accessed 23 January 2022).

The technical community within UK higher education

Total number and region

Using HESA staff records, we calculated the 2018/19 HE technical workforce to comprise of 22,925 full-time equivalents (FTE: the equivalent of a standard full-time, full-year employment contract), which was made up of 35,410 individual contracts and part-contracts held by part- and full-time staff who worked as technicians for at least part of that academic year.[39] While this represents a marginal increase during our period of investigation, up from 22,490 FTE in 2012/13, it is worth noting that in a 2013 paper, Lewis[40] identified strong declines in the HE technical workforce (in both real terms and as a ratio of technical:academic staff) throughout 2003-2010, and across several disciplines, including engineering, physics and chemistry.

Figure 4 shows the total number of technical staff reported to be working in UK HE providers by their Standard Occupation Classification (SOC) code, which are used to classify workers by their general occupation area. The majority are placed within SOC311 – Science, Engineering and Production Technicians – although this may be in part because that is the default code given to any staff reported as 'technician' unless additional information is supplied. There is also a significant number placed within SOC313 – Information Technology Technicians – which includes both IT operations technicians and IT user support technicians. The proportion of technicians within each of these areas are broadly consistent throughout 2012/13 to 2018/19, with only Animal Care and Control Services showing consistent change during this period (a 49% increase, from 605 in 2012/13).

12,575
Science, Engineering and Production Technicians (SOC311)

7080
Information Technology Technicians (SOC313)

900
Animal Care and Control Services (SOC613)

660
Health Associate Professionals (SOC321)

495
Design Occupations (SOC342)

410
Metal Machining, Fitting and Instrument Making Trades (SOC522)

300
Other Skilled Trades (SOC544)

220
Printing Trades (SOC542)

145
Draughtspersons and Related Architectural Technicians (SOC312)

110
Conservation and Environmental Associate Professionals (SOC355)

15
Metal Forming, Welding and Related Trades (SOC521)

10
Textiles and Garments Trades (SOC541)

Total workforce:
22,925 FTE

Figure 4: Technical workforce numbers within UK HE providers, by Standard Occupation Classification (SOC) code (2018/19).
Source: HESA Staff Records 2018/19. Numbers provided are full-time equivalents (FTE).

[39] Further details of how these staff were identified are provided in Appendix A

[40] P. A. Lewis and H. Gospel. (2011) Technicians under the Microscope: A Study of the Skills and Training of University Laboratory and Engineering Workshop Technicians. See: **https://www.gatsby.org.uk/uploads/education/reports/pdf/he-techn-final-report.pdf**

Total workforce:
22,925 FTE

Region —— Name of region

X% —— Proportion of UK's total HE technical population

(X) —— Actual number of technicians (FTE)

1 per X —— Ratio of technical staff to academic staff

Scotland
15%
(3475)
1 per 14.2

North East England
4%
(885)
1 per 19.5

Northern Ireland
2%
(440)
1 per 16.1

Yorkshire and the Humber
9%
(2100)
1 per 17.0

North West England
12%
(2745)
1 per 15.3

East Midlands
8%
(1765)
1 per 17.0

West Midlands
7%
(1490)
1 per 23.7

East of England
6%
(1310)
1 per 21.5

Wales
4%
(940)
1 per 22.2

London
17%
(3840)
1 per 21.3

South West England
6%
(1285)
1 per 23.5

South East England
11%
(2585)
1 per 24.1

Figure 5: Regional distribution of UK HE technical staff, by number, percentage of the UK total, and as a ratio of technical to academic staff within each region (2018/19).
Source: HESA Staff Records 2018/19.

Figure 5 shows where these technical staff are located, and identifies London as having the highest density of staff in the UK. London is also the area with the highest total *number* of staff (17%), with Scotland the next most populous region (15%). This regional distribution was consistent throughout the seven-year investigative period. The regional distribution of technicians is broadly consistent with regional distribution of academic staff at those same HE providers: for example, London is also the UK region with the highest number of academic staff, and Northern Ireland the region with the least. However, when comparing ratios of technical staff to academic staff, London and South East England perform less well (1 technician per 21.3 academic staff, and per 24.1, respectively), with Scotland showcasing the highest technician : academic ratio (1 technician per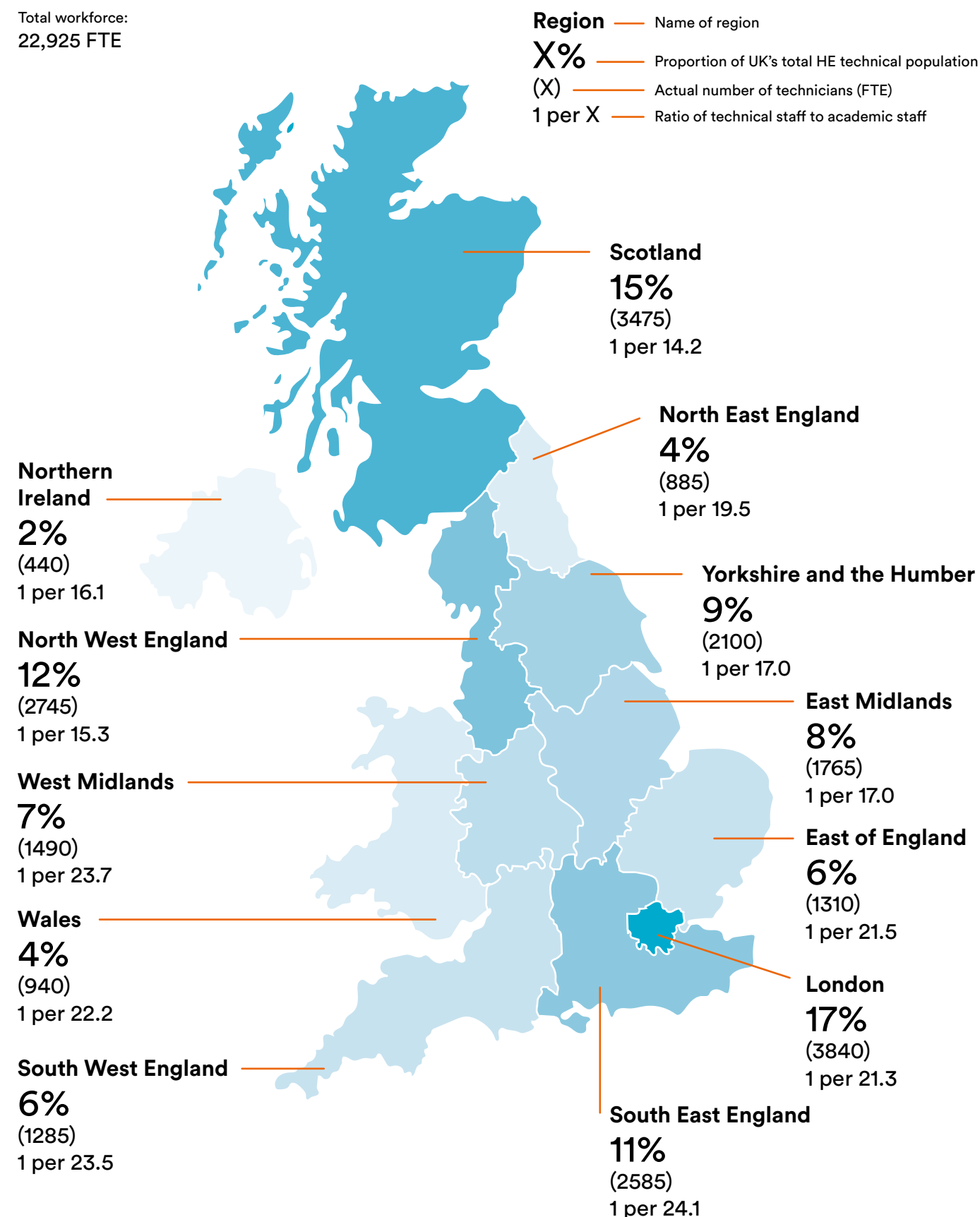 14.2 academic staff), followed by North West England, Northern Ireland, Yorkshire and the Humber and East Midlands (all at least 1 technician per 17 academic staff).

However, the decision to allow institutions to opt out of data submission for non-academic staff seems to have impacted certain regions more heavily than others: *reported* numbers for the East Midlands fell by nearly 50% from 2018/19 to 2019/20, and the West Midlands and Yorkshire and the Humber were also impacted more strongly than other regions. Ultimately, this change in reporting may have implications on measuring and assessing impacts of any future 'levelling-up' strategies within the UK.

Figures 4 and 5 both include staff reported as IT technicians (SOC313): despite making up a significant minority, this group has typically been omitted from previous reviews of technical staff. It is also worth noting that our own survey, open to all UK technical staff, generated very few responses from IT technicians or IT specialists, despite efforts made to engage them, and stakeholder interviews suggest that IT technicians often do not consider themselves as part of the general HE technical community. Further, when using HESA staff records to explore characteristics of this group compared to 'non-IT' technicians, there were some key differences identified around core characteristics, including age, sex and ethnicity. Accordingly, the following detailed exploration of HE technical staff (see Figures 6 and 7) excludes all reported IT technicians, followed by a direct comparison between IT and non-IT technicians (see Figures 8 and 9).
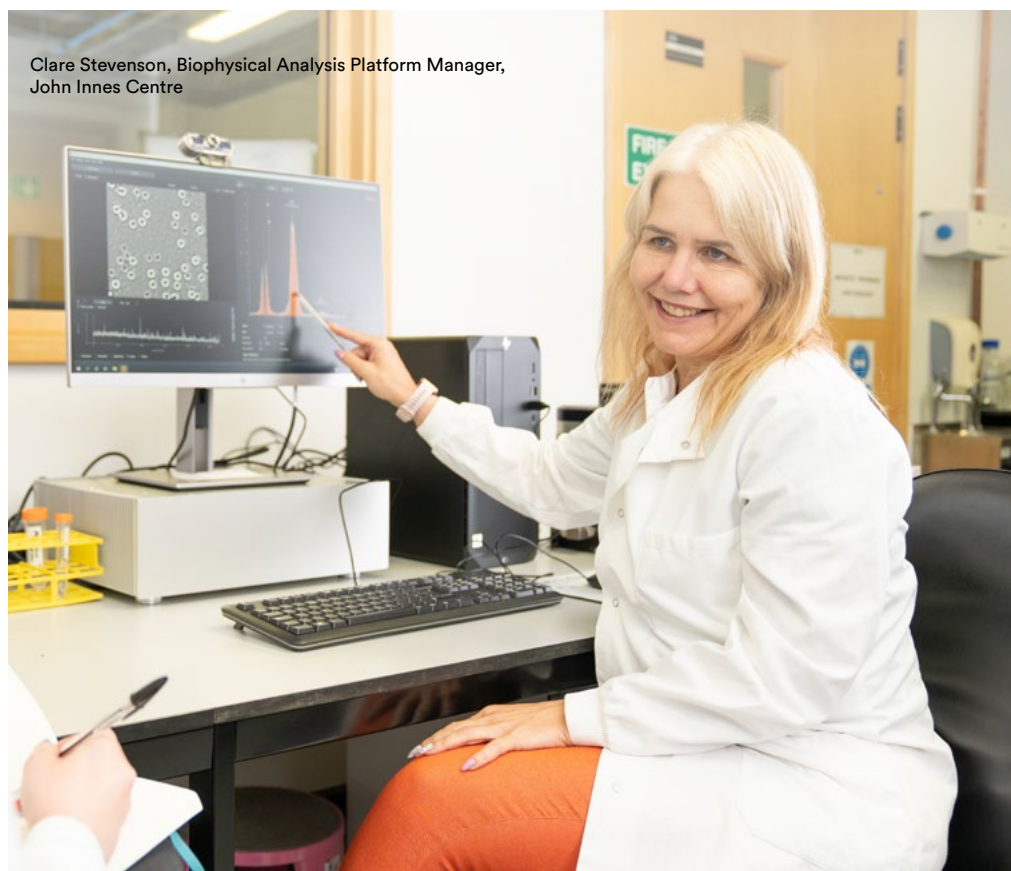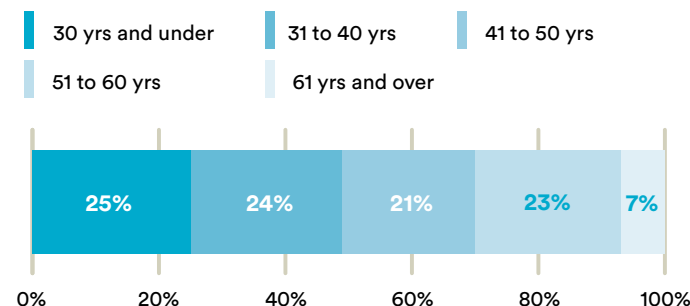

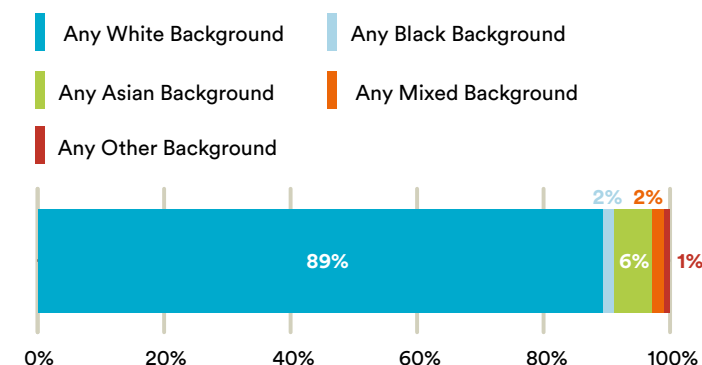Clare Stevenson, Biophysical Analysis Platform Manager, John Innes Centre

Conor Howell-Bennett, Senior Technician, University of Nottingham

6a. Technical workforce by Age

Legend:
- 30 yrs and under
- 31 to 40 yrs
- 41 to 50 yrs
- 51 to 60 yrs
- 61 yrs and over

Bar: 25% | 24% | 21% | 23% | 7%

(x-axis: 0% 20% 40% 60% 80% 100%)

6b. Technical workforce by Ethnicity

Legend:
- Any White Background
- Any Black Background
- Any Asian Background
- Any Mixed Background
- Any Other Background

Bar: 89% | 6% | 2% | 2% | 1%

(x-axis: 0% 20% 40% 60% 80% 100%)

6c. Technical workforce by Sex

Legend:
- Female
- Male

Bar: 40% | 60%

(x-axis: 0% 20% 40% 60% 80% 100%)
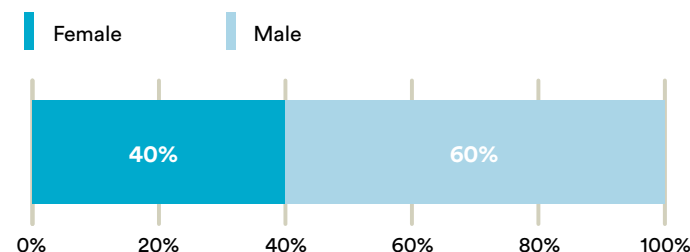
6d. Technical workforce by Nationality

Legend:
- Non-EU Countries
- EU Countries (non-UK)
- United Kingdom

Bar: 4% | 8% | 88%

(x-axis: 0% 20% 40% 60% 80% 100%)
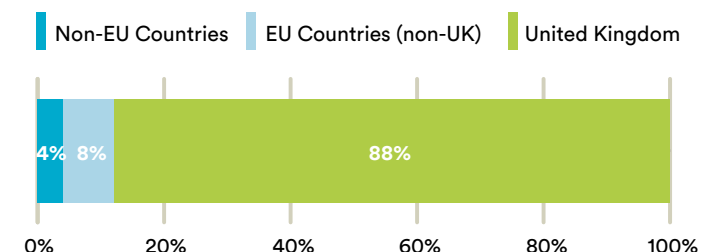
6e. Technical workforce by Age and Sex

Legend:
- Female
- Male
- Other

Number of technical staff (FTE)

Age (yrs)	Total	Female %
0 to 25	1910	49%
26 to 30	2029	50%
31 to 35	1910	49%
36 to 40	1860	45%
41 to 45	1610	39%
46 to 50	1730	37%
51 to 55	1885	33%
56 to 60	1815	28%
61 to 65	860	25%
66 and over	170	21%
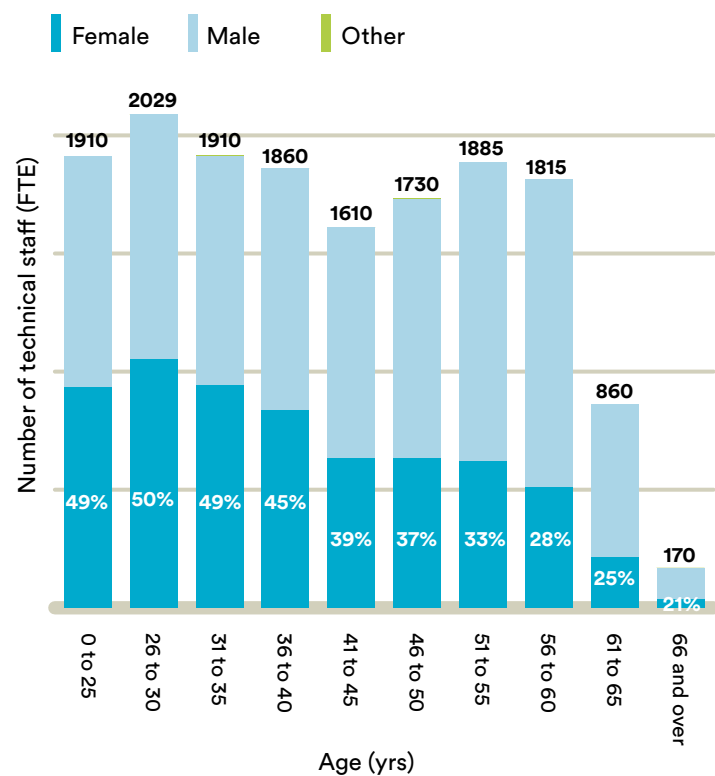
6f. Technical workforce by Salary

Proportion of technical workforce (%)

Annual salary pro rata (£)	%
Less than 15,000	0%
15,001 to 20,000	10%
20,001 to 25,000	20%
25,001 to 30,000	26%
30,001 to 35,000	23%
35,001 to 40,000	12%
40,001 to 45,000	4%
45,001 to 50,000	3%
More than 50,000	2%
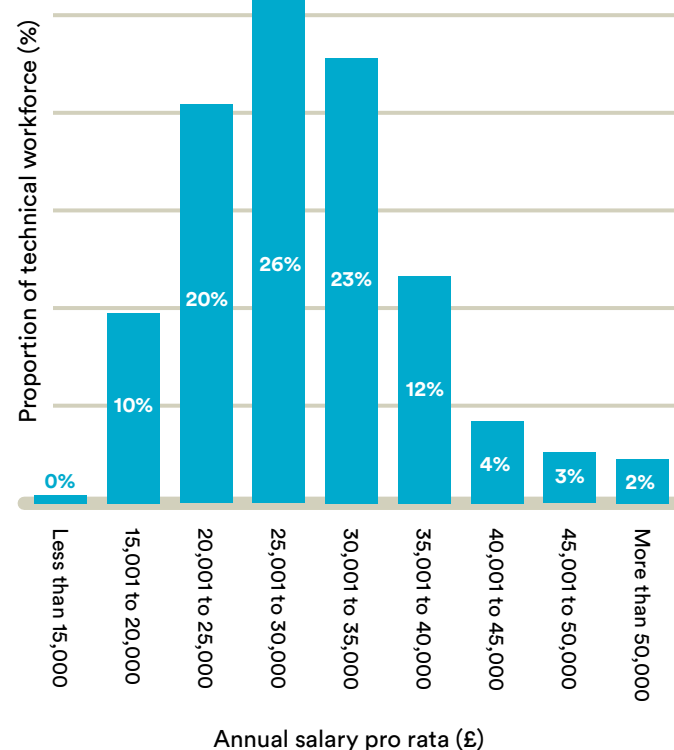
6g. Technical workforce by Employment Type

Full-time
36% of those that work full-time are female

87% work full-time
13% work part-time

Part-time
68% of those that work part-time are female
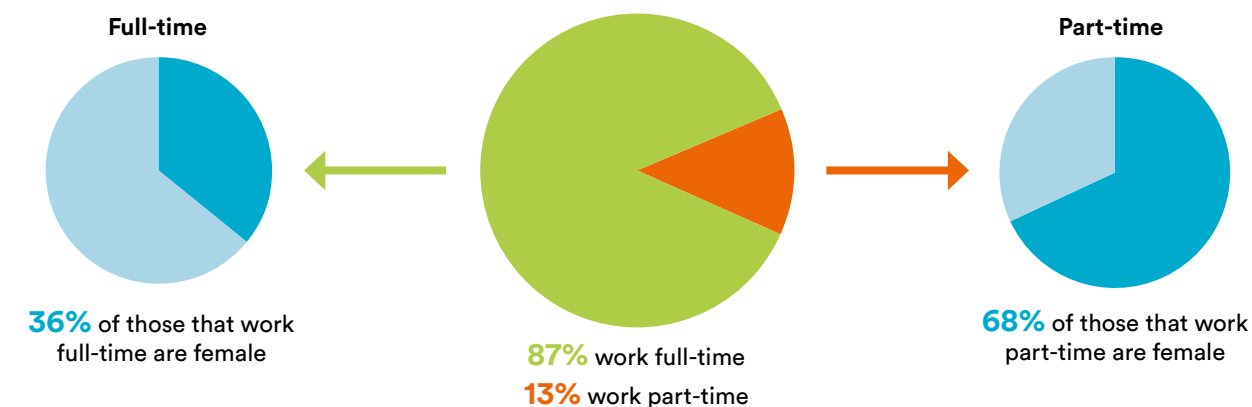
6h. Technical workforce by Contract Type

Open-ended/Permanent
38% of those who have a permanent contract are female

81% have a permanent contract
19% have a fixed-term contract

Fixed-term
53% of those who have a fixed-term contract are female
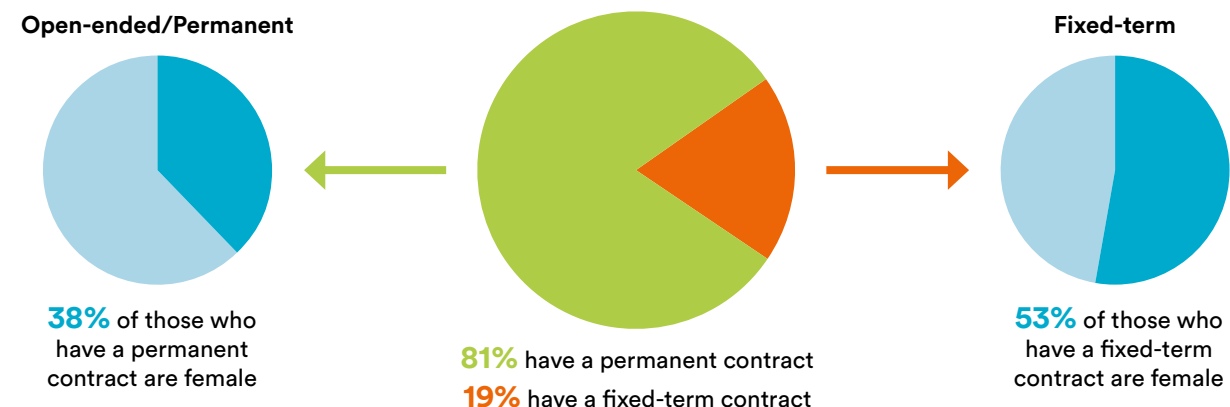
43%
of those aged over 50 years old have worked at the same employer for 20 years or more

31%
of senior technical staff are female, compared to 43% for more junior technical staff

11%
of the total higher education technical workforce hold a PhD

6%
are reported to have a known disability

Figure 6(a-h): Overview of key characteristics of the UK HE technical population (2018/19).
Source: HESA Staff Records 2018/19. Non-IT Technicians only.

Age

In 2018/19, almost one third of the technical workforce were aged over 50 years (30%), with almost a fifth aged over 55 years (18%) and likely to retire within 10-15 years. While there are comparably high numbers of technical staff under the age of 30, there appears to be some degree of a 'missing middle' between younger technicians and those nearing retirement. This supports concerns raised from within the technical community, and suggests a potential issue around succession planning for technical workforces. As can be determined using Figure 8, the pattern of aging workforces seem particularly pronounced for physics and engineering disciplines, with biosciences, veterinary sciences and medicine-related disciplines having comparatively much younger workforce populations.

The overall age profile has remained relatively stable between 2012/13 and 2018/19, with a slight year-to-year increase in the number of technicians aged 25 years and under (from 9 to 12% of the total workforce), and a slight increase in the proportion aged over 65 years (up to 1% of the total workforce) likely caused by an extended retirement age limit.

Sex

The majority of the workforce are male (60%), particularly in technicians over 40 years (see Figure 6) and for certain discipline areas (see Figure 8). Since 2012/13, the number of female technical staff have been increasing, with the largest increases found in those aged 61 to 65 years (7%) and 31 to 40 years (4%).

The difference in ratio of male and female staff has reduced slightly (by 3%) since 2012/13, but is still less favourable than the equivalent HESA data for academic staff in the same HE providers (54% male to 46% female ratio in 2018/19).[41]

HESA categorises legal sex rather than gender, and the 'other' option accounted for less than 1% of the total technical population for all a vailable years (reported 2017/18 onwards).

Ethnicity

As shown in Figure 6, the HE technical workforce is predominantly white and/or from any white ethnic background (in 2018/19, 89% were white, 2% black, 6% Asian and 3% mixed/other); this balance has changed very little since 2012/13. When compared with equivalent academic staff the technical workforce is less diverse, but both are less diverse than the UK's student population (in 2018/19, of those known: academic staff were 83% white, 2% black, 10% Asian, 4% mixed/other;[41] UK-domiciled students were 76% white, 7% black, 11% Asian, 6% mixed/other).[42] To compare to the national picture beyond HE, 2011 Census data give us a an ethnicity profile of working age population (16 to 64 years) within England and Wales that is somewhere between the 2018/19 HE technical and HE academic workforces (86% white, 3% black, 8% Asian, 3% mixed/other).[43]

The ethnicity profile for HE technical staff is not consistent across all UK regions, though the differences appear to broadly match ethnicity differences for the general population: for example, London has by far the most ethnically diverse technical population (in 2018/19, 71% were of any white background; 8% any black background; 15% any Asian background; 6% any mixed/other background), as well as the most diverse general population in comparison to the rest of the UK. The high degree of ethnic diversity in London somewhat skews the ethnicity profile for the overall HE technical workforce, because London is also the most heavily populated with the highest number of HE technical staff. The second most ethnically diverse region for HE technical staff is the West Midlands (in 2018/19, 81% were white; 3% black; 12% Asian; 3% mixed/other), followed by the East Midlands. The regions that are the least ethnically diverse were NI (97% were white/any-white background), Scotland, North East England, Wales (all 95%), and South West England (94%).

Nationality

The vast majority of the workforce are UK nationals (88% UK, 8% EU, 4% non-EU in 2018/19), and to a greater extent than found among the equivalent academic workforce (68% UK, 18% EU, 14% non-EU). Very little change was found over the seven-year investigative period.

Contract type

The majority of technicians work full-time (87% in 2018/19) and hold open-ended/permanent contracts (81%). This is true throughout the seven-year investigative period, though there has been a slight year-on-year rise in the number of fixed-term contracts (up 3% since 2012/13) and part-time working (up 2% since 2012/13).

In comparison, academic staff at the same HE providers were significantly more likely to work part-time (34%) and hold fixed-term contracts (34%). Technical staff working on a part-time basis or holding a fixed-term contract are more likely to be female, whereas technical staff working on a full-time basis or on a permanent contract are more likely to be male. This is also true for academic staff in the same HE providers, but the difference is more pronounced in the technical workforce.

Fewer than 1% of technical staff are reported to hold a zero-hours contract.

Length of employment

Nearly a quarter of technicians over 50 have been with the same employer for 30 years or more (24%), though this has slightly decreased (from 26% in 2012/13). Since 2012/13, the number of technical staff employed for more than 10 years has been steadily decreasing. This perhaps suggests technicians are becoming more willing to move into different roles and/or change employers, or that employers are not providing enough career opportunities to retain their existing technical talent.

Highest qualification held

HESA collects data on the highest qualification held by each HE provider's employees. However, this is listed as 'unknown/not applicable' for a significant number of technicians (23% in 2018/19).

The majority hold a qualification at either undergraduate, higher degree or doctorate level (65% in 2018/19, including 11% holding PhDs). This majority has increased since 2012/13 (from 59% in 2012/13, including 8% holding PhDs). A more detailed discussion around qualifications held at point of entry into technical careers is provided in Section 9.

Salary

Since 2015/16, the most common annual salary for all technical staff has been £25,000 to £30,000. Since 2012/13, for all technical staff 30 years and younger, the most common annual salary has been £20,000 to £25,000. For those aged over 50 years, the most common annual salary is £30,000 to £35,000.

Role seniority

In 2018/19, a fifth of technical staff (21%) could be described as holding a senior role, using reported contract level of K0 – listed as senior professional and/or technical staff, and/or equivalent to a lecturer, research fellow, senior research assistant or teaching fellow – or above as a marker of seniority.

Less than a third of senior technical staff are female (31%), which is less than the equivalent proportion for junior technical staff (43%). This pattern was similar throughout the investigated time period, although both senior and junior technical roles have become marginally less male-dominated since 2012/13 (by 2% and 4% respectively). In contrast to the differences seen by sex, ethnic diversity was almost identical for both senior and junior technical role holders.

Intersectionality

While this breakdown gives a good overview of the major characteristics of the technical workforce, there will be intersectionality across many of these characteristics. For example, younger age groups include a higher proportion of females and are generally more ethnically diverse. Technical staff from any white and/or black background have a greater male to female ratio imbalance than technical staff from any other ethnic background. Older technicians are more likely to hold more senior roles and are more likely to have higher salaries than younger technical staff, who are more likely to hold fixed-term contracts and have higher academic degree qualifications.

Discipline differences

There are noticeable differences found across all of these characteristics when considering technical communities within different discipline areas. HESA's academic cost centres attribute the source/s of funding for any particular contracted role. While it is an imperfect way of exploring a technician's duties, it remains the best means to compare technical staff across different discipline areas.

[41] HESA webpages. HESA staff record for academic staff for 2018/19 academic year. See: **https://www.hesa.ac.uk/news/23-01-2020/sb256-higher-education-staff-statistics** (accessed 25 January 2022).

[42] HESA webpages. Higher Education Student Statistics: UK, 2018/19 - Student numbers and characteristics. See: **https://www.hesa.ac.uk/news/16-01-2020/sb255-higher-education-student-statistics** (accessed 25 January 2022).

[43] Gov.uk webpages (2018). See: **https://www.ethnicity-facts-figures.service.gov.uk/uk-population-by-ethnicity/demographics/working-age-population/latest** (accessed 23 January 2022).

Figure 7: UK HE technical workforce numbers reported within different departments and/or discipline areas (2018/19).

Source: HESA Staff Records 2018/19. Non-IT Technicians only; financial cost centres used as proxy for department and/or discipline area.

Pie chart values:

- 3650 — Medicine, Dentistry, and Allied Subjects
- 2545 — Biosciences
- 2295 — Engineering
- 1930 — Other Central Cost Centres (inc. Central admin, Premises, Staff & Student Facilities, Residences & catering)
- 1355 — Total Academic Services
- 980 — Veterinary, Agriculture & Forestry Science
- 655 — Chemistry
- 620 — Physics and Mathematics
- 595 — Geography, Earth, Marine, & Environmental Sciences
- 595 — Design, Creative & Performing Arts
- 375 — Education, Architecture, Administrative & Business Studies
- 245 — Humanities, Languages, and Social Studies

Marie Slater, Technical Team Leader, Manchester Metropolitan University

Engineering (2295 FTE)

Female	12%
Female (of senior roles)	9%
Aged over 50yrs	43%
Any white background	91%
UK Nationality	92%
Part-time	8%
Fixed-term	14%
With Doctorate	6%
Salary >£30000 p.a.	54%
Senior roles (K0+)	27%

Chemistry (655 FTE)

Female	34%
Female (of senior roles)	27%
Aged over 50yrs	35%
Any white background	90%
UK Nationality	89%
Part-time	10%
Fixed-term	12%
With Doctorate	19%
Salary >£30000 p.a.	50%
Senior roles (K0+)	25%

Physics and Mathematics (620 FTE)

Female	12%
Female (of senior roles)	6%
Aged over 50yrs	43%
Any white background	90%
UK Nationality	90%
Part-time	7%
Fixed-term	17%
With Doctorate	12%
Salary >£30000 p.a.	70%
Senior roles (K0+)	37%

Biosciences (2545 FTE)

Female	56%
Female (of senior roles)	48%
Aged over 50yrs	27%
Any white background	88%
UK Nationality	84%
Part-time	15%
Fixed-term	24%
With Doctorate	17%
Salary >£30000 p.a.	39%
Senior roles (K0+)	18%

Medicine, Dentistry, and Allied Subjects (3650 FTE)

Female	58%
Female (of senior roles)	55%
Aged over 50yrs	24%
Any white background	84%
UK Nationality	83%
Part-time	14%
Fixed-term	30%
With Doctorate	12%
Salary >£30000 p.a.	43%
Senior roles (K0+)	18%

Veterinary, Agriculture & Forestry Science (980 FTE)

Female	75%
Female (of senior roles)	61%
Aged over 50yrs	18%
Any white background	96%
UK Nationality	91%
Part-time	18%
Fixed-term	15%
With Doctorate	9%
Salary >£30000 p.a.	21%
Senior roles (K0+)	9%

Design, Creative & Performing Arts (595 FTE)

Female	36%
Female (of senior roles)	34%
Aged over 50yrs	26%
Any white background	93%
UK Nationality	91%
Part-time	28%
Fixed-term	9%
With Doctorate	3%
Salary >£30000 p.a.	46%
Senior roles (K0+)	24%

Total Academic Services (1355 FTE)

Female	38%
Female (of senior roles)	31%
Aged over 50yrs	23%
Any white background	91%
UK Nationality	91%
Part-time	11%
Fixed-term	14%
With Doctorate	7%
Salary >£30000 p.a.	35%
Senior roles (K0+)	16%

IT Technicians - SOC313 (7075 FTE)

Female	25%
Female (of senior roles)	23%
Aged over 50yrs	22%
Any white background	83%
UK Nationality	91%
Part-time	9%
Fixed-term	11%
With Doctorate	4%
Salary >£30000 p.a.	61%
Senior roles (K0+)	36%

Figure 8: Key characteristics of UK HE technical workforces, by discipline area (2018/19).

Source: HESA Staff Records 2018/19. IT Technicians identified via SOC code 313; all other groupings identified via financial cost centres.

Figure 8 provides an overview of characteristics of technical staff from eight of the cost centre groups highlighted in Figure 7, plus the same for all IT Technicians (identified via SOC313, irrespective of cost centre). One clear observable difference between discipline areas is the of proportion of female technical staff. While the majority of disciplines are male-dominated – particularly engineering, physics and mathematics – biosciences and medicine-related subjects are both slightly female-dominated, and veterinary science strikingly so. Even for these female-dominated disciplines, however, female technicians were significantly underrepresented within more senior technical roles: in veterinary science, for example, senior technical roles were 61% female, compared to 77% of junior roles.

Some disciplines appear to have particularly high numbers of staff over 50 years old, such as engineering, physics and mathematics, while veterinary science have the youngest technical population. Similarly, veterinary science has the lowest proportion of staff earning more than £30,000 per annum, with physics, mathematics and engineering the highest.

Veterinary science also had the least ethnically diverse technical population, while medicine-related disciplines and IT technicians had the most diverse. Medicine-related disciplines and biosciences also had the highest proportion of non-UK nationals.

Biosciences and medicine-related disciplines have the highest proportion of technical staff on fixed-term contracts, though the creative arts have by far the highest proportion working part-time (followed by veterinary sciences). Chemistry and biosciences have the highest number holding doctorates/PhDs, with creative arts and IT technicians having the lowest.

IT technicians, when compared to all non-IT technicians, are more male-dominated (75% compared to 60%), younger and more highly paid, while also being comparatively more ethnically diverse. IT technicians are also more likely to work full-time and hold open-ended contracts than non-IT technicians. Figure 9 compares the age profile of the IT and non-IT technical workforces, only the latter of which appears to showcase traits of a 'missing middle'.
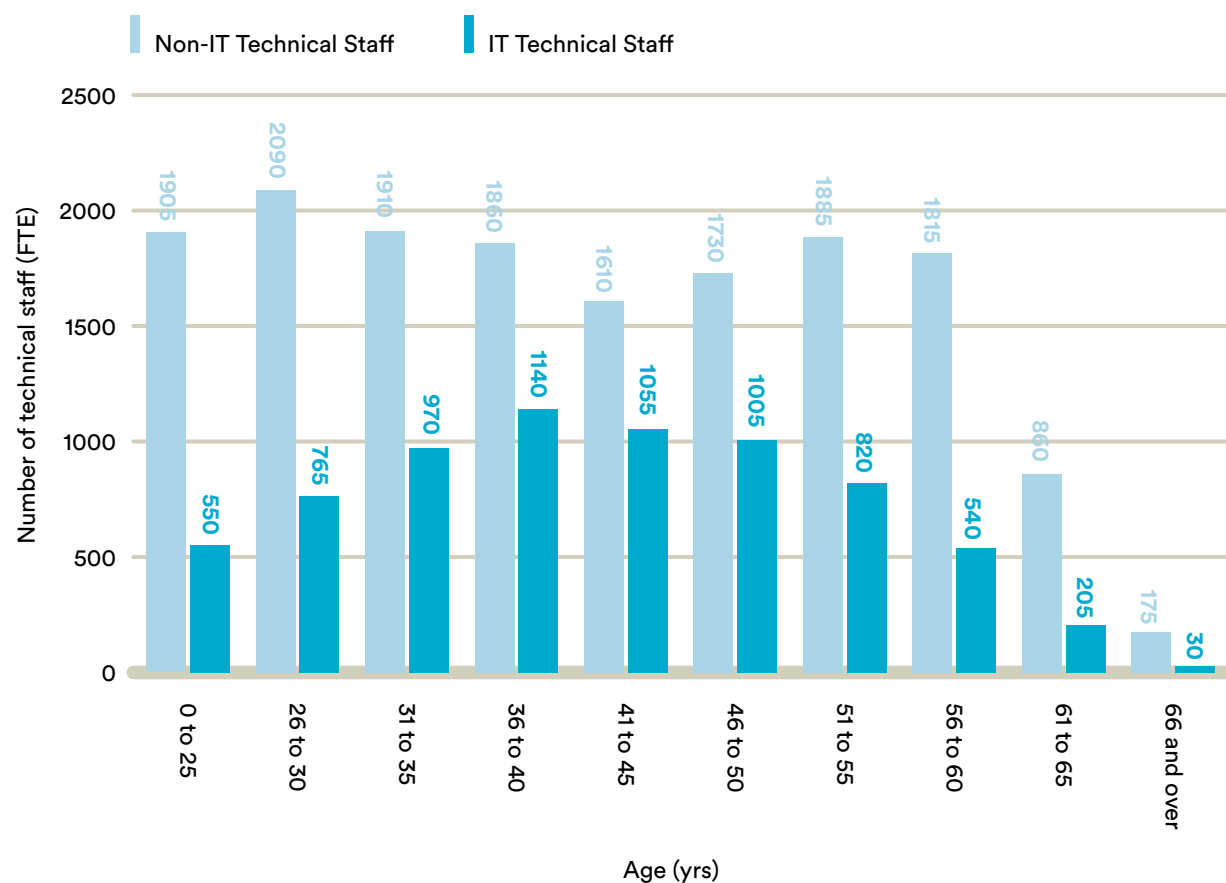
Figure 9: Comparison of IT and Non-IT technical staff populations within UK HE by age (2018/19).
Source: HESA Staff Records 2018/19.

Limitations of the HESA data

As discussed earlier in this report, there are contested definitions of what constitutes a technician and therefore differences in the ways HE Providers define and code their technical staff in HESA returns. For example, some technical specialists may be coded as researchers and other technical staff may be coded as administrative staff. It should be noted that the overall number of technicians working in UK universities is very likely to be higher than what can easily be found using HESA staff records in their current form. Further to reintroducing mandatory reporting of technical staff, another potentially beneficial inclusion would be an identifiable and sector-wide technical staff contract marker equivalent to that currently attributed to all academic staff.

Other UK technical workforces

While HESA's staff records provide us with the most complete sector-level evidence base available for the UK's technical workforce, it only covers HE providers and therefore may not necessarily accurately represent technical workforces in RIs and industry. Comparisons between these different workforces are drawn below.

Research institutes' technical workforces

Many of the characteristics explored in this section using HESA records were also investigated within our own national survey of UK technical staff. This remained open to technical staff across all UK workplaces, including RIs, enabling a direct comparison to be made between the HE and RI technical communities that responded. While respondents were self-selecting, the samples of technical staff (1,600 respondents from 90 different HE providers and 151 respondents from 16 different RIs) showed no significant differences in terms of age, ethnicity, working pattern (full-time vs part-time), contract type (fixed vs open-ended) and disability status.

National technical workforce

In early 2021, the Royal Society published a policy briefing exploring the research and technical workforce in the UK.[44] Using information from the Labour Force Survey, it estimated there were nearly 693,000 technical roles nationally, across all workplace types and sectors, in 2018/19, a 20% increase from 2013/14. It also used HESA staff record data to explore numbers of HE technical staff, albeit using a more restrictive definition of who should be included within this workforce than we have in this report. Accordingly, they found a total HE technical population that was 58% smaller in size than our own value.

The briefing identified some key differences between the national and HE technical workforces, including that the HE technical workforce has a higher proportion aged between 50 to 65 years, and a much larger proportion of science and engineering technicians, compared to the national technical workforce. However, this latter point may be impacted by the 'Science, engineering and production technicians' SOC code being used as a default case when staff records are submitted to HESA.

The comparative briefing also identified some regional differences between the HE and national technical workforces: nationally, the regions with the greatest numbers of technicians were South East England and the East of England; in the HE sector, however, the regions with the greatest number of technical role holders were London and Scotland. NI had the fewest number in both cases, as might be expected for the UK region with the smallest overall population.

44 The Royal Society webpages (2021). See: **https://royalsociety.org/topics-policy/publications/2021/research-and-technical-workforce-uk/** (accessed 14 November 2021).

Conclusions

Compared to academic HE workforces, the technical HE workforce is found to be more male-dominated, less ethnically diverse and lower paid, but with a higher proportion of full-time employment and a lower proportion of fixed-term contracts. The are limited opportunities to make whole-workforce comparisons beyond the HE sector, but what has been done suggests the UK HE technical workforce is broadly comparable with both RI and national technical workforces.

When considering how the HE technical workforce has changed over time, there were certain characteristics that showed very minimal changes (e.g. ethnicity), and others that showed more significant changes (e.g. the male-to-female ratio imbalance). There were a number of characteristics that varied strongly across different disciplines, including sex, age, working pattern, qualifications, ethnicity and salary. Engineering, physics and mathematics technical staff were particularly male-dominated and older in age, whereas veterinary sciences, biosciences and medicine-related subjects were identifiably female-dominated and younger in age. Creative arts disciplines had by far the highest proportion of staff working part-time.

These findings highlight the need to consider and/or include technical staff in any Equality, Diversity and Inclusion (EDI) initiatives brought in at sector and institutional level. But also, due to the differences between staff in technical and academic roles, and between technical staff across different disciplines, we have perhaps also highlighted a need to consider more targeted EDI initiatives aimed towards specific technical communities. Ultimately, our hope for the future is a workforce that is sustainable over many years and generations of technical staff, and one which is not dominated by any particular characteristic or age group.

Patterns of underreporting for the technical population continue to highlight the 'invisibility' of this workforce compared to others within UK HE and research. This is exacerbated by recent coverage changes to HESA staff records.

Our recommendations

R3 **Employers of technical staff should collect, report and analyse data on their technical workforce. To enable sector level understanding, a new, simple, and fit-for-purpose classification for technical roles should be developed.** For example, this could be developed as part of the recently proposed BEIS annual R&D workforce survey. For HE institutions, we call on HESA and its regulators (OfS, HEFCW, DfENI, SFC) to ensure such data are mandated, collected, and made available for technical staff roles.

R4 **Employers of technical staff, funding bodies, and learned societies should undertake targeted and specific action to address the Equality, Diversity, and Inclusion (EDI) challenges facing the technical community.** Along with the inclusion of technical staff in broader EDI initiatives, we strongly encourage interventions, at a sector and institutional level, to address the low numbers of technicians from Black, Asian and ethnic minority backgrounds, along with the lack of women in technical leadership roles. Specific interventions are also required to tackle discipline-specific EDI challenges. EDI charters (e.g. Athena Swan, and the Race Equality Charter), and the institutions that engage with them, should ensure inclusion of technical staff.

08

Funding Technical Roles

We want a future where:

The funding landscape supports and enables opportunities for the technical community, and is transparent, easily understood and accessible.

This section provides a detailed exploration of how technical staff are funded and resourced by their institutions.

Current landscape

Due to the diversity of technical roles, including differing contributions to research, it is necessary to have flexible funding models to account for the input technical staff have in enabling research. However, despite the added complexity this flexibility brings, appropriate costing of technical resource on grants is essential.

The transparent approach to costing

For research funded by UKRI, institutions abide by the transparent approach to costing (TRAC) methodology to calculate the costs that can be included on research projects.

Common mechanisms for costing technicians include:

○ Directly allocated (DA) staff costs – Staff resources that are costed onto a research project, usually for a portion of their time, and shared with other activities. This approach is common for investigators on grants and can be used where a technician is the grant lead, but is also commonly used for costing pooled technical staff.

○ Directly incurred (DI) staff costs – Staff resources are costed directly to a research project as the actual costs to be incurred and evidenced by an audit trail, such as timesheets. This can include full-time staff for the project, such as researchers and technicians who have all, or part, of their working time dedicated to the project.

○ Facilities access costs – DA or DI costs on a project proposal required to fund the services of a research facility or resource. These facilities can, but do not always, operate under TRAC. Facilities can be (but are not limited to): physical infrastructure, such as microscopy facilities or animal facilities; and knowledge infrastructure, such as research software engineers and bioinformaticians. Facility charges may include both the resource needed for technical staff in the facility and the resource needed to run and maintain any equipment. This will often be charged on a 'per unit' basis – for example, per hour.

○ Estates and indirect costs – (this can also include infrastructure technician rates, where the institution calculates these separately from estate rates). Often referred to as 'overheads', this is the resource required to support the research organisation and provide estates support, infrastructure and administration. These costs frequently support technical roles working in, for example, estates, logistics, operations and IT.

Alongside these grant mechanisms, HE institutions also make use of the UK's dual support funding system. Many receive additional quality related (QR) funding to support research activity, administered by their national funder.[45] This serves as a block grant for HE institutions to support their individual research priorities, which in many cases supports 'core funded' technicians.

It is important to note that some roles in research, such as academics or postdoctoral researchers, attract charge-out rates for estates and indirect costs as overheads, calculated proportional to the FTE dedicated to the project. Many technical posts do not attract these charge-out rates. However, there are notable exceptions, such as research software engineers, where the posts are deliberately configured to attract overheads.

With contributions to research ranging from technical specialists leading the development of analytical equipment, to core technicians underpinning infrastructure essential to research, it is worth having multiple routes for inclusion of this resource on proposals. Consequently, institutions use a combination of the methods above, with choice influenced by cost recovery, funder guidelines and TRAC methodology.

Similar approaches are used for funding from charities, adapting the methods above in line with guidance. Technical staff are also integral to research funded directly by industry, where full economic costing is used.

Best practice

Using TRAC to build in the real costs of tech support

The University of York's Bioscience Technology Facility uses TRAC to build the real costs of technical support into research pricing, including the time it takes to prepare and maintain equipment and to train users. This has enabled systematic cost recovery – at a high rate of over 80% – to support a vibrant technical community. Users comment on the value for money for the support they receive. The approach has been critical to retaining and expanding technician roles, ensuring expertise continues to develop.

How are technical staff currently funded on research projects?

To understand how technical staff are funded, and perceptions around inclusion of technical staff on funding proposals, we used a combination of data from HESA staff records, our own national survey of technical staff, and independently commissioned follow-up surveys, interviews and focus groups exploring funding with a wide range of stakeholders.

HESA staff records (2018/19) indicated 83% of the UK HE technical workforce had their basic salary wholly generally financed by HE providers themselves. Other sources included research councils (3%), charitable foundations (3%), while 4% were covered by multiple sources of funds, including HE providers. Although the data suggest the majority of technical staff are financed by HE providers, this does not consider their time included via for example overhead costs on research grants, facility access charges, or the QR income these institutions receive, which may indirectly be used to cover these costs.

HESA's data indicate that there are stark differences in funding sources between disciplines. When looking at the split by cost centre, medicine, dentistry, and allied subjects (59%) and biosciences (69%) have a much lower proportion financed by HE providers. In comparison, physics and mathematics (74%), chemistry (89%) and engineering (85%) are more likely to be underwritten by the HE providers. Outside STEM, funding from the HE provider is typically higher – for example, in design, creative and performing arts it was 98%.

How funding for technical work was obtained varied between disciplines. Physics and mathematics reported the highest proportion of direct funding from research councils (14%) for technical staff, in contrast to chemistry (2%) and engineering (3%). Medicine, dentistry and allied subjects, and biosciences reported higher proportions of funding from charitable foundations for technical staff (11% and 10% respectively).

This variation of funding source for technical staff across disciplines is in part likely driven by the differences in their roles. These data do not discriminate between roles directly or indirectly related to research and those that are not, such as teaching technicians. It should also be treated with some level of caution, as some roles will not be captured by HESA and RIs were excluded.

When asking how their role was funded in the national survey of technical staff, overall, 72% selected 'department or institution overheads or standard running costs' and 13% selected 'unsure'. Just over 19% selected 'funding by an external research grant', with 11% from UK research councils, 5% from charitable foundations and 4% on other or unknown sources of external research grant. UK industry and/or public corporations was selected by 3% of respondents.

Unsurprisingly, research technicians were significantly less likely to be reported as funded by department or institution overheads (44%), compared to teaching technicians (79%) and those in a dual role (87%). Correlations with HESA's data were seen for individual disciplines. As may be expected due to their research-intensive nature, technical staff at RIs were more likely to be funded on external research grants.

Further to this, an online survey focused on perceptions and approaches to funding technical staff was conducted from February to April 2021. There were responses from technical staff, research managers and administrators, principal investigators, (PIs) and finance managers and administrators.

Respondents were asked at which point technical staff were consulted during the costing process. Reassuringly, low proportions of respondents suggested technical staff were not consulted, across all role types.

PIs and research managers and/or administrators were likely to include technical staff in the costing process for reasons such as: to ask 'specific questions as we develop the application'; 'as initial ideas about the project develop'; and 'as we complete the funding application'. Other options were: 'as we finish the funding application'; 'to get input at the start of the process'; 'to check our thinking and/or calculations'; and 'we don't consult technicians or technical specialists'. The level of engagement reported by technical staff was generally lower, indicating a marked difference in perception between staff groups.

The survey also asked how technical staff were costed in grant applications. Here, technical managers and technicians, and facility managers generally selected fewer potential answers, as they may have been reporting only on their own experiences. However, every staff group was more likely to select DI, DA and facility costs compared to indirect costs or estates and infrastructure costs.

Interestingly, none of the PIs or research managers or administrators answered 'not sure' for how technical staff are costed onto grants, whereas a small proportion of facility managers and technical managers or technicians did. This indicates a level of uncertainty or lack of information for technical staff on how they are funded, in line with responses from the national survey of technical staff.

All staff groups, including research managers and administrators, primarily reported (60+ %) a lack of clear guidance from their organisation on inclusion of technical staff on grants. Conversely, when asked whether they understood why technicians are costed in a particular way, only PIs and facility managers had a majority 'no' response.

Case study

Research Technology Platforms ensure appropriate recovery on grants

The University of Warwick's Research Technology Platforms (RTPs) are a diverse range of centrally managed core facilities, accessible to researchers internally and externally. Since inception in 2014, the RTPs have worked across the full research project life cycle, from pre-to-post award, to ensure facility access is costed at appropriate levels and effectively tracks associated facility access to budgets.

University of Warwick's pre-award system has an 'associate with' checkbox for each RTP that prompts research office staff to discuss RTP access requirements with PIs, begin discussions directly with RTPs on inclusion of costs, and to provide detailed data on associated proposals and their status. This pre-award process is supported by clear and accessible information detailing eligible rates, by instrument and funder, provided by the RTP.

Post-award, the tag in the system identifies which RTPs are associated with the award, enabling the research finance team, alongside RTP guidance, to ensure dedicated cost lines are set up in the financial systems. This provides RTPs with valuable information for the management of their physical and staff resources, and to monitor budgets against access charges.

The increased communication with PIs from an early stage in the project life cycle, detail of data and budgetary tracking has improved the sustainability of the RTPs, raising their profile and enhancing recognition of their technical staff. The data support business cases for investments, internally and externally, providing confidence to senior staff making decisions. Consequently, individual RTPs have benefited from significant investment in technical posts and equipment, with rapid programme growth from five to 12 platforms.

[45] Department for the Economy Northern Ireland (DfENI), the Higher Education Funding Council for Wales (HEFCW), Research England (RE), and the Scottish Funding Council (SFC).

From our survey, seven volunteers were chosen to be interviewed and two focus groups involving colleagues in different roles in both universities and RIs were held.

> " *Some colleagues just assume that technical support, equipment and facilities can be provided for free.* "
>
> Technical Manager and/or Technician
> (Funding survey, April 2021)

During these discussions, it became apparent that the complexity of the funding landscape led it to be perceived as transparent but not clear. This was amplified by an internal lack of clarity on how technical staff should be costed onto grant applications, with different options driving different behaviours across institutions. There were also multiple reports of a perceived 'cap' on UKRI funding applications even where this is not the case, creating a working practice where PIs reduce the costs included on their proposals to what they perceive to be acceptable limits. With this practice, technical staff were the last cost included – and often the first cost to be cut. Alongside this, there were concerns that technical time is not included on equipment grants. More worryingly, some reported they were actively discouraged from including technicians on research grants in favour of research assistants, despite effectively still requiring a technical role, in order to attract overheads and thus better cost recovery. These points could lead to issues around technical staff sustainability, recognition and career pathways due to reduced available resourcing.

> " *There is no clear guidance on this [funding landscape]. Within our college (one of four in the university), this differs among RIs. Often it is seen as a negative to cost a technician rather than a research assistant because technicians do not attract overheads.* "
>
> Research Manager and/or Administrator
> (Funding survey, April 2021)

There were also positive initiatives highlighted. Through the Technician Commitment, senior champions had encouraged a standard approach to including technicians within grant proposals. Some institutions had developed clear guidance and approval processes to ensure technical staff time was costed appropriately, including checklists and standard questions to trigger further discussions.

Looking to the future, there were requests to develop a clear, consistent and transparent approach to funding technical staff on grants. Alongside this, there needs to be a clear expectation, outlined in both funder guidelines and institutional policies, that technical staff are included at appropriate levels where they will contribute. To ensure this is acted on, it was suggested technical staff should be included at all stages of the research proposal development process, considering their knowledge and expertise to ensure appropriate cost calculations. To showcase technical staff contributions to research, it was suggested other staff, funders and industry partners take part in lab tours.

Best practice

Championing technicians at the University of Edinburgh

Since signing the Technician Commitment, the institution has introduced a champion for technicians as part of the responsibilities of one of its vice-principals, the head of the College of Medicine and Veterinary Medicine. One tangible development has been the creation of standard text to be included in grant applications, which captures the technician contribution. Academic colleagues are being encouraged to use this wherever appropriate.

Karl Geleff, Technical Specialist - Foundry and Metalwork, Sheffield Hallam University

How funders can drive positive change

Funders can – and do – play an extremely important function in driving change across the sector and raising awareness of important issues. For example, a publication by the Biotechnology and Biological Sciences Research Council (BBSRC) and the Science Council outlined the challenges technical staff face with regards to career structure.[46]

UKRI has recently published its Technician Commitment action plan as both a funder and employer of technical staff.[47] It details the need for shared vision and standards across the UK funding landscape. To achieve this, it states:

"As a funder, we will collaborate with other funders to develop consistent narrative, expectations and comparable grant terms and conditions around:

- The roles of technicians within the research and innovation system, our collective vision for their career progression and the relationship between staff support and the resulting impact across the economy and society

- The scope of what we consider professional development for technicians and the level of support we expect for technicians from the research organisations that we fund

- How research organisations can support technical careers and develop technical career pathways"

UKRI has also stated that it will amend its eligibility criteria for grants, so technicians contributing to the intellectual leadership and management of a project can apply for funding as an investigator, with their organisation's support. Some funders, such as BBSRC, already have clear guidance on how technical staff can apply for funds as PIs and co-investigators.[48]

Importantly, the UKRI Technician Commitment Action Plan includes the need to recognise and value those directly funded by grants, and to collect data to recognise those indirectly funded. This will aid recognition and enhance best practice across the sector. UKRI also details actions to explore how technicians are funded through research grants and QR, alongside stakeholders, and how this impacts career development and the sustainability of technical roles. Crucially, they are also committed to review and revise as necessary the guidance and training for reviewers and panel members, including around the appropriate level of staffing and workload expectations for technically skilled people on grants. It is also important to include a technical voice on panels, with support and training to enable valued participation. This involvement would provide technical staff agency in what is funded and help drive positive culture change.

Conclusions

Technical staff have a diverse range of roles and responsibilities that directly and indirectly contribute to research. Therefore, it is imperative to have a range of methods to include technical roles in funding calculations, with discretion on how an institution does so. However, there is a clear lack of understanding on how technical staff should be included in grants within individual institutions, with inconsistency in how technical staff are included in costings. Worryingly, there is evidence that technical staff are under-costed on proposals, and are the last cost added and first cost stripped out when a proposal is perceived as 'too expensive'.

There is evidence that technical staff are consulted during the development of a funding application, but this is not consistent and many technical staff are unaware of how they are funded. Institutions need to support their technical staff, research managers and PIs to ensure that processes and guidance are in place to fund the technical workforce appropriately. This is of paramount importance to support technical staff time on research projects, and to enable career development, recognition and sustainability. Internal guidance must ensure the inclusion of technical staff time is not discouraged in favour of other roles.

Funders will play an important part in driving forward progress. This will not only be through clear guidelines for inclusion of costs, but also opportunities for technical staff as PIs, through better collection of data and enhanced recognition of the roles of technical staff in research.

Our recommendations

R5 **Funders and employers of technical staff should provide clear and consistent guidance to ensure technical contributions are costed appropriately and eligibility requirements of existing funding opportunities should be reviewed to ensure inclusion of technical staff where appropriate.** For example, funders of research and development should provide clear and transparent guidelines on how technical staff can be costed onto grants and guidance on the roles that technical staff can hold on grants should be considered. The review of Full Economic Costing, as recommended in the *Government's Research and Development (R&D) People and Culture Strategy*, should ensure that the inclusion of technical staff on research grants is not disadvantaged relative to other staff roles in the research ecosystem.

Thomas Knight, Engineering Technician, Newcastle University

[46] Nature. (2016) Correspondence. See: **https://www.nature.com/articles/540199c.epdf?author_access_token=ZOl8Flo6AsVkfc5K4Uv3ydRgN0jAjWel9jnR3Zo Tv0O1035gXr5vE0F6N6HUf-QF6XqxKKB8q4Sxh7hb5jjNhj1CDJX49ZbAaiWFs9E8Gr6qBp6SN1QT2K3phQfqxpoT** (accessed 14 November 2021).

[47] UKRI. (2021) Technician Commitment UKRI Action Plan. See: **https://www.ukri.org/wp-content/uploads/2021/02/UKRI-040221-TechnicianCommitmentActionPlan.pdf** (accessed 14 November 2021).

[48] BBSRC webpages (2021) See: **https://www.ukri.org/councils/bbsrc/career-and-skills-development/investing-in-research-teams/technicians-and-technology-and-skills-specialists/** (accessed 23 January 2022).

09

Technical Career Pathways, Progression, Professional Development, Succession and Sustainability

We want a future where:

Technical careers are visible, understood and aspired to, with clear career progression and professional development opportunities.

Multiple well-understood and appropriate entry routes are available into a variety of technical careers throughout the sector.

Opportunities and mechanisms are available to move between career pathways and across sectors.

This section explores entry points into technical careers and challenges in recruitment and retention. Alongside this, we explore succession planning, sustainability and ongoing professional development of technical staff.[49]

Current landscape

In recent years, the UK government has released a number of announcements and papers suggesting reform to post-16 technical education, skills and qualifications. The stated focus of these reforms is to reduce skills gaps for UK employers within key science, engineering, manufacturing, construction and digital disciplines. Since 2010, the Gatsby Charitable Foundation has commissioned a series of reports researching apprenticeships, skills and training within certain technical communities in specific industrial and applied STEM disciplines as well as reports on student views about various educational pathways.[50-54] The most recent of these reports highlighted that many students aged 14 to 18 years were dissatisfied with the level of information their school or college provided about technical and vocational education opportunities: school-leaving-aged students often lacked meaningful and/or consistent knowledge about these options. The Technicians Make it Happen initiative campaigns for technical skills, roles, and careers within the UK, aiming to '[inspire] young people and [explain] to the adults in their lives, such as parents and teachers, that the career of a technician can have boundless opportunities'.

We build on this work by exploring key findings and challenges from the point of view of the UK HE technical community, both technicians and technical managers, from a wide range of discipline areas.

[49] Primary sources used include our National Survey of Technical Staff, focus groups with UK technical managers to explore recruitment and retention challenges, and follow-up focus groups with the wider UK technical community.

[50] Gatsby Charitable Foundation webpages Reports. See: **https://www.gatsby.org.uk/education/reports?term=&filter%5B%5D=284** (accessed 14 November 2021).

[51] Technicians make it happen webpages. See: **https://www.gatsby.org.uk/education/programmes/technicians-make-it-happen**. (accessed 14 November 2021).

[52] Technicians make it happen webpages. See: **https://www.technicians.org.uk/about** (accessed 14 November 2021).

[53] Gatsby Charitable Foundation. (2021) School, college, and student perspectives on information shared about educational pathways: Gatsby Benchmark 7. See: **https://www.gatsby.org.uk/uploads/education/careers/pye-tait-gatsby-benchmark-7-research-into-school-and-college-relationships.pdf** (accessed 14 November 2021).

[54] Gatsby Charitable Foundation. (2014) Good Career Guidance. See: **http://www.gatsby.org.uk/uploads/education/reports/pdf/gatsby-sir-john-holman-good-career-guidance-2014.pdf** (accessed 14 November 2021).
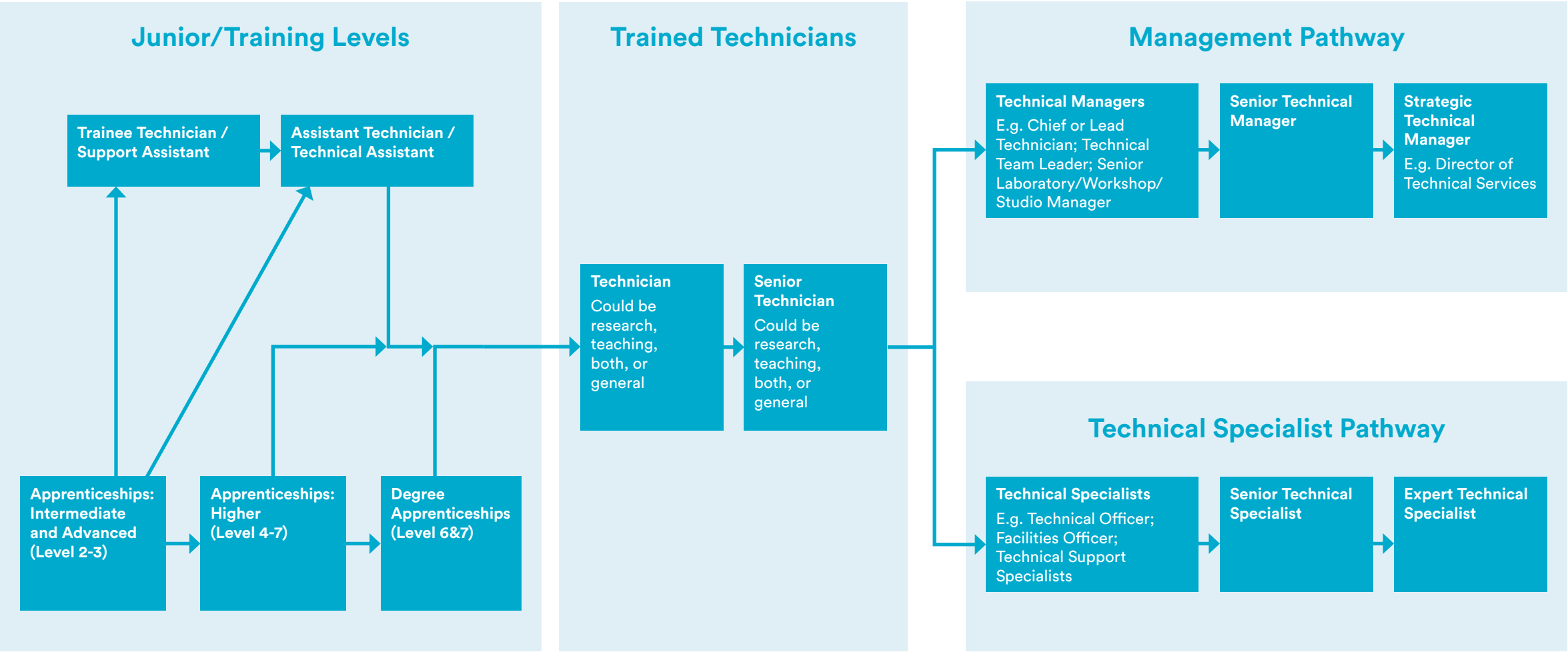
Entry into technical careers

The technical career framework and possible entry routes

Figure 10 outlines our vision for a career framework for technical staff within UK HE and research. This framework aims to provide a broad overview, applicable regardless of discipline area, sector, or workplace type.

While this graphic suggests clear linear progression opportunities within a technical career (from left to right), technical staff in many institutions may not recognise such clear or obtainable progression opportunities within their own workplaces, nor the possibility of progression within a 'technical specialist pathway'.

Accordingly, such institutions could use this suggested framework as an initial tool to help evaluate and structure their own technical career pathway frameworks.[55] However, work is already being done within some UK institutions to help improve opportunities for technical staff to break through perceived glass ceilings, increasing scope for higher-grade technical postings through both managerial and/or specialist pathways.[56-59]

Figure 11 outlines possible entry routes into our envisioned technical career framework. While technical careers and entry routes are highly diverse and complex, and changing over time, with many differences across disciplines and sectors, this summary aims to highlight a broad but pragmatic range of feasible current and near-future options for entry into technical careers.

Junior/Training Levels

Trainee Technician / Support Assistant

Assistant Technician / Technical Assistant

Apprenticeships: Intermediate and Advanced (Level 2-3)

Apprenticeships: Higher (Level 4-7)

Degree Apprenticeships (Level 6&7)

Trained Technicians

Technician
Could be research, teaching, both, or general

Senior Technician
Could be research, teaching, both, or general

Management Pathway

Technical Managers
E.g. Chief or Lead Technician; Technical Team Leader; Senior Laboratory/Workshop/ Studio Manager

Senior Technical Manager

Strategic Technical Manager
E.g. Director of Technical Services

Technical Specialist Pathway

Technical Specialists
E.g. Technical Officer; Facilities Officer; Technical Support Specialists

Senior Technical Specialist

Expert Technical Specialist

Legend

→ Linear career pipeline for UK technical staff.

Figure 10: Representation of a standardised technical career framework within UK HE and research.

Source: interviews with technical managers and career specialists from a range of UK institutions and discipline areas.

[55] The National Technician Development Centre, based at the University of Sheffield, has also produced an overview of a technical career pipeline, although with less focus around the early stage options or the more aspirational senior specialist roles: **https://nationaltechnicianscentre.ac.uk/hett-framework/**

[56] University of Bristol webpages. See: **http://www.bristol.ac.uk/staffdevelopment/professional-services/technical-staff/career-framework/** (accessed 23 January 2022).

[57] University of Glasgow. (2017) Job family role profiles. See: **https://www.gla.ac.uk/media/Media_506090_smxx.pdf** (accessed 23 January 2022).
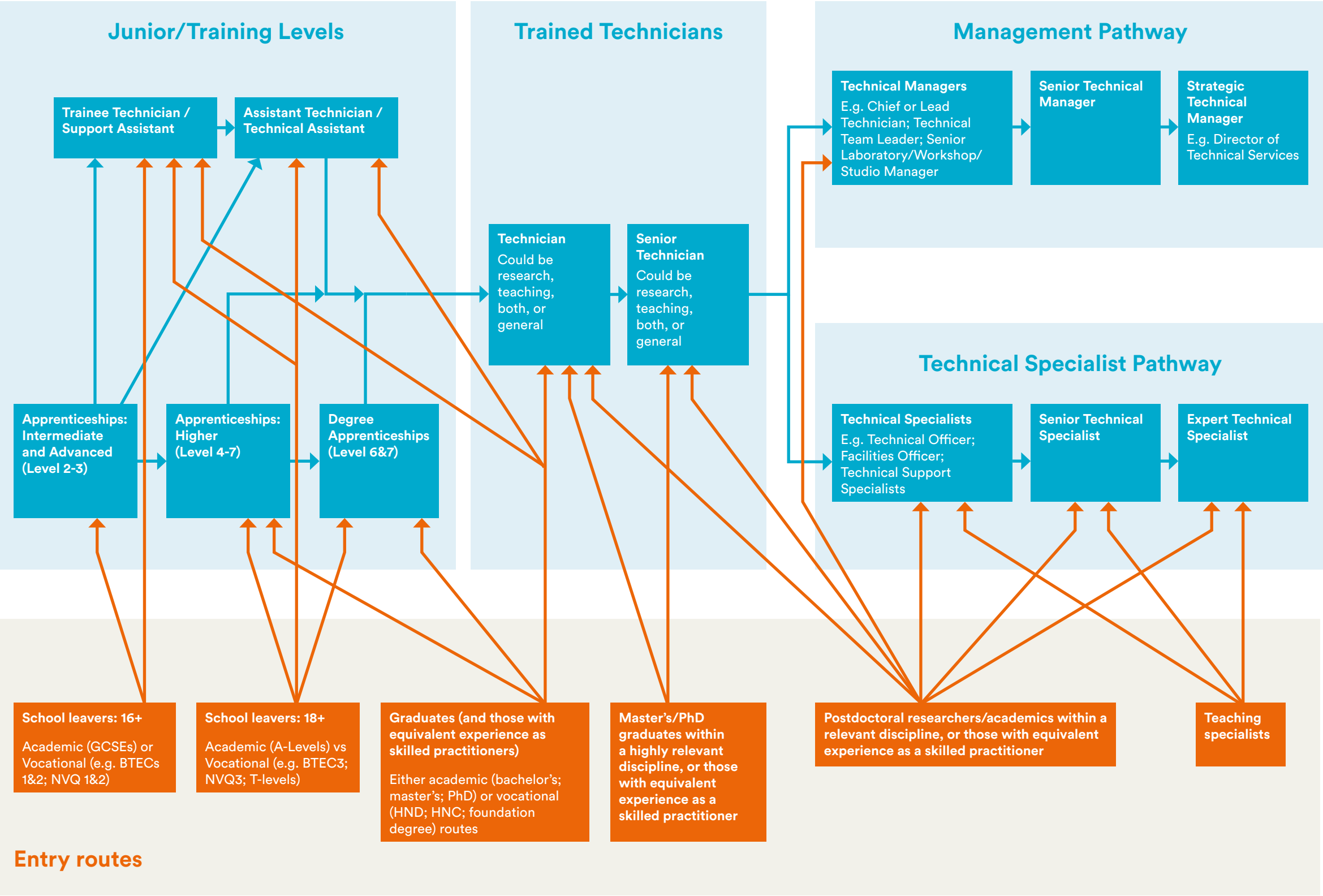
[58] University of Nottingham. (2019) Technical Services Job Family See: **https://www.nottingham.ac.uk/hr/guidesandsupport/jobfamilies/jobfamilies/ documents/technicalservicesjobfamily-summaryoftheleveldescriptors.pdf** (accessed 23 January 2022).

[59] University of Warwick. (2021) Technical Staff – Career Pathway Our Job Families Fa1-Fa9. See: **https://warwick.ac.uk/research/technicians/93663_-_uow_ technician_commitment_brochure_web.pdf** (accessed 23 January 2022).

Figure 11: Possible entry routes into technical careers within UK HE and research.
Source: interviews with technical managers and career specialists from a range of UK institutions and discipline areas.

Case study

Career Profile: Expert Technical Specialist
Andrew Filby, Newcastle University

Andrew's primary role is directing the Biosciences Institute, a core facility on which many rely for its expertise and cutting-edge research capability. The facility provides hundreds of users and tens of research groups with deep technical expertise and intellectual input from Andrew and his team. Without this, scientific discovery and the development of core technologies and methodologies could simply not happen.

Andrew followed an academic route in his early career, completing an undergraduate degree in biochemistry and PhD in immunology. Industrial placements were embedded within these routes and Andrew then went on to undertake commercial roles across the UK in industry organisations. This experience opened up a lot of opportunities, with his horizons then expanding to influence technical expertise internationally.

In 2015, Andrew was offered the opportunity to run the core facility at Newcastle and be the technical expert helping others with research including developing methodology, enriching the service and making it continually better for users. He enjoys working in an area that is his passion with significant reach and impact.

"I am passionate about parity of esteem and how technologies and methodologies can unify all, and be an important leveller in science."

Andrew considers his career pathway fairly common, particularly in his field of expertise where there are a number of linked disciplines – that is, cell, flow cytometry and immunology research. He would like to see the type of applied knowledge he uses daily to be promoted more to people thinking about joining a technical career, particularly from an early age. Andrew is confident that when he and his team do things right, they can solve global challenges and push best practice as wide as possible as technical specialists.

"We have created a community of true team science and healthy research culture."

Case study

Career Profile: Strategic Technical Manager
Fred Hale, University of Bristol

Fred is a Faculty Technical Manager and works across the University of Bristol and beyond to elevate the importance of a technical strategy within organisations. He started his career as an apprentice technician within industry, where he progressed to a management position. Later, he left to run Investors in People, where he further developed his interest in management and leadership. Today, with responsibilities for the university's institutional Technician Commitment Action Plan, and connections with colleagues across the GW4 Alliance (a partnership of four universities in the region) to ensure a joined-up regional technical strategy, Fred's role is critical to sustaining technical skills and careers in the future.

Fred analyses skills gaps and designs resourcing strategies to mitigate challenges, for example leading on a technical apprenticeship offering for his institution. An aligned approach across the institution for this is critical when technical services are often embedded in many different departments. Through his role, responsible for technical strategy at a senior and central level, he achieves the collaborative approach that is so needed for driving technical strategies forward.

However, Fred's role across the sector is uncommon and he hopes to see more organisational commitment to these roles in the future. He emphasises the importance of placing this long-term role within organisational structures as opposed to a sole reliance on the advocacy of passionate individuals (although greatly appreciated).

"The lack of similar strategic roles like mine across the sector leaves us vulnerable."

By elevating the importance and value of a strategic technical role, it ensures the technical voice is heard in decision-making and appropriate strategies are implemented to ensure future sustainability of technical roles and capability across the sector.

Case study

Career Profile: Senior Technical Manager
Jodie Chatfield, University of Nottingham

Jodie has navigated the technical landscape to become a technical services manager at the University of Nottingham's School of Life Sciences.

She loved science when doing her A-Levels, so when a two-year trainee position came up at the University of Nottingham's Queen's Medical Centre in 1995, she went for it. That apprenticeship laid the foundations for her next position at the City Hospital in clinical oncology, where she spent eight years developing skills in molecular biology, techniques to manipulate DNA, and tissue culture – the biggest learning curve of her career. But it was in 2016, while she was researching embryology at the department of genetics, that she really found her passion.

She says applying for a part-time post managing a team of part-time support technicians, who were split over four floors across two different sites, was the making of her. "It was really haphazard, making sure everyone was working. I used to go home with charts and sheets trying to work it all out. Trying to manage it was like a jigsaw puzzle that never fit.

"I loved it though. I loved the support, making sure they were all alright and sorting out all their problems."

At the time, she didn't realise she was blazing a trail – in fact, the position she holds now she once could only dream of. "I often saw these people [technical managers] and wondered how they got to be in those positions, never knowing it would just be something that would be advertised.

"My career pathway probably isn't that common, but if you really want to step up and go for these things you have to apply for a separate role."
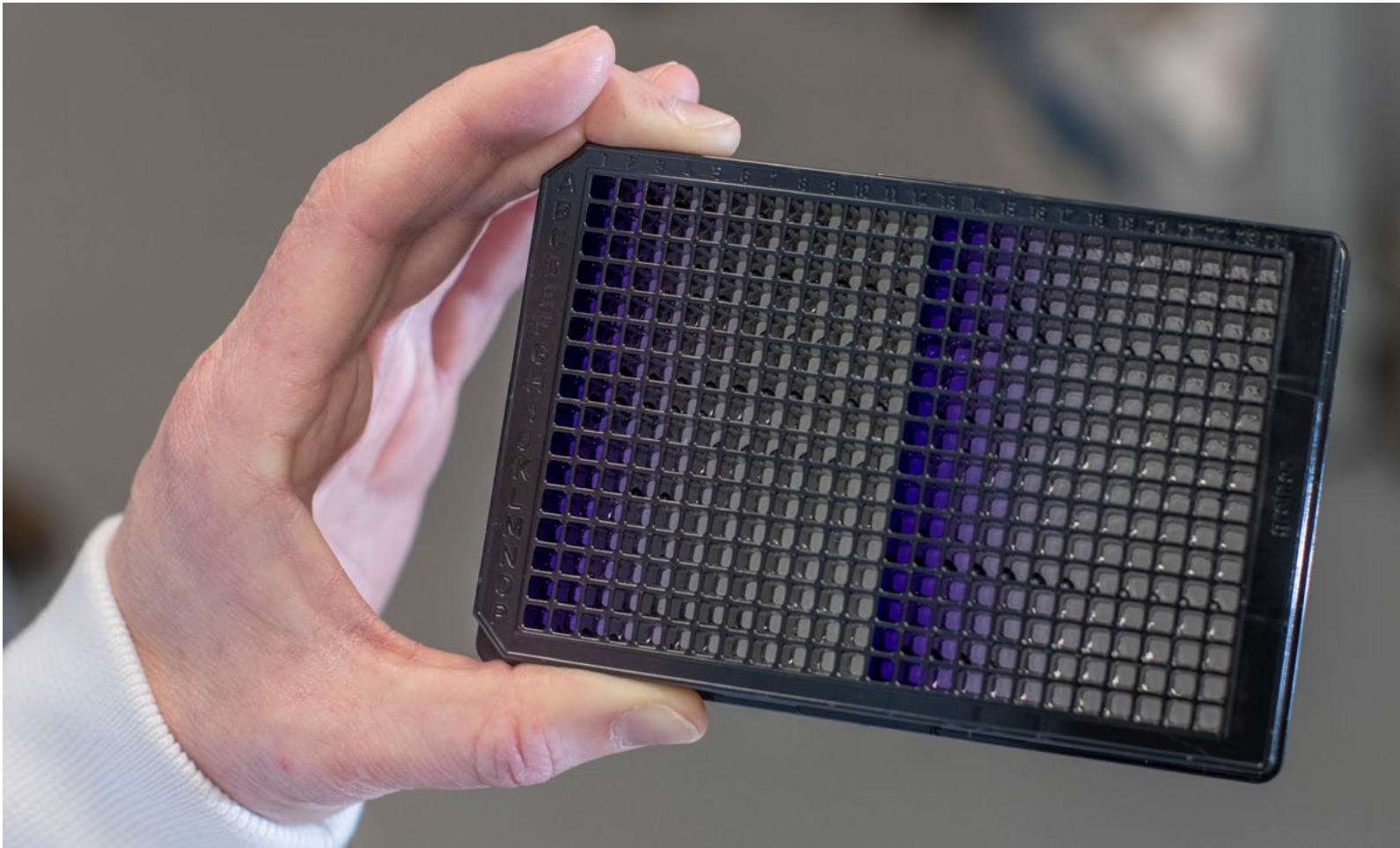
Most common entry routes

More than twice as many respondents to our national survey of technical staff said they entered their technical career following academic qualifications as those entering either via apprenticeships or other vocational qualifications (see Figure 12), while the proportion of entrants from academic routes was significantly higher among younger respondents. Entry via apprenticeships accounted for a relatively small proportion of respondents under 55 years (other than those under 25 years, for whom apprentice technicians unsurprisingly make up a disproportionately high percentage).

> Younger respondents were much more likely to enter their technical career with academic qualifications than by any other means – this is in direct contrast to older respondents.

Respondents were also asked to identify the highest qualification they held before starting their technical career (see Figure 13). This was in contrast to data available within HESA, which only detailed the highest qualification staff held at the time of collection.

The majority started their technical career with an academic degree at level 6 or above, whether that was a bachelor's (33%), master's (18%), or PhD (15%).

> 66% of 1766 respondents entered their technical career with an academic degree at level 6 or above.

There were clear differences when considering age. The majority of respondents aged 21 to 55 years started their career with at least a bachelor's degree-level qualification, whereas the majority of respondents aged over 55 years started their technical career with one of an array of vocational qualifications or pre-degree academic qualifications.

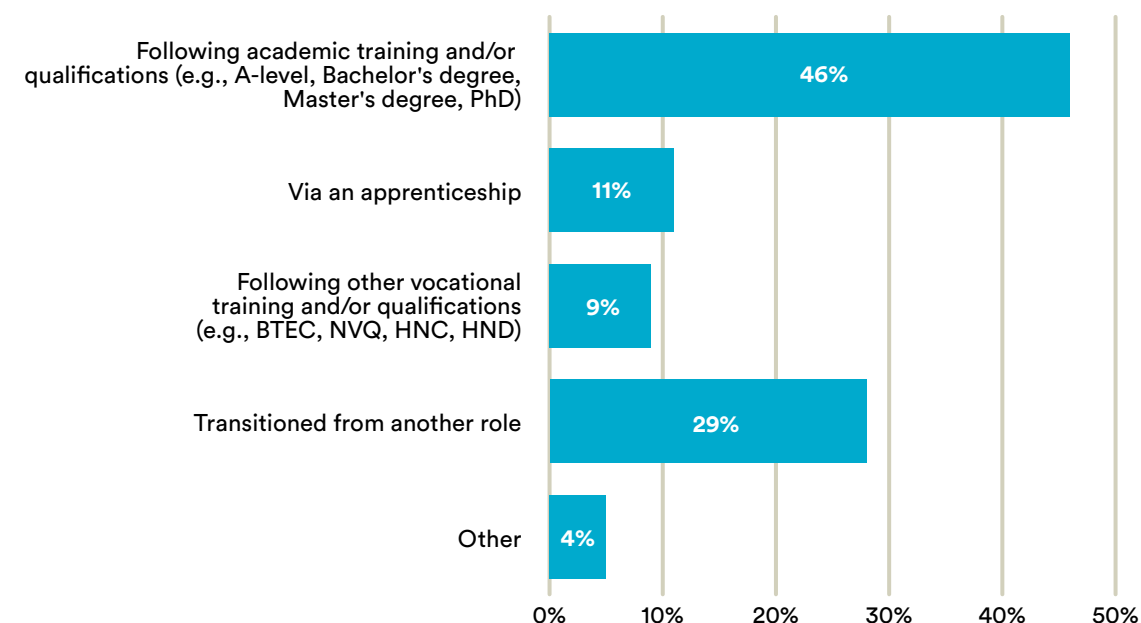Gillian Hume, Flow Cytometry Technician, Newcastle University

Figure 12: Common routes into technical careers.

Source: TALENT Survey of UK Technical Staff 2021: "Which of these routes best describes how you entered a technical career?" (n=1766)
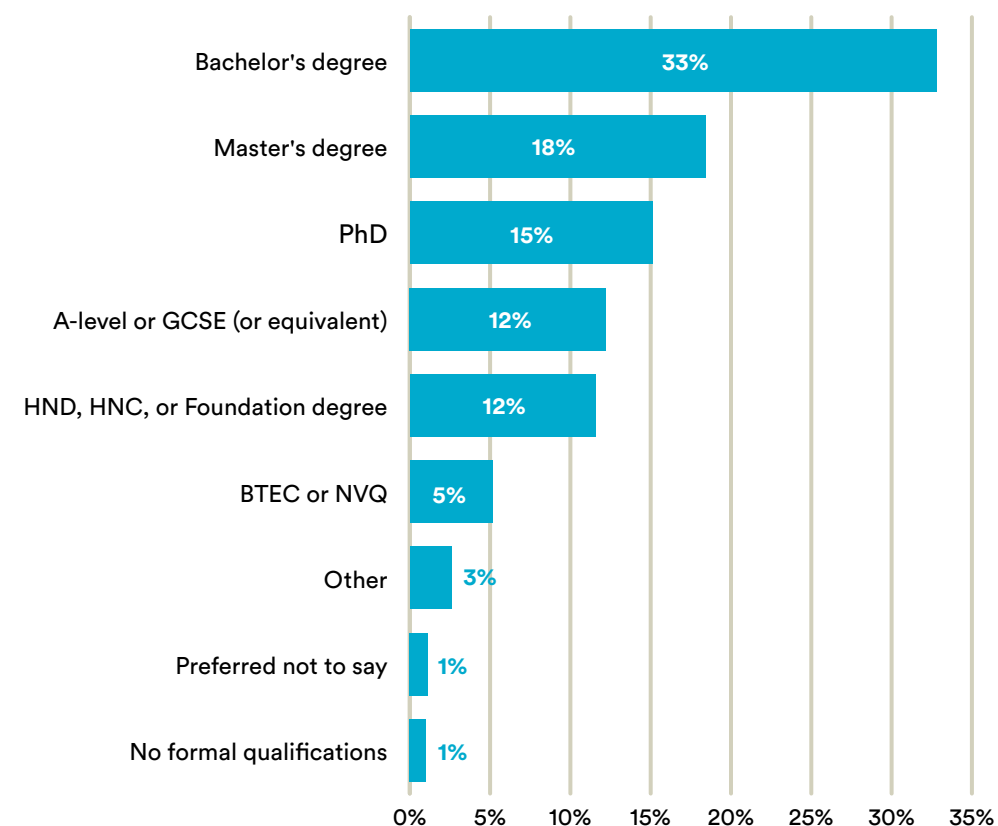
Figure 13: Qualifications held before starting technical careers.

Source: TALENT Survey of UK Technical Staff 2021: "What was the highest qualification you held before starting your technical career?" (n=1766)

An evolving landscape

For respondents aged 26 to 45 years, the highest qualification held upon entering their technical career was: 41% bachelors; followed by 24% master's; 19% PhD; 16% other technical, vocational and/or pre-degree academic qualification; 0% no formal qualifications.

For respondents aged 46 years and over, the highest qualification held was: 49% other technical, vocational and/or pre-degree academic qualification; followed by 25% bachelors; 11% master's; 13% PhD; 2% no formal qualifications.

During a series of focus groups, UK technical managers widely agreed that our findings accurately reflected their personal experiences. They also widely identified a common theme of change over time, with increasing numbers of applicants holding ever-higher, and more academic-oriented, qualifications. The context and implications of this, including appropriateness for different technical roles, is explored later within this chapter.

A complex landscape: differences by discipline, job role and workplace type

Our national survey of technical staff shows us that typical entry routes into technical careers and entry-level qualifications differed according to discipline area, whether driven by supply or demand. These discipline differences were supported by HESA's data.

From our survey, biosciences and the creative arts (including design and performing arts) had the highest proportion of respondents entering with academic qualifications, while engineering had by far the lowest (15% compared to 51% for all non-engineering technical staff). Engineering and physics had the lowest proportion with any degree-level qualifications (33% and 50% respectively) and the highest proportion with vocational, pre-bachelor's level, or other formal qualifications (65% and 49% respectively).

Biosciences, chemistry and some of the physical sciences (materials and earth, marine and environmental sciences) had the highest proportion of staff who started their technical careers with a PhD (22%, 32% and 27% respectively). This pattern was reversed for those entering via an apprenticeship, with engineering having the highest proportion (38%) and biosciences and creative arts disciplines having the lowest (6% and 3% respectively).

Creative arts disciplines also had the lowest proportion of staff entering their technical career via any other vocational qualification (3%), and the highest proportion who transitioned from another role and/or applied for an available role. They also had the lowest number starting their career with PhDs (rounding to 0%), as well as the highest number with a bachelor's degree as their highest qualification upon entry (55%, with a further 21% holding a master's). This is thought to follow a general pattern of experienced creative arts practitioners and freelancers entering HE technical teaching roles as part of a 'portfolio career' (holding multiple part-time jobs alongside each other), something generally not seen in other technical disciplines.

Technical managers agreed there were differences in the qualifications of applicants between disciplines, which generally reflected expected or desired qualifications. Technical managers within engineering disciplines, for example, prefer vocationally trained candidates.

Research technicians and core facility/technologies technicians had the highest likelihood of starting their technical career with a PhD, followed by technical managers and research and teaching technicians. Teaching technicians were the highest proportion with bachelor's degrees as their highest qualification upon entry (26%), and the lowest proportion with PhDs (8%), second only to support technicians (3%).

There were also significant differences in selected entry routes depending on which type of workplace respondents were employed within.

Respondents from Russell Group HE institutions were significantly more likely to enter their technical career via academic training or qualifications than respondents from any other HE institution. Respondents from post-1992 institutions were three times less likely to enter via an apprenticeship than respondents from any other HE institution type, and significantly more likely to have transitioned from another role, which would align with skilled practitioners moving into technical teaching roles within creative arts disciplines.

When comparing respondents from any HE institution with those from any RI, we found those in HE were significantly less likely to report entering via academic training or qualifications, but more than twice as likely to report entering via an apprenticeship. These comparisons could be heavily affected by selection bias, however, due to the low overall numbers of RI respondents (151, or 9% of total) and the overrepresentation of bioscience specialists within that group (64% of RI respondents compared to 25% of all other respondents).

Apprenticeships

Since 2017/18, HESA staff records have included a marker to indicate whether a member of staff is receiving apprenticeship training and, if so, at what level.

According to HESA records, only 1% of the HE technical workforce received apprenticeship training during 2017/18 or 2018/19 (280 and 285 FTE respectively), although this proportion rises to almost one in 10 for technicians aged 25 years or younger (9% in 2018/19). The two discipline-specific HESA cost centres with the highest numbers of apprentices were both within engineering, although greater numbers were listed within generic cost centres. While overall total reported numbers are low, and the majority of apprentice technicians are under 25 years, our findings also suggest that apprenticeship training is not exclusively being used for school leavers, with a handful of HESA apprentices aged 50 years and older, and one of our surveyed apprentice technicians previously holding a master's degree. There are caveats around the accuracy of HESA data for technical staff, as discussed earlier in this report, but this does point to an opportunity for HE employers to further utilise their Apprenticeship Levy – funding that may already be available but under-utilised – to train and upskill new and existing technicians.[60]

Previous employment

HESA staff records include data on previous employment, which can provide information about how individual technicians entered their employment with their current employer, but not necessarily how they entered their technical career.

Unfortunately, a significant proportion of technical staff have their previous employment listed simply as 'unknown/not applicable' (22% in 2018/19, down from 34% in 2012/13). Of those known, the majority were listed as 'private industry/commerce in the UK' or 'other employment' (54% in 2018/19), with only a smaller proportion listed as 'student' (11%), or from another HE provider or RI (13%). This likely supports the argument made elsewhere that geographical location is more important to technical staff than workplace type when choosing employer, when compared to academic staff.

[60] https://www.gov.uk/government/news/key-facts-you-should-know-about-the-apprenticeship-levy

David De-La-Haye, Sound Technician, Newcastle University

Recruitment of technical staff within UK higher education and research

Motivating factors to choose a technical career

When survey respondents were asked why they chose to enter a technical role and/or career, over two-thirds cited their interest in the subject or area of work as a key factor, ahead of job availability, involvement in practical work and job security (see Figure 14).
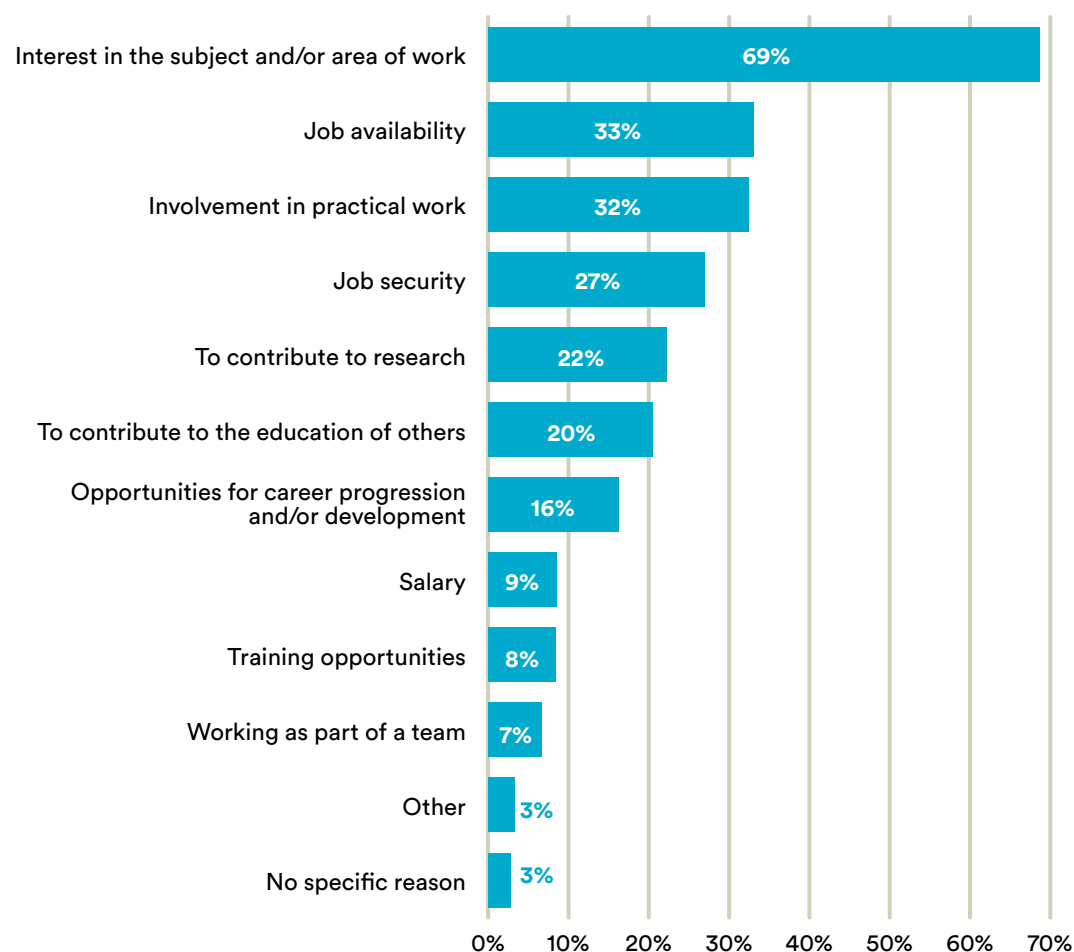

Figure 14: Common motivations for entering a technical role and/or career.

Source: TALENT Survey of UK Technical Staff 2021: "What were the key reasons you chose to enter a technical role and/or career?" (n=1766)

Respondents who entered their technical career with a degree (bachelors and above) were significantly more likely to select job availability as a key motivating factor, although this proportion was even higher when considering only those entering with a master's or PhD (42%).

Respondents who held a PhD upon entering their technical career were significantly less likely than their peers to select opportunities for training or career progression, or salary, as key factors, but were almost twice as likely to select job security (46% cf 24%). PhD-holding respondents were also significantly more likely to select job availability (40% cf 25% for all pre-degree entrants), and contribution to research (42% compared to 11% for all pre-degree entrants). Entrants with master's degrees were well-aligned with PhD entrants in terms of job availability and contribution to research, but not in terms of job security, which suggests this may be uniquely important to postdoctoral staff who no longer want precarious contracts – the norm within academia for postdoctoral staff – but more stable contracts found within technical posts.

Respondents who began their career with GCSEs or A-levels as their highest qualification were significantly more likely than others to select opportunities for training and career development as key motivating factors.

UK technical managers' views on recruitment

In focus groups held with UK technical managers, it was agreed that, while there was still a mix of qualifications and experiences held by job applicants, there were increasing numbers holding university-level qualifications, including 'overly qualified' individuals with advanced academic qualifications applying for jobs at even very low grades. These suggestions align with similar points reported by Lewis around 'overqualification' in the context of certain localised technical workforces as well as a wider national context within the UK (more so than in other European countries).[61-63]

Participants in our focus groups agreed that applicants increasingly holding more academic-focused qualifications was likely due to a combination of factors, including general societal changes within the UK, with increasing numbers of school leavers obtaining university degrees as a default and an evolving UK graduate job market.

While it was pointed out that there are cases where more academic routes might be beneficial for certain technical roles, the general consensus was that vocational routes, apprenticeships and trainee roles were not currently used enough as valuable routes into technical careers.

> Overall, technical managers desired a greater balance of technical staff and recruits coming from vocational routes, as well as academic routes. Role requirements differ by discipline and role, but recruitment is currently skewed too far towards only academic routes.

The importance of experience, potential, aptitude and attitude were highlighted as being vital to success within technical roles, and applicants holding higher degrees might not be suited to these roles if they lack these attributes.

"You can have a PhD, but [...] can't organise a laboratory, [...] can't organise a workshop, [...] can't plan, [...] can't do the safety and make sure that everything is ready to go. [...] those are the facets of operational management. So, you can have a PhD and have the aptitude towards operational management, or not have a PhD and have those same attributes."

Technical Manager (Focus Group, March 2021)

Technical managers identified that, although low in number, where apprenticeships were used they still attracted many well-qualified candidates, suggesting they could be expanded as attractive routes into technical careers. One participant suggested they felt there was greater use of apprenticeship schemes and on-the-job training within industry, although Lewis reports similar findings in his exploration around industrial biotechnology.[62]

[61] P. A. Lewis and H. Gospel. (2011) Technicians under the Microscope: A Study of the Skills and Training of University Laboratory and Engineering Workshop Technicians. See: **https://www.gatsby.org.uk/uploads/education/reports/pdf/he-techn-final-report.pdf**

[62] P. A. Lewis. (2016) Technician Roles, Skills, And Training In Industrial Biotechnology: An Analysis. See: **https://www.gatsby.org.uk/uploads/education/reports/pdf/industrial-biotechnology-technicians-report.pdf** (accessed 23 January 2022).

[63] P. A. Lewis. British Journal of Industrial Relations, 2020, 58:3, 617–643, Developing Technician Skills for Innovative Industries: Theory, Evidence from the UK Life Sciences Industry, and Policy Implications. **https://doi.org/10.1111/bjir.12532**

Some technical managers emphasised that technicians can grow into their roles and this should be reflected in the recruitment process, and time allowed for this growth and development in role, rather than requiring applicants to be immediately ready. Benefits to hiring people with lower-level qualifications and training them into the role included ensuring development of the right skills for the job, and building loyalty.

" Rightly or wrongly, I still try to use the apprentice route whenever I can because I believe in talent management and succession planning. "

Technical Manager (Focus Group, March 2021)

One issue raised concerning the increased number of applicants with higher academic qualifications, was that these candidates may push others with lower academic qualifications down the list of priority, or prevent them from proceeding to interview stage altogether, regardless of whether they have a better aptitude for certain technical roles. It was felt this may result not only in the loss of good candidates with lower qualifications, but also potentially hiring the wrong person for a role. This related to a feeling that more highly qualified people sometimes do not want to learn the basics of a role, or cannot do it, and become disenchanted very easily. It was felt there is sometimes a greater willingness to learn by recruits with lower qualifications. This aligned with comments reported by Lewis in his exploration of industrial biotechnology technicians, in which he explored the idea of an abundant and ready supply of graduates in the UK, fed by a national systemic bias towards HE qualifications rather than FE or vocational qualifications. He described this as a tempting short-term positive for employers (who accordingly would not have to host their own apprenticeships), who then saw long-term negatives in the lack of practical ability of many of these graduates and a comparatively higher turnover of graduate employees who became dissatisfied with their work or their salaries.[64]

The benefits of hiring people with the right mindset, qualities, and the ability to pick up skills on-the-job was a sentiment echoed across all our groups of technical managers. Technical competence, proactivity, and people skills were all sought-after qualities in technicians, whereas their level of qualification was of much less concern. Whether through employment, sandwich degrees or training routes, candidates having some prior hands-on experience was deemed extremely beneficial.

" We actually changed the way we were recruiting because our [previous] recruitment process had been kind of led from, essentially, recruiting [from an] academic perspective. It was advertising nationally and getting picked up internationally, and what we were getting were people who were overly qualified without the technical background, and a) possibly couldn't do the job, and b) we couldn't keep them. So, we actually shifted the emphasis. Personally, I would sooner recruit somebody with a basic qualification background who has some technical competence [and] preferably has experience as a technician, than somebody who is more highly qualified. "

Technical Manager (Focus Group, March 2021)

Through this and other comments, it was suggested that, rather than aiming recruitment at a national level and focusing on academic qualifications, recruiting locally from either local school communities or local graduate communities – with a focus on skill and/or aptitude – might be more likely to produce candidates willing to learn and commit to technical roles and careers.

To do this, raising the profile of technicians and technical careers was seen as important, both among the local community through school and community outreach (potentially through regional partnerships) and also HE students. Suggested ways of doing this included regular inclusion of technical staff in university publicity, as well as within published research.

" As long as we can get the right person in the job, that is the most important thing, and we mustn't shift our focus from that. [...] And if they're not quite right now, can we develop them and grow them into it over the next 3 to 5 years? "

Technical Manager (Focus Group, March 2021)

Recruitment processes and job descriptions

Job descriptions were a common theme of discussion, including the importance of having accurate job descriptions for roles being advertised. A number of these technical managers worked in institutions that had moved to generic job descriptions, with some reporting this had led to a loss of detail and accuracy about the role and role holder, while others reported their institutions used the same job descriptions for professional services staff as for technical, despite the obvious inherent differences within many of these roles.

Participants felt that technical roles were more closely aligned to academic than professional services roles, and that their job descriptions should accurately reflect the responsibilities of the ultimate role holder. Another participant, however, felt that adoption of generic job descriptions – with the option to add further parts for specific roles – had improved their overall quality because their previous system included job descriptions that were poorly written and inaccurate, thus limiting the pool of suitable applicants.

Another point raised was the need for job descriptions to be written and/or reviewed through the lens of equality, diversity and inclusion. Use of language and focus on academic qualifications could limit the pool of candidates who apply to any given role, including the loss of potentially very capable technicians. It was suggested that a better balance between skills and academic qualifications would be beneficial, with a more holistic approach taken to recruitment, particularly given the need for technical staff to have a well-honed range of skills, including people skills and pastoral support provision, to practical affinity with equipment and technology.

Connected to this was the suggestion that specific questions relevant to the role be used to assess the particular skills and qualities required. Accurate and considered job adverts, and the inclusion of a practical test at interview stage, were key examples of initiatives reported to be beneficial to recruitment processes. Targeting recruitment to local talent pools was also recommended.

One manager highlighted how their institution now had a dedicated HR colleague specialising in technical roles, who had developed a good understanding of them, which was ultimately beneficial to the recruitment process.

" I would like a clear job description. At present, it is very ad-hoc to the point that I actually do not know what is expected of me. "

IT Specialist (Survey of UK Technical Staff, March 2021)

Such a lack of clarity around roles and expectations is a concern, not only because they are unlikely to be working within a productive environment, but also because it is one of six key areas identified by the Health and Safety Executive Management Standards as a major stress risk factor.[65] If not managed properly for any given workforce, such a lack of clarity can have implications associated with poor health, lower productivity, and increased rates of absences and accidents.

Another manager emphasised the importance of making sure the technical voice is heard during discussions about recruitment and filling roles:

" [At my institution we have] almost a dedicated [human resources (HR)] business partner that is with technical services for the long haul, and they do pick up that understanding. When you have an HR business partner that changes on a six-monthly basis, they never really build up the wider appreciation of the technical role. "

Technical Manager (Focus Group, March 2021)

Case study

Job descriptions written by technicians for technicians

Generic job descriptions written by technicians for technicians were introduced at the University of York (UoY) in April 2019. These descriptors offer transparency of job specification, as well as the skills and competencies required for technical staff working at a particular grade, and are a useful tool for performance review discussions. A comparison of all available technical grades has been published, which illustrates in detail to the UoY technicians how they can work and develop their careers flexibly across departments and teaching and research disciplines.[66]

64 P. A. Lewis. (2016) Technician Roles, Skills, And Training In Industrial Biotechnology: An Analysis. See: **https://www.gatsby.org.uk/uploads/education/reports/ pdf/industrial-biotechnology-technicians-report.pdf** (accessed 23 January 2022).

65 HSE webpages. See: **https://www.hse.gov.uk/stress/standards/index.htm** (accessed 23 January 2022).

66 From a submission to our open call for views and evidence by the University of York.

Recruiting PhD holders

During our focus group discussions, some managers highlighted the need for some technical roles to be filled by applicants with PhDs, such as facilities manager positions, roles requiring very specialist knowledge likely gained through a PhD, or technical roles described as 'semi-academic'.

While acknowledging that some PhD-holders and postdoctoral staff applying for technical roles might be treated with suspicion regarding their long-term motivation and/or longevity, reasons given for why such candidates might apply to technical roles, included a challenging national job market, higher job security within technical roles compared to academic roles, or because they did not want to follow a traditional academic career pathway. It was also suggested that some might just like the appeal of a technical type of role, due to its high level of variety, greater opportunities to focus on ground-level science, and the excitement of creating practical solutions to arising problems.

> *Fourteen years ago, I finished my PhD and at the time, applied for a technical post because that is what I knew I wanted to be. I love the aspects I had undertaken in my PhD, which were all the kind of support, the teaching, the demonstrating, the kind of showing others, developing new techniques, all of the attributes I really liked. I think, at the time, I was viewed with utter suspicion [...] In fact, I remember the person who appointed me saying, 'We never take people with PhDs because they want academic careers'. I think what I've noticed over the last several years is it has shifted, and actually, certainly within our faculty, a lot of people have PhD's. But it's not the reason we appoint them, because it's about how you demonstrate the skills you've got and how you're going to apply them within the role and it doesn't matter what your qualifications are, it's what you can do.*

Technical Manager (Focus Group, March 2021)

It was generally agreed that, as with any applicants for a technical role, applicants with PhDs should continue to be appointed due to their skills and experience, rather than by virtue of having a particular qualification.

Retention challenges

Motivating factors to leave the technical profession

In total, 47% of respondents to the national survey of technical staff reported they had considered leaving the technical profession within the past three years, while 51% said they had not. Two per cent preferred not to say. Over half of those aged 26 to 45 years had considered leaving, with those aged 36 to 40 years the most likely to consider it (56%).

Of those who had considered leaving, nearly two thirds suggested a lack of opportunities for career progression (65%), followed by a lack of recognition of work contributions (44%) and salary (39%).

Research technicians were significantly more likely than those in other job roles to consider leaving because of their contract coming to an end, or a lack of job security. Technical managers were more likely to suggest a poor work-life balance was to blame, whereas research and teaching technicians were significantly more likely to highlight a lack of recognition for contributions as a key factor.

Career progression

When asked, only 19% of survey respondents said they could see clear career progression available to them as a member of technical staff. This point was regularly expanded upon in open questions and in follow-up focus groups, including through use of phrases such as 'glass ceiling' and 'dead men's shoes'.

It was highlighted that very few progression opportunities were available beyond a certain level (hence, a low 'glass ceiling'), and those few that did exist tended to be filled for extremely long periods of time, resulting in a large backlog simply waiting for that role holder to retire (hence 'dead men's shoes', a phrase prevalent throughout our focus groups with technical managers, and previously reported in a similar context by Lewis).[67]

Our technical manager participants reiterated a lack of available progression opportunities, leading skilled technicians away from specialist skilled technical roles, creating a loss of technical skill, often into reluctant managerial roles. Due to the limited opportunities for career progression, it was pointed out that technical staff often have to move sideways or leave their institution to progress. Some technical staff often have parts of their role that blur the line with academic positions – for example, with certain teaching commitments – and one manager suggested that, in their experience, technical staff can end up being 'lost' to academic positions.

It was pointed out that this system does not encourage long-term retention and increases the likelihood of staff abandoning their career or leaving HE and research sectors for other areas or sectors, or to industrial equivalents. It was also pointed out that this system can create reluctant managers who do not actually want to manage people or projects, but who enter these roles simply because it is the only option open to them.

> *There is a glass ceiling on technical staff promotion. There is no incentive to improve skills or carry out work well. Moving into a more managerial role is the only way up the pay scale. There seems to be no reward to becoming better and more skilled in a technical role.*

Research Technician (Survey of UK Technical Staff March 2021)

Disparity with academic staff

In a series of focus groups with the wider UK technical community (all disciplines and job roles), one commonly raised theme of contention was that of disparity within the sector. It was felt that disparities across job families, different institutions and different departments within a given institution were major concerns for technical staff, affecting how valued they felt within their own workplace. This was commonly linked to lowered motivation and loyalty as a workforce.

One particularly strongly referenced disparity within the focus groups (both among technical managers and the wider technical community) was around career progression of academics compared with technical staff.

It was a common point that the closeness of technical staff to their academic colleagues meant that differences in career progression opportunities were felt more keenly. The perception was that within academia, an individual is largely promoted according to how 'good' that person is at their job, as measured by a relatively well-defined set of metrics (regardless of how appropriate or otherwise those particular metrics might be). As technical staff, however, the person is not promoted: instead, it is the role that has to be expanded to allow a person to progress by regrading it. This stems from the Framework Agreement for the Modernisation of HE Pay Structures[68] which was introduced in 2003. It was generally felt by research participants that this model does not allow for technical staff to be rewarded for excelling at their job, and prevents a progression of technical staff along a linear career pipeline. While this was highlighted as a key concern, there was also some acknowledgement of flaws in the academic career model, including challenging workloads, high levels of responsibility and pressure, and insecure contracts for early- and mid-career academics.

The reported overall feeling of disparity was likely a combination of increasing responsibilities and roles of technical staff, believed to encroach on and blur with those of academic staff, without an accompanying progression in career opportunities, as well as a lack of sufficient opportunities to regrade expanding roles.

Indeed, concerns raised weren't solely linked to differences between regrading and the promotion system, but were linked to a perception that the regrading system was simply not being utilised in a functional manner for technical workforces.

One key challenge identified was that technical job roles are generally poorly defined and/or understood; it is extremely difficult to convince institutions to expand a role, or recognise an already expanded technical role via regrading, if that member of staff's original role was neither well-defined nor understood.

It was also pointed out that, in many cases, a job role will evolve and increase in complexity over time, with staff often taking on extra duties that are not recognised in terms of compensation, nor reflected in their job description, nor reviewed as part of a discussion regarding role responsibilities and duties.

Further, it was felt that caveat statements, such as "And any further duties necessary for the department", or similar, were being used to cover permanent expansion in workload, roles and responsibilities of technical staff over many years, while avoiding an accompanying increase in recognition or reward. Participants indicated these concerns were fairly commonplace and were likely key factors regarding motivation and retention of technical staff.

[67] P. A. Lewis and H. Gospel. (2011) Technicians under the Microscope: A Study of the Skills and Training of University Laboratory and Engineering Workshop Technicians. See: **https://www.gatsby.org.uk/uploads/education/reports/pdf/he-techn-final-report.pdf**

[68] **https://www.ucea.ac.uk/our-work/collective-pay-negotiations-landing/Framework-Agreement/**

Barriers to a successful career

A 2019 Wellcome Trust survey explored research culture among UK researchers, with predominantly academic staff respondents. They identified 'job insecurity', 'lack of funding' and 'unmanageable workload' as key barriers to a successful career as a researcher, and key reasons to leave their research community.[69]

In contrast, 'lack of opportunities' and 'lack of support' were the two answers most commonly selected by respondents to our national survey of technical staff (see Figure 15).

When respondents were separately asked an open question about what change would have the greatest positive impact on them as individual technical staff, 'opportunities for career progression' and 'greater visibility and recognition' were each referred to more than twice as often as any other theme. When asked the same question but referring to the wider technical community, rather than themselves as individuals, the same two themes were again more than twice as likely to be mentioned. There concerns were reiterated throughout our focus groups.
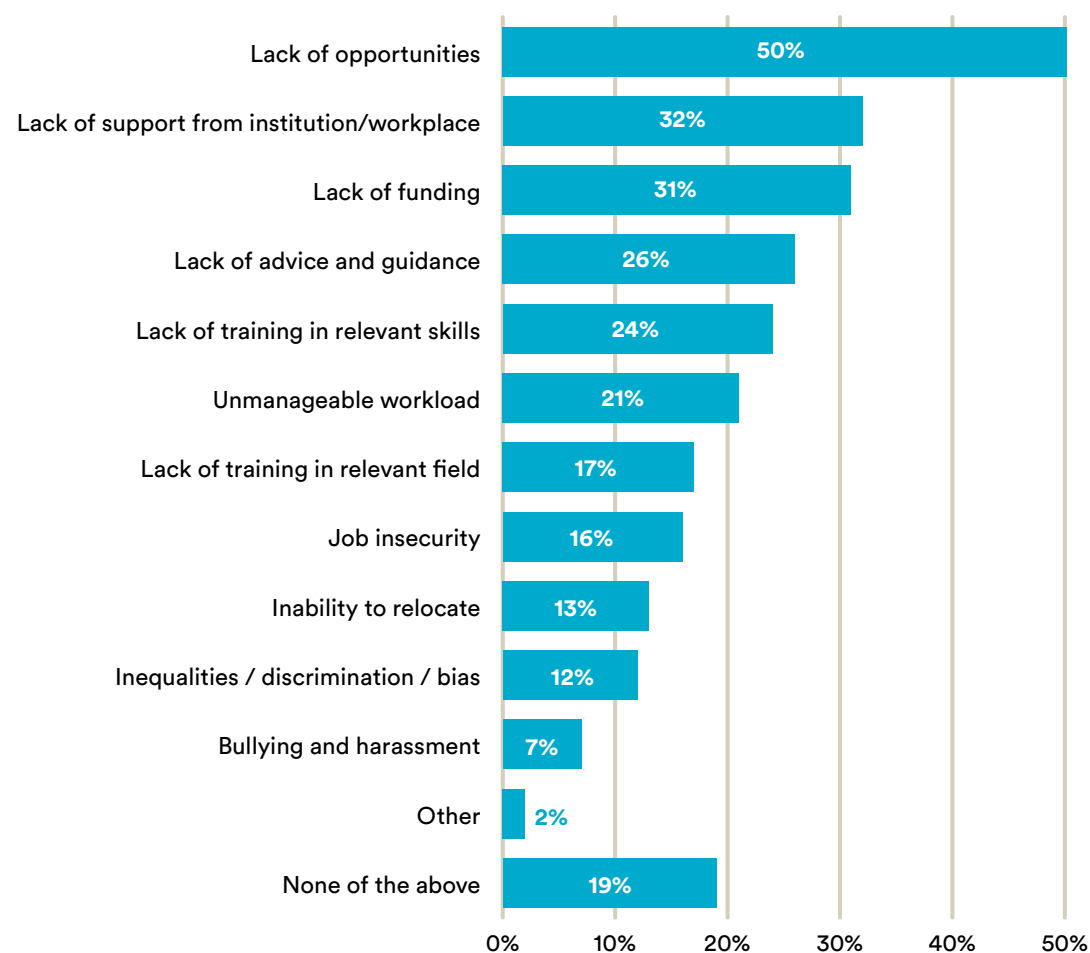
Figure 15: Common barriers to successful careers as technical staff.

Source: TALENT Survey of UK Technical Staff 2021: "In general, do you face any barriers to achieving a successful career as a technician / technical role-holder?" (n=1760)

[69] Wellcome webpages (2020). See: **https://wellcome.org/reports/what-researchers-think-about-research-culture** (accessed 14 November 2021).

Q: What single change, if any, do you think would have the greatest positive impact on the wider technical community within the UK?

A: Nearly half (47%) of respondents referred to better recognition of technical staff, and nearly a third of respondents (30%) referred to greater career progression and/or better defined career pathways and professional opportunities.

Those technical staff who had considered leaving the technical profession were significantly more likely to identify at least one barrier to their success as a technician, when compared to those who had not considered leaving. Some of the most significant differences were around barriers such as 'Inequalities/discrimination/bias' (those who had considered leaving were four times more likely to identify this as a barrier), bullying and harassment, lack of support from their institution, and lack of opportunities (all approximately twice as likely).

Teaching technicians were more likely to identify 'lack of opportunities' as a barrier, technical managers were more likely to identify 'unmanageable workload', and research technicians were nearly three times more likely to identify 'job insecurity'. Respondents within the creative arts were nearly twice as likely to identify 'inequalities/discrimination/ bias' as a barrier when compared to those from any other discipline.

UK technical managers in focus groups also regularly referred to salaries and funding of technicians being a key retention challenge.

EDI and protected characteristics as barriers to success

Disabled technical staff who were surveyed were also significantly more likely to identify a range of barriers to their career success, including 'Inequality/ discrimination/bias' (nearly three times as likely – 30% compared to 11%), 'lack of opportunities', 'bullying and harassment' (twice as likely), 'lack of advice and guidance', 'lack of training in relevant skills', and 'inability to relocate' (nearly twice as likely).

There were no significant differences between male or female respondents when identifying barriers to their success but, as identified within the HESA data, even in those disciplines with a majority of female technical staff, this majority was not reflected within more senior or managerial positions.

There were, however, some slight differences by age, with respondents aged 31 to 40 years significantly more likely to report 'lack of opportunities' and 'lack of advice or guidance' as barriers to success, when compared to all other respondents.

When considering ethnicity, only one in 10 respondents (11%) from any white or any Asian ethnic background identified that 'Inequality/discrimination/ bias' was a barrier to their success. Although sample sizes were low, selection of this barrier was up to three times higher for those respondents from any black ethnic background (33%) and any other ethnic background (27%). Those from any black ethnic background were also significantly more likely to identify 'lack of training in relevant field' as a barrier (50% compared to 17% of remainder).

These differences suggest a need for increased awareness of the differing experiences of staff within technical roles, dependent on a range of factors, including protected characteristics such as age, ethnicity and disability. It identifies the importance of inclusion of technical staff within institution and sector-wide equality, diversity and inclusion (EDI) initiatives, as well as identifies the need for targeted action to help develop those underrepresented staff to create, and take advantage of, future opportunities and work together to reduce barriers to success.

Retention: Work-life balance and a career for life

UK technical managers did reflect on a number of positives regarding retention of technical staff, including how many technicians see their role as a job for life, supported by more senior roles being filled for a very long time. In our focus groups within the wider technical community, all participants were more than willing to discuss the favourite aspects of their role, which overwhelmingly fell into three main categories: 'engaging with students'; 'variety'; and 'solving problems'.

Responding to the national survey of technical staff, 82% agreed or strongly agreed they felt proud to be part of the technical community (54% strongly agreed).

> 68% of survey respondents said they would recommend a technical career to someone who was considering it.

Over two-thirds of respondents (68%) agreed they would recommend a technical career to someone who was considering it. The majority of respondents were similarly positive about recommending their current workplace and/or department to other technical staff.

The majority of survey respondents (58%) agreed that they 'hope[d] the remainder of [their] career will be in the technical profession', although the greatest agreement was in respondents over 46 years, and the greatest disagreement was in those 35 years and younger. There were very similar findings when respondents were asked whether they 'hope[d] the remainder of [their] career will be with [their] current employer'.

Omar Aboelazayem, Technician Specialist, University of Nottingham

Career transitions and movement within the sector

Over two-thirds of surveyed respondents indicated they had not changed employer since starting their technical career, nor ever moved to another department within the same employer. Nearly three-quarters had never moved to an employer in a different city or region of the UK, and over 90% had never moved to an employer outside of the UK. Technical staff who did make a career transition cited 'career progression and development' as the key reason, selecting this option almost twice as often as any other motivating factor.

While these data only capture transitions of those who were still technical staff when surveyed (and therefore does not represent those who have left technical careers altogether), the findings were well supported within our focus groups with technical managers and the wider technical community. Our findings suggest two key points:

1. Technical staff tend to stay local and within the same geographical region, rarely moving location to different regions or countries.

2. Technical staff rarely make career transitions to different employers (when compared to academic HE colleagues).

Technical managers said technical staff are far less willing to move location than academic staff and are more likely to stay in a role if it is local to their home. The managers argued that technicians' lower salaries may prohibit moving around as much as academic staff, but also that some cities and regions did have multiple opportunities for technical staff. One manager pointed out how many technicians had been lost to industry during the COVID-19 pandemic, however, and another identified many had been lost to voluntary severance.

In a 2018 paper, Savage[70] suggests that, within the creative arts, it is becoming increasingly commonplace for technical staff to transition out of technical roles to take up academic teaching positions.

HESA staff records contain a 'reason contract ended' and an 'activity after leaving' data field, aiming to provide information about why a staff contract has been discontinued and what kind of employer a role holder moves to once they have left their post.

These datasets for technical staff include a high proportion of incomplete data, but what is there suggests a technician leaving a UK HE provider is significantly more likely to move to work in the private sector, at a RI and/or 'other education provider', than they are to move to another HE provider. This further supports the suggestion that technicians prefer to stay local and would rather leave their sector or technical career than move large geographical distances to remain within their sector.

These findings suggest technical staff generally want stability and opportunities to develop within their current location and with their current employer. So, improving strategic succession planning and skill sustainability is likely to be more straightforward for technical workforces than for others. If technical staff feel supported by their institution and are provided with sufficient opportunities, their retention is likely to be extremely high, keeping skills and expertise within an institution and the sector.

Case study

Career Profile:
Industry to Higher Education
James Yeatman,
University of Birmingham

As a former Cyclotron engineer, James used to find it really exciting to tell people he 'fixed particle accelerators for a living'.

But he's since made the move out of industry and into HE, where he's now a technical manager at the University of Birmingham. Instead of producing nuclear medicines, he is now involved in some 'very meaningful forward-looking research' into renewables, hydrogen and how to remove carbon from the power grid. "It's a good career move and a step up for me," says James.

He describes one of the key advantages of moving from industry to HE as the wealth of technical experience and mechanical skills he has brought with him to his role at the University of Birmingham. He believes this has given him an edge when overseeing operations, helping him to understand why equipment might not be working or computer software has gone wrong.

It was word of mouth that made him aware of the career possibilities that exist in HE. He says: "I didn't really expect there to be that many particle accelerators in universities. It makes obvious sense now I'm here, but before I wouldn't have even thought about it."

70 T Savage, Art, Design & Communication in Higher Education, 2019, 18:2, 201-218, Challenging HEA Fellowship: Why should technicians in creative arts HE be drawn into teaching? **https://doi.org/10.1386/adch_00007_1**

Succession planning and sustainability

Technical staff within our focus groups highlighted concerns over a potential 'missing middle' of technical talent: technicians were retiring in the older age groups and trainees were being recruited at very young ages, without sufficient joined-up thinking to provide adequate succession of acquired skill and expertise to future generations.

> *With everything being pared to the bone, and reducing the numbers of technicians, and having a big disconnect between the lower grades and the upper grades, [with] not a lot in the middle, there's a real problem with succession planning: if someone does retire, there is literally no one available to fill the gap. And I know that is an issue with a couple of groups I can think of off the top of my head [including my own group].*
>
> *I don't think there's enough acknowledgement from management [whether school or faculty or other] that there needs to be some sort of planned succession in place. You can't just wait for somebody to leave and as if by magic they'll be someone else who can slot in. [But] that's the way it's been operating for quite some time. It wasn't like that when I first came here 10 years ago: [there] was a little bit more slack in the system [and] more opportunity for training, then they just decided to pare everything back to the bare minimum, so when one person goes it has a monumental effect on an entire group.*
>
> Teaching Technician (Focus Group, July 2021)

Longer-term strategies and succession planning are needed for technical communities, considering the skills and responsibilities of technical staff, the size of the workforce and the potential progression of roles. These long-term strategies need to be evidence-based, with an understanding of the community, the environment and competing sectors.

As discussed in Section 11, regional partnerships could potentially be a vital route to sustainable succession planning due to combined resources and forming a critical mass of like-minded technical staff within a given geographical location. Interviewed technical managers highlighted the potential benefit of regional partnerships for networking, equipment and resource sharing, and training. Where regional partnerships are not possible, it was suggested more informal secondment opportunities, or other centralised training opportunities, could be beneficial to improve succession and the sharing of skills and expertise, and reduce the risk of single-point failure (caused by losing a single employee).

Technical managers also mentioned the impact of COVID-19-related changes to roles, highlighting how additional responsibilities may have been taken on alongside previous responsibilities, leading to increased workload, which could become unmanageable over prolonged periods.

> *I think it pays dividends, probably, to think about the longer-term strategy right from the offset. [...] I think we have a bit of a mix where some [managers] don't have a view of their roles and structures within their schools [....] – how do we map this out so that when someone leaves over here, you're growing someone to perhaps take on part of some of what their role is?*
>
> Technical Manager (Focus Group, March 2021)

In focus groups with the wider community, it was reiterated that a lack of understanding of technical roles and responsibilities added to the difficulties of long-term succession planning for the technical workforce. It was felt that the difficulties senior institutional leaders and HR departments had in understanding what it is that technicians actually do limits successful succession planning and joined-up thinking about progression, from apprenticeships to entry level roles, from trainee or junior technicians to more senior roles, and knowledge transfer from those near retirement.

Participants stated that technical staff who were retiring from their workplaces – of which there were anticipated to be many in the coming years – would be taking with them a wealth of knowledge, expertise and experience that would be difficult to replace. If technical roles and responsibilities are not understood, then these roles, skills and expertise are not likely to be suitably replaced when staff retire.

This links to the potential importance of integrating technical expertise strategically within an institution's HR department, not only for short-term involvement within recruitment processes and/or job description reviews, but also for longer-term succession planning, helping prevent expertise gaps and losses.

Case study

Creating Career Pathways
Simon Breeden and Nik Williams, University of York

Carving out career pathways within the technical workforce has been a problem that has sat on the 'too hard to do pile' for years, admits Simon, Head of Technical Services at the University of York. But thanks to the Technician Commitment, work to correct this really took off in 2017.

Now a career development structure has been created – supported by the National Technician Development Centre – using a family of generic role descriptors to help staff see how they can progress their careers. And Nik, HR partner for Sciences and Research and Enterprise at the university, is working strategically with senior leadership to make sure the right people are involved at the right time – among many other things.

One of the first tangible achievements – as well as the generic role descriptors – is the introduction of rolling secondment opportunities, so a young grade 5 can take an opportunity to work at grade 6 one day a week to get some experience, for example, so they feel able to take an opportunity when it next becomes available. Plus, the university has recently got a grade 8 technical specialist role agreed with HR. Until this point, career development had very much been led by the individual.

There is currently limited opportunity for knowledge transfer from more senior technical staff, particularly in smaller departments and/or more isolated roles. It was stated that often roles from which people have retired are not filled, with the slack being taken up by the remaining technical staff. This adds to their burden, but again without increased recognition.

Technical staff reported often going 'above and beyond' to plug gaps caused by poor-succession planning, working increased hours and taking on extra responsibilities as colleagues retire around them. This pattern has raised concerns due to its lack of sustainability and likelihood of dire consequences if continued unchecked.

What single change, if any, would have the greatest positive impact on you or your technical community?

> *A greater number of technical roles – there are never enough technical members of staff to deal with the volume of work being requested and there is visible fatigue within the technical community I work in.*

> *Hiring additional competent technical staff. Current staff tend to be massively overloaded, and spend most of their time firefighting urgent issues and trying to keep normal teaching or research going. Technical staff do not have the slack to work on lower priority projects, interest projects, or self-development that is not immediately needed to address urgent emerging issues.*

> *Recognise understaffing. Employers need to recognise that technical staff need time to explore and research complex subjects, perhaps informally, and that they aren't just there to do a specific job that's been laid out for them. Sometimes, in some jobs this is possible, but often departments are so understaffed there is no time for testing different solutions, or for reflection on a task or thinking about how it could have been done better.*

> *Current workloads are unsustainable and rely on technical staff working unpaid and long hours despite the institution['s] supposed commitment to work-life balance and fair pay.*
>
> Technical Staff (Survey of UK Technical Staff, March 2021)

It was suggested that a period of overlap and/or handover between retiring technical staff and their replacements would be beneficial for sustainable knowledge transfer of the requirements of their role, particularly those duties which are poorly understood by others or which are not accurately reflected by their job descriptions. The practicalities would have to be explored, but it was felt the use of part-time or job-sharing options would likely increase the feasibility of such a scheme, and encourage a cyclic system of retention of technical knowledge and gained experiences within an institution.

Professional Development

To ensure future skill requirements are met, it is important that managers and institutions take a strategic approach to the long-term skill development needs of their technical workforce. Provision for technical staff should at least be as available and role-relevant as it is for staff in other job families, if not more so, due to the high level of specialist skill and expertise needed in many technical roles, and the reliance on technical staff to not only maintain and manage significant resources, but also to train others to do so. The influence of individual technical staff can be extremely wide-reaching when we consider their longevity in post and the huge number of individuals they can train, support, or work alongside, as well as the processes they develop and the standards they instil in the wider workforce Accordingly, it is imperative that these individuals are upskilled where appropriate so the standards they instil, and the impact they have on staff and students across many different roles and levels, is both current and of the highest quality.

Types of opportunities

When asked, nearly two-thirds of respondents to our national survey identified a desire for more technician-specific training opportunities (see Figure 16). These findings were backed up by our focus groups and open survey questions.

> *Most of the training is generic for personal skills that do not reflect my technical role and [do] not help my career progression.*
>
> Technical Manager (Survey of UK Technical Staff, March 2021)

Nearly half of all respondents identified a desire for more placements and secondment opportunities, and over a third of respondents identified a desire for more technician-specific mentoring schemes.

> *[Regarding secondments and mentoring:] Learning how other teams solve similar problems without changing jobs would be a great way to improve our work. Sharing ideas across institutions.*
>
> IT Specialist (Survey of UK Technical Staff, March 2021)

Female technical staff were significantly more likely than their male peers to support greater availability of mentoring, shadowing and placement schemes, as were technical staff aged 26 to 30 years old and those who had been technicians for three to five years. Slightly more senior technicians (five to 10 years in technical roles) were significantly more likely to specify training and mentoring opportunities that were external to their organisations, as were respondents from creative art disciplines, who also identified a greater desire for external placement and/or secondment opportunities.

Technical staff at universities were significantly more likely than their RI counterparts to identify a need for further technician-specific training opportunities in general, which could suggest a difference in training provided in universities compared to RIs.

Another common theme was the desire for managerial and institutional support for technical staff to take advantage of professional development opportunities when available. Examples would include ring-fencing a set number of days per year for technical staff to engage in professional development opportunities, and protocols to allow these staff to be released, with cover where appropriate. It was highlighted that these day releases needed to work in practice, rather than just in theory, and parallels were drawn to the Researcher Development Concordat,[71] which states:

> *Institutions must provide opportunities, structured support, encouragement and time for researchers to engage in a minimum of 10 days' professional development pro rata, per year, recognising that researchers will pursue careers across a wide range of employment sectors.*
>
> Researcher Concordat Principle from the Researcher Development Concordat (September 2019)[72]

The lack of training and professional development opportunities for technical staff was also a common theme of discussion during our focus groups with UK technical managers, including the need for time, space and a cultural expectation for staff to take advantage of training opportunities when available.

> *When I started, I had day release, I could improve myself, I could get further on, I had people that were training me. I also had a good system within the university because there were [many] more technicians in those days than there are nowadays. So, I had a good support system where I could actually develop [...] [The infrastructure is] just not there anymore.*
>
> Technical Manager (Focus Group, March 2021)

Offering appropriate professional development opportunities for technical workforces is a necessity for employers of technical staff who hope to have access to the necessary skills and expertise to support emerging developments within future research, innovation and education. Due to the impact technicians have on students, researchers, projects, and the general running of many aspects of HE and RI environments and infrastructure, investment in upskilling technicians and exposing them to examples of best practice throughout the sector are likely to be paid back many times over by improved productivity and efficiency throughout the system, and more impactful responses to change and emerging requirements.

Technician-specific training — 63%
Placements and/or secondments — 46%
Technician-specific mentoring schemes — 37%
Shadowing schemes — 30%
Other — 3%
None of the above — 17%
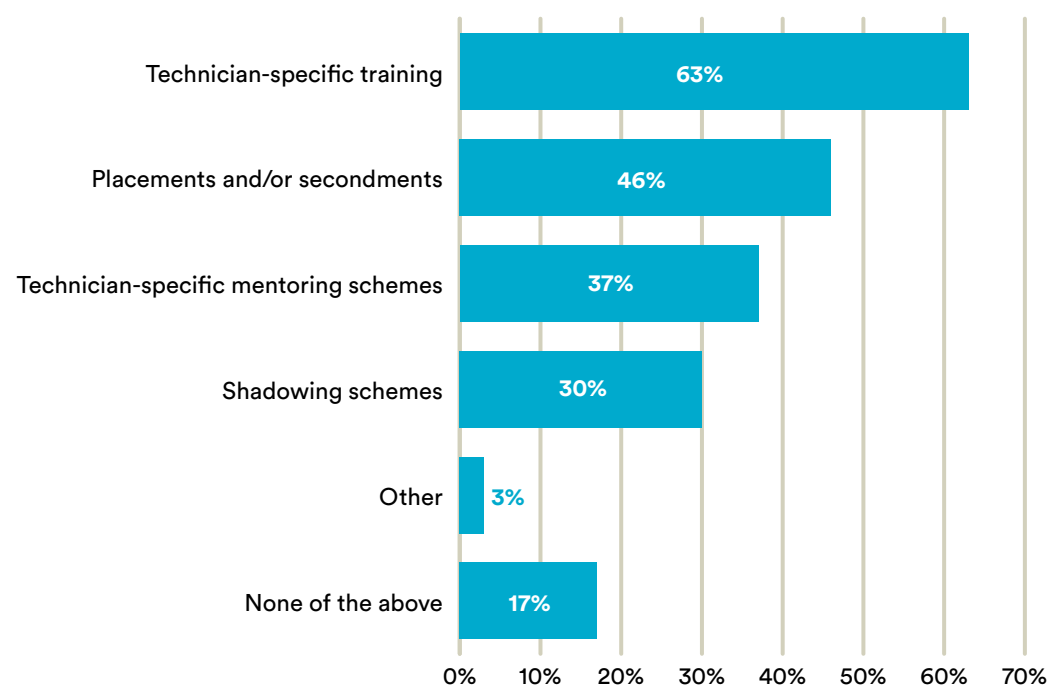
(axis: 0% 10% 20% 30% 40% 50% 60% 70%)

Figure 16: Professional development opportunities which technical staff desire to be more readily available.

Source: TALENT Survey of UK Technical Staff 2021: "Are there any particular types of training or professional development opportunities that you would like to be more readily available to you?" (n=1760)

71 Vitae webpages. See: **https://www.vitae.ac.uk/policy/concordat/full** (accessed 23 January 2022).

72 The Concordat. (2019) The Concordat to Support the Career Development of Researchers. See: **https://www.vitae.ac.uk/policy/concordat/Download_Concordat_PDF** (accessed 14 November 2021).

Technical staffs' priorities for skill development

In Section 11, we discuss the sector-wide perspective of the emerging roles and skill needs of UK technical staff within HE and R&I. But first, in Figure 17 we show the perspective of technical staff and technical managers themselves: when survey respondents were asked about what types of skills they thought they needed to develop in the next three to five years, they prioritised those which were specific to their role as a technician, whether related to specific apparatus, equipment, computing-skills, or to health and safety, rather than generalised transferable skills. The main exception was a high positive response towards people management.

In general, the technical perspective shown in Figure 17 showed good alignment with the sector-wide perspective discussed in Section 11, with high recognition of the need for upskilling in new apparatus and equipment for emerging research areas, as well as computer-based fields around AI, robotics, virtual reality (VR), and more. Further areas identified included project management, people management, and health and safety skills, which will all be important for technical workforces regardless of particular discipline area.

Respondents within the creative arts were nearly twice as likely as others to identify a need for developing their own teaching/teaching-related skills, again reaffirming the particularly strong focus on teaching held by creative arts technical staff, as explored further in Section 11.
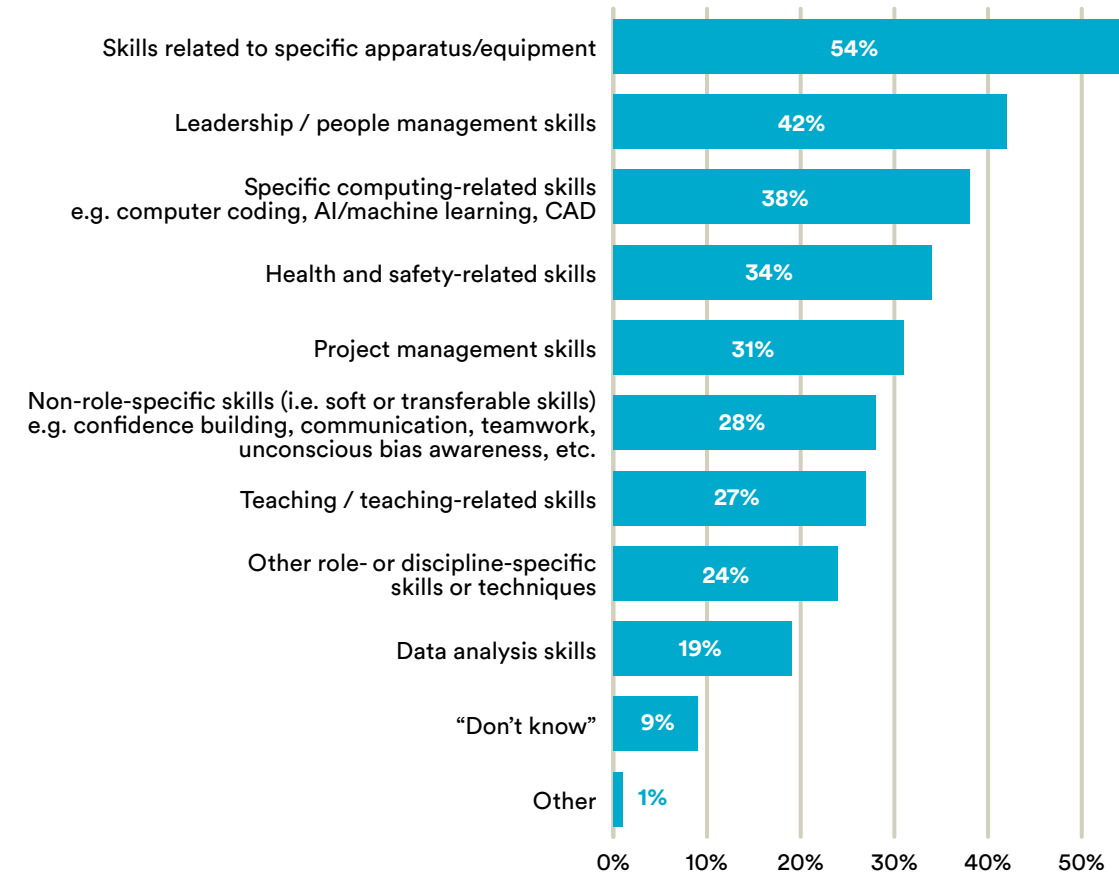
Skill	Percentage
Skills related to specific apparatus/equipment	54%
Leadership / people management skills	42%
Specific computing-related skills e.g. computer coding, AI/machine learning, CAD	38%
Health and safety-related skills	34%
Project management skills	31%
Non-role-specific skills (i.e. soft or transferable skills) e.g. confidence building, communication, teamwork, unconscious bias awareness, etc.	28%
Teaching / teaching-related skills	27%
Other role- or discipline-specific skills or techniques	24%
Data analysis skills	19%
"Don't know"	9%
Other	1%

Figure 17: Skills which technical staff think they need to develop over the next three to five years.

Source: TALENT Survey of UK Technical Staff 2021: "Are there any particular skills, or types of skills, that you think you need to develop over the next 3 to 5 years?" (n=1760)

Mary Aspinall, Technical Officer, Manchester Metropolitan University

Professional registration and accreditation

Lewis and Savage have previously commented on the potential benefits of technical staff engaging with professional registration schemes and/or accreditation processes (such as with the Science Council or AdvanceHE, for example), to provide a framework for continued professional development, as well as to provide confidence of practice.[73, 74]

When asked, 73% of survey respondents thought greater support for professional registration would have a positive impact on technical staff in the UK. Within our follow-up focus groups, technical staff commented on how important support would be for those hoping to explore professional registration, while others noted that associated costs would not be covered by their institution, despite a equivalent costs being covered for academic staff.

Conclusions

The staff we engaged with were extremely proud to be part of the technical community and could clearly identify aspects of their roles they loved, but they were also clear about a range of barriers to their success as technical staff, and the technical workforce in general – particularly around sustainability and succession within technical workforces.

A high proportion of the technical community entered their career following academic degree qualifications, including master's and PhDs, with a much smaller proportion entering via vocational and/or apprenticeship routes than previous generations. There were identifiable differences according to specialist disciplines, with technical staff within traditional science disciplines significantly more likely to have entered their technical career following PhDs. While higher academic qualifications were seen as valuable for particular technical roles, many technical managers highlighted the importance of a diverse and sustainable workforce with appropriate mindsets and practical skills, and that vocational routes, apprenticeships and development of individuals within trainee roles were currently underutilised as ways to attract or recruit new technical staff.

Within recruitment processes, this lack of understanding had a negative impact on the ability to attract or identify candidates who would be most suitable for technical roles and careers. Beyond recruitment and succession planning, this lack of understanding and clarity around roles, expectations, and required competencies also negatively impacts the functionality of regrading processes for technical staff, which were generally felt to be underutilised and not fit for purpose within current systems. The lack of progression opportunities within regrading structures that deliver little movement was held in contrast to an academic promotion system that sees visible movement and progression of individuals on a regular basis. For regrading systems to work in practice, clearer guidelines are needed regarding skills, competencies and appropriate duties of technical staff at different levels, as well as opportunities to track expansions of job responsibilities over time.

Technical staff report a desire for improved access to professional development opportunities that are tailored to technical staff and their specific needs. Of at least equal importance, however, is the necessity of support – time, financial and cultural – to allow technical staff the capacity to take advantage of such opportunities when they are available. While acknowledging this need for support of others, it is also important that technical staff continue to engage positively and proactively with opportunities, and pursue options to take ownership of their own development. Parallels can be drawn with the ownership that researchers are encouraged to take for their own career and development as part of the Researcher Development Concordat principles.[75]

Our recommendations

R2 **Funders and employers of technical staff in higher education and research should recognise the blurring of boundaries between technical and academic roles. They should provide opportunities and mechanisms to move between career pathways and across sectors.** This aligns with the Government's *Research and Development (R&D) People and Culture Strategy* which will provide support for flexible, cross-sector training programmes to encourage more movement & collaboration between academia, industry and the third sector.

R6 **Employers of technical staff, funders, and sector bodies (e.g. professional associations and learned societies) should support outreach and public engagement activities regarding technical careers in local schools and colleges to increase visibility of technical career opportunities to young people.** A good example of such activity is the Gatsby Charitable Foundation's Technicians Make It Happen campaign, which highlights the varied technical career opportunities available across all sectors.

R7 **Employers of technical staff should broaden access to technical careers in the sector by utilising and expanding entry routes to include both vocational and academic pathways.** We urge employers to invest in apprenticeship and trainee technician programmes, and to host work placement schemes for technical qualifications where possible (e.g. T-level placements in England). We encourage funders to support and facilitate investment in new generations of technicians through the creation of funding opportunities to support technical traineeships. Funders should encourage applicants to include new apprenticeship positions on bids for major infrastructure investments. The Apprenticeship Levy should be better used to train technicians, and pooled Levy sharing across organisations should be explored.

R8 **Employers of technical staff should ensure inclusion of technical expertise within end-to-end recruitment processes when hiring for technical roles.** This should include utilising technical expertise when compiling role profiles, advice on where to advertise and technical input or representation on recruitment panels.

R9 **Employers of technical staff should ensure visibility of clearly defined career pathways and progression routes, with accurate and standardised job descriptions for technical roles.** Pilot activity should be considered by employers of technicians to explore new opportunities for progression routes akin to those available for academic roles.

R10 **Employers of technical staff, funders, and sector bodies (e.g. professional associations and learned societies) should ensure provision and access to a range of professional development opportunities tailored to technical roles and careers.** For example, technician-specific training courses, mentor-mentee programmes, placements and shadowing opportunities. There should be support from employers and professional bodies to ensure that technical staff can gain professional registration in recognition of their skills and expertise (for example, through the Science Council and Engineering Council licensed bodies, or via accreditation through AdvanceHE fellowships). Equity with other staff groups is key: for example, the Researcher Development Concordat recommends a ring-fenced 10 days' pro rata per year for professional development. Funding bodies should ask in grant applications and post-hoc assessment exercises (e.g. REF and future equivalents) about the professional development opportunities for technicians employed on or supporting research projects.

R15 **Technical staff should engage positively with current and future opportunities that are available to them.** Technical staff and those working with them should raise awareness of opportunities for the technical community. Managers of technical staff should inform and support their teams, encourage participation and celebrate successes.

[73] T Savage, Art, Design & Communication in Higher Education, 2019, 18:2, 201-218, Challenging HEA Fellowship: Why should technicians in creative arts HE be drawn into teaching? **https://doi.org/10.1386/adch_00007_1**

[74] P. A. Lewis and H. Gospel. (2011) Technicians under the Microscope: A Study of the Skills and Training of University Laboratory and Engineering Workshop Technicians. See: **https://www.gatsby.org.uk/uploads/education/reports/pdf/he-techn-final-report.pdf**

[75] Vitae. (2019) The Concordat to Support the Career Development of Researchers. See: **https://www.vitae.ac.uk/policy/concordat/Download_Concordat_PDF** (accessed 14 November 2021).

10

Perception, Recognition and Representation of Technical Staff

We want a future where:

Technical staff are included in, and can influence, strategic planning and decision-making in their organisations and across wider sector initiatives.

This section considers the perceptions of technical staff about their value and contribution, the perceptions of others and how technicians feel they should be within decision-making processes.

Current landscape

Despite the crucial role that technicians play in HE and research, they are often not recognised for their contribution, knowledge, skills and expertise. They have been described as 'invisible',[76] 'unsung heroes',[77] or 'Cinderella staff'.[78]

The Commission sought to explore the perceptions and recognition of technical staff and their representation within institutions in UK HE and research. Key questions that we addressed were:

- How do technicians feel they are perceived and valued by staff and students?
- How are technical skills and expertise understood, perceived and valued by staff and students?
- How are technical staff represented on decision-making committees within their institutions?
- What changes are possible to improve the perception, recognition and representation of technical staff, and what would they prioritise?

Overall, the picture of how valued technical staff feel is fairly negative. They reported that they, their roles and their contributions were not always understood and valued, particularly among more senior leadership in universities, which is reflected in institutional processes and structures. They feel excluded at various levels of decision-making and are not always afforded the same opportunities as other staff groups. These are issues that employers can – and should – address, especially given the importance of their roles to their organisations and as many staff and students highly value the contribution of technical staff.

[76] S. Shapin, American Scientist, 1989, 77:6, 554-563, The Invisible Technician, **https://www.jstor.org/stable/27856006**

[77] Times Higher Education webpages (2012) See: **https://www.timeshighereducation.com/news/research/research-intelligence-technically-indispensable/421798.article** (accessed 24 January 2022).

[78] Times Higher Education webpages (2012) **https://www.timeshighereducation.com/news/firm-footing/421921.article** (accessed 24 January 2022).

Technical staff perceptions of value and recognition

We asked a series of questions in the national survey of technical staff about how valued respondents felt by different groups[79] for the different contributions they make.[80]

Overall workplace contributions

As shown in Figure 18, the majority of respondents reported feeling valued by their technical colleagues, managers, postgraduate students, academic colleagues and undergraduate students (range: 85% – 60%).

Fewer respondents (28%) said they felt valued by senior leadership and 37% reported feeling undervalued by them. Even starker, just under half (48%) of respondents said they felt undervalued by national policymakers, with a mere 3% feeling valued by them.
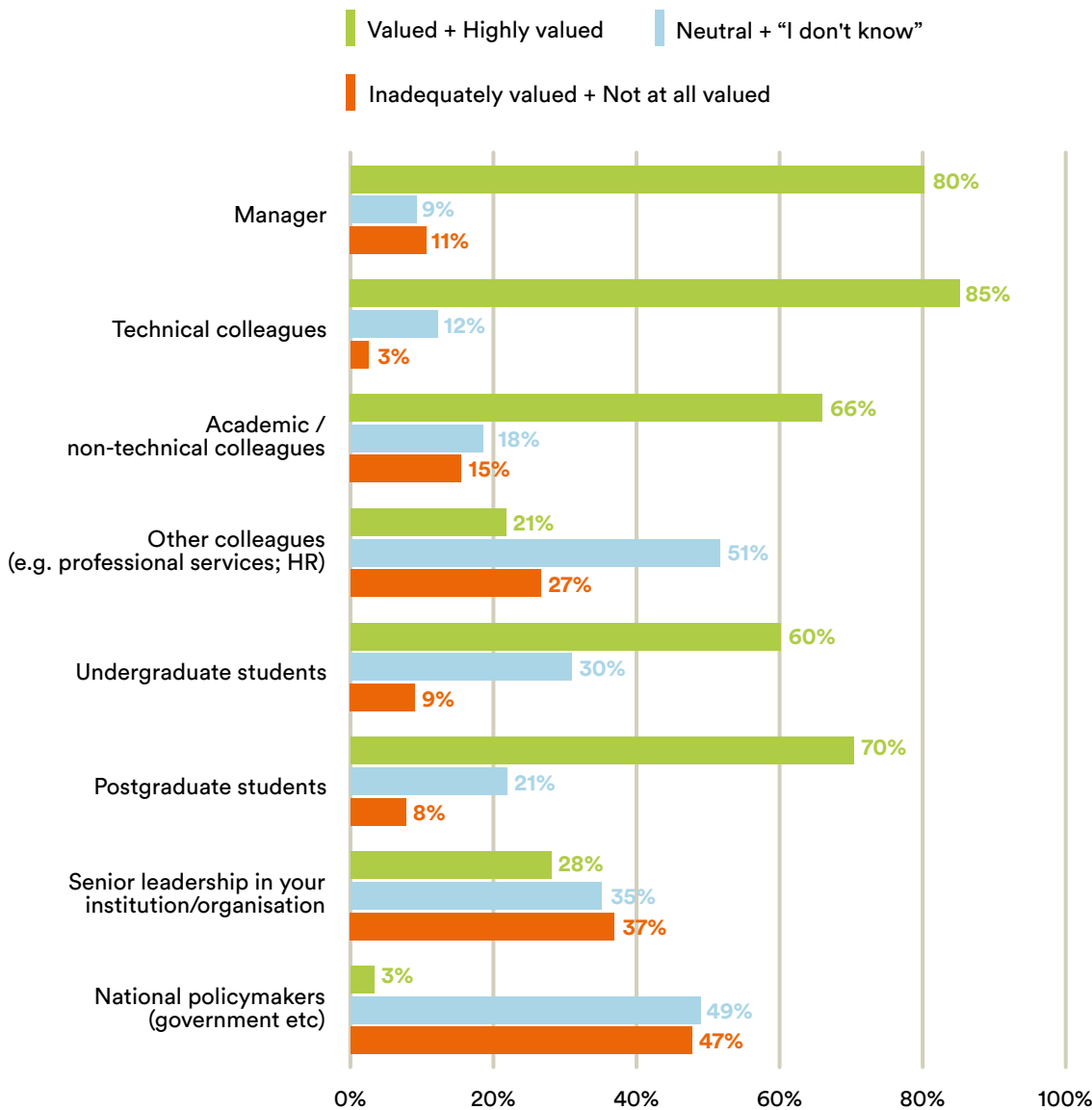
Figure 18: How technical staff perceive their workplace contributions are valued by others.

Source: TALENT Survey of UK Technical Staff 2021: "Overall, to what extent do you feel your workplace contributions are valued by the following groups?" (n=1760)

[79] National policymakers, senior leadership within their institutions or organisations, undergraduate students, postgraduate students, technical colleagues, their managers, academic and non-technical colleagues, other colleagues for example, professional services staff HR.

[80] Teaching, training, research, and their workplace contributions as a whole.

These findings resonated strongly with focus group participants. The lack of recognition from senior leaders and other levels of management within universities was widely felt to be linked to them not understanding what technicians contribute to various endeavours. Many participants said there was a significant structural gap between technicians 'at the sharp end' and senior leaders, which was difficult to bridge as senior positions for technicians were few in number or lacking entirely. It was also felt that technical staff had to push for recognition rather than being considered an integral part of the institution's staff. They felt this lack of recognition was reflected in various ways, such as career and salary paths, but also in communication within institutions, which they felt often excluded technical staff.

Contributions to teaching and learning activities

How valued technical staff feel about their teaching activities largely reflected their responses to how valued they felt for their overall contributions, with slightly higher numbers reporting feeling valued by undergraduate and postgraduate students, technical colleagues and managers.

Teaching technicians were more likely to feel valued for teaching than technicians who taught but were in a research role.

Holding a teaching qualification made little difference to how valued technicians felt. There were some differences in the activities technical staff carried out and how valued they felt; those involved in background support for the learning environment or in the design of resources were more likely to feel valued by academic or non-technical colleagues than those involved in other teaching activities.

Technical staff working in design, creative and performing arts were more likely to feel valued for their contribution to teaching, which they are more likely to be involved in than technicians in other disciplines.

Teaching was mentioned by some respondents when asked about changes that would have a positive impact on them as a technician, and on the technical community. Technical staff want to be recognised and acknowledged both formally and informally for their contribution to teaching – particularly by leadership – and to have promotion and pay opportunities they feel are commensurate with the work they do and in line with opportunities for other staff groups. Some respondents also mentioned having more opportunities for, and input into, teaching, including curriculum planning and marking, and support for gaining teaching qualifications.

Technical staff in the focus groups had mixed feelings about recognition for teaching. Many reported it was their favourite part of the role and that students and academic staff who worked alongside them readily showed recognition. However, others felt there was little to no recognition, or that the appreciation they felt from colleagues was lost higher up the management structure. A number of participants suggested that raising their visibility to students, such as on course documentation, or being introduced to students at the start of their courses, would help them to feel included and valued as a member of the teaching team. Others suggested raising the visibility of teaching activities to colleagues.

> *The university had a town hall meeting recently and they got the senior [technical] manager of the teaching labs to give a presentation about what they've been doing and that was very well received and it was a fantastic opportunity for her to be able to present to the wider community and to the senior leadership team exactly what they had to do to make everything possible for teaching. And the feedback that she got, so many of them were genuinely blown away with what they had managed to do and just couldn't believe what they'd made possible. But in the background, I also know they're like dead on their feet.*

Technical Manager (Focus Group, July 2021)

Contributions to research activities

Survey respondents reported similar levels of recognition for their contribution to research as for their overall contributions, with slightly fewer feeling undervalued by policymakers and senior leaders, or valued by technical colleagues and managers. Significantly fewer reported feeling valued by undergraduate students, which is likely to be reflective of their lack of interactions with them in a research capacity.

Those involved in research activities were also asked to indicate their level of agreement with the statement: "Technical staff are usually credited appropriately for their contribution to research and/or research outputs." Most respondents disagreed with this statement (64%), including 28% who strongly disagreed.

There was correlation between those respondents who felt technicians were not appropriately credited for their contributions to research, with those who felt their own contributions to research were not valued by others.

When asked about positive changes that would impact them and/or the wider community, many survey respondents referred to being able to apply for funding, more opportunities and inclusion within research – including supervising students and fieldwork – acknowledgement in papers and other publications, and the opportunity to contribute their skills, knowledge and expertise.

> *Recognition of the role my research experience can contribute in my technical work. Discovery can come from technical staff as well as research lab staff/students/PIs.*

> *Things like the 'hidden REF',[81] whereby someone making a contribution to a research paper is correctly acknowledged/authored, even if they didn't directly provide intellectual contribution.*
> Technical Staff (Survey of UK Technical Staff, March 2021)

Focus group participants repeatedly emphasised the need to credit technical staff in published research. They suggested there should be policies to ensure fair and consistent attribution, as currently they feel it is dependent on the team in which the technician works. Some had policies in place to ensure acknowledgement, but noted that, by the time of publication, this was often forgotten. Participants wanted more inclusive approaches to acknowledgment to ensure that all contributions were recognised. Some participants felt they were seen as a resource for research activities, rather than as individuals contributing their technical skills, knowledge and expertise, which made them feel undervalued.

> *I think there's an expectation that as a technician that your work is just part of the project and that you're not necessarily need to be highlighted as doing something special. [We have] realised that technicians are treated very differently across the board and that sometimes if you're embedded in a research team you're treated more as a recognized researcher, [but in a different role] you're almost like a resource as opposed to people, and I think that goes back to the way that our posts are held. We're post holders, we're not people who are able to progress in the same way as others. So I think that's a frustration where the institutions don't really recognise us as individuals developing our roles because you're just that post holder.*
> Research and Teaching Technician (Focus Group, July 2021)

Lucy Warr, Assistant Technician,
Manchester Metropolitan University

[81] The hidden REF is a competition that recognises all research outputs and every role that makes research possible. **https://hidden-ref.org/**

Contributions to training activities

When asked about their training of other colleagues, the majority felt valued by all groups: technical colleagues, managers and non-technical colleagues (82%, 71% and 55% respectively). Very few reported feeling undervalued by these groups (3%, 12% and 13% respectively).

Those who carried out formal or structured training were more likely to feel valued by all groups than those providing ad hoc training.

Survey respondents were asked if there were any ways they felt they should have been recognised, but were not, in the past three to five years.

Overall, 26% said they did not think they should have been recognised in any additional ways, though this was higher for technical managers and those who had been in their role for two years or less.

Praise and awards

The majority of survey respondents reported they had received informal praise from colleagues and managers (75% and 73% respectively), with few reporting they had not but should have been recognised this way (13% and 18% respectively). Far fewer (48%) had received formal recognition through appraisal or review, but only a minority (28%) felt they should have received this. Teaching technicians were significantly likely to believe they should have received formal acknowledgement in an appraisal (36%).

Focus group participants felt informal recognition was important to helping them feel valued. However, most agreed it was highly dependent on who they were working with as to whether this happened, with particular reference to academic colleagues. Many felt there were still negative, ingrained attitudes towards technical staff and that a hierarchy exists. A couple of participants worked in environments where this hierarchy was not present – one in a RI and another in a relatively new team – and they felt more valued and included as a result. Many also mentioned that a lot of work went unnoticed, or was taken for granted, even though it would have an impact on the functioning of other work, whereas if something went wrong, they were often blamed, or expected to fix it, even if it was beyond their remit. Some participants felt a culture change was needed to make informal recognition more ingrained day-to-day and to challenge the idea of a hierarchy.

> *We get [informal praise] as a facility staff [...] professional personal tweets and comments that get put out and so [...] I find that quite rewarding when some of the PIs will put out a short series of tweets with some work they've done [...] recently and you know, they'll mention the facility that's actually supported that work and maybe name somebody specifically, if they particularly helped generate the data that's in the figure they're showing and so that doesn't tick everybody's box in terms of a reward, but I find that very, very rewarding.*

Technical Manager (Focus Group, July 2021)

> *I think [...] we get the blame but never the recognition. So, if it goes wrong you get the blame for it. But if it goes right, somebody else came up with the idea even though we're doing exactly the same job regardless.*

Research and Teaching Technician (Focus Group, July 2021)

Just over a quarter of survey respondents (26%) had been nominated or received an award, with 12% reporting they should have been recognised in this way.

Awards and rewards were mentioned by several focus group participants as a way of feeling recognised and valued. Where awards were publicised, or an event was held, it was felt these helped raise the visibility of technical work. However, further discussion about such schemes revealed technicians often felt overlooked, or were unclear whether these were open to them, or felt the categories appropriate for them were too vague. Therefore, more technical-specific categories could help, as could clearer communication. Many technical managers involved in the focus groups said they had pushed for recognition of their technical staff through award schemes, whereas others reported a lack of support from managers.

> *[Rewards are] a formal way for somebody to say thanks. So, where it's not a huge amount of money, it's not about the money, it is about that recognition of a job well done or going over and above and [...] technicians obviously are often – and always – going over and above because we never want to let anybody down.*

Research and Teaching Technician (Focus Group, July 2021)

> *[There is a] problem with how the announcements come out about these reward schemes and recognising exceptional performance. [Technicians see the announcements as for other staff groups, so] I make sure that I promote it and say: 'this means you: make sure that you put a nomination in for anybody you feel is eligible'. I contact all of my academics and say: 'your technical staff [...] are eligible for these awards or for those recognising exceptional performance[...]' Now that's what I do, but that's not necessarily consistent with how all the other technical managers cascade that information. So, I think technical services management as a whole needs to be better in how they promote those types of reward schemes and opportunities for awards to technical staff, so that [technicians] know [what applies to them].*

Technical Manager (Focus Group, July 2021)

Financial recognition and promotion

A higher number of respondents felt they should have received financial recognition through bonuses or pay rises above the standard and/or should have been recognised through role progression or regrading than had received recognition in this way. Likewise, more respondents felt they should have been promoted than were. Respondents based at RIs were more likely to have received financial recognition or a promotion, compared to those working at a university.

Financial recognition, promotion and regrading were prominent topics in the survey's open questions. Technical staff lamented the lack of career opportunities available to them and the impact of this on the perception of technical careers. Comparisons to the promotions processes for academic staff were made throughout the open responses. This difference is keenly felt by many technicians as they work alongside academic staff, contributing to research and teaching, feeling they carry out much of the same work but without similar career opportunities.

Focus group participants also highlighted that technicians fill roles, rather than being recognised as individuals with specialist knowledge – as academics are – despite the number of years they have spent developing their knowledge and skills and the qualifications they may have.

Acknowledgement in publications

Only a minority of respondents had been acknowledged in publications, including papers, presentations and blog posts in the last three to five years, 39% for those involved in research activities and 11% for those who were not). Even fewer had been named as an author or co-author (33% for those involved in research and 7% for those not).[82] Nearly a quarter (24%) of those involved in research felt they should have been acknowledged but were not and 15% thought they should have been an author when they were not. Respondents working in biosciences and medicine-based specialisms were more likely to have been named as an author or co-author when compared to other disciplines, such as engineering and chemistry. Respondents based at RIs involved in research were more likely to have been named as an author or co-author (41%), compared to those working at a university (32%). Respondents from both workplace types were equally likely to feel they should have been named but were not. These feelings were echoed in the open questions about changes to benefit them and the wider community, and in the focus groups.

> *A lot of our work disappears into a PhD thesis or scientific paper without proper recognition.*

> *Technicians' input needs to be positively acknowledged in research and teaching by making others aware of the work and expertise we put into projects/lessons.*

Technical Staff (Survey of UK Technical Staff, March 2021)

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[82] Not all respondents who answered this question are involved in research.

Visibility

Technical staff in both the survey and the focus groups felt that they, their roles and technical careers need to be promoted and have more visibility. This would help develop an understanding of them, which would ultimately increase perception and recognition. There were many comments in the survey and focus groups on the invisibility of technical staff and their work, with a feeling this was due to the long-standing sentiment that technicians should be invisible, as for many years the mark of a good technician had been invisibility while carrying out their role, as well as them being discouraged from speaking up.

> " *This would be a culture change [...] Technical staff could make such a bigger contribution towards teaching and research, however, I think there is still a culture of hiding technical staff away in a prep room or equivalent. This is a culture that a lot of technical staff are also comfortable in. My hope for those willing to change and new technical staff is that opportunities are provided for [them] to become front and centre in all aspects of research and teaching. There are lots of good examples of this already happening, but it is a significant culture change for many [with] lots more to do to achieve it.* "
>
> Technical Manager (Survey of UK Technical Staff, March 2021)

Some felt that the vital work of technical staff during the COVID-19 pandemic and the recognition some of this had received, could help provide a platform for technical staff and their work, along with other initiatives, such as the Technician Commitment. However, many noted that their work – and the position they had been in through the pandemic – had not been acknowledged or appreciated adequately, if at all.

Focus group participants suggested a number of things that could help increase the visibility of technical staff, from ensuring they are included on course documentation, being introduced to students and increased representation, through to bigger initiatives, such as media spotlighting and 'showcase' events for technical work and careers. Where these had taken place, it was noted that colleagues, managers and senior leaders were surprised and impressed by the work of technical staff.

Alongside this, it was suggested in both survey and focus groups that professional registration could be beneficial in recognising and demonstrating technical knowledge, skills and expertise.

> " *We're trying to encourage [professional registration] but we've only had about [...] six out of 300 technicians really take it up. We have a few more [who] have done it with the HEA, so I think we're slowly building up momentum. I think it's really worthwhile. I mean, I went for Chartered Scientist last year and was successful and it was a difficult process, but I think [...] the more technicians that go and get professionally registered in some way and recognised for their teaching, I think that will start to improve things for technicians 'cause you're showing you're not just a technician, you are highly skilled, and you have evidence of it. 'cause we forget you just do your day-to-day job. You sort of forget what skills you have. [...] like I'm just doing what I normally do, but it's actually really important.* "
>
> Laboratory Floor Manager (Focus Group, July 2021)

Relationships with academic staff

Technical staff who worked in universities discussed the relationships they have with academic staff in both the survey and focus groups.

While many worked well with academic colleagues, there were some common issues identified. It was noted that the way technical staff were treated, and the respect and acknowledgement they received, was highly dependent on the individual academic and their views towards technical staff and their roles.

> " *[One possible change to create positive impact:] to be valued more by the academic staff within the school. This could be achieved on so many levels, such as asking how I am before telling me how much they need doing by a certain deadline. Not putting me down in front of students. Acknowledging me for my hard work, rather than taking the credit. Telling me I am not working hard enough and getting their samples processed fast enough without considering all of the health and safety policies and protocols that needed to be in place to work in the building during a national lockdown. Stop referring to me as 'just a technician' – there is a very bad opinion of technicians that is still in place today within the academic community.* "
>
> Research Technician (Survey of UK Technical Staff, March 2021)

Inclusion was a key point raised; technical staff wanted to feel more included in the team, particularly around decision-making, which impacted them. Many felt a lack of inclusion led to the impact of changes on them not being considered, or how technical aspects would work – for example, in building design or projects – and demonstrated a lack of respect for their knowledge and potentially additional expense for the institution.

> " *[Regarding] being included in university meetings [...] we had [a] situation, there was a new building, and no one asked technicians about anything, just academics. [...] They told builders what they wanted, and it ended [with a] laboratory without a fume hood, which for chemistry is something you can't imagine.* "
>
> Research Technician (Focus Group, July 2021)

Alongside this, many felt communication could be improved, as they did not hear about things until the last minute, which affected their workloads and wellbeing, or only heard from academic colleagues when something went wrong.

> " *[One possible change to create positive impact:] engagement at the beginning of planning processes – rather than an 'optional' afterthought when delivery is expected.* "
>
> Teaching Technician (Survey of UK Technical Staff, March 2021)

Many felt that if academic staff had a better understanding of technical staff and their roles, this would be significantly improved.
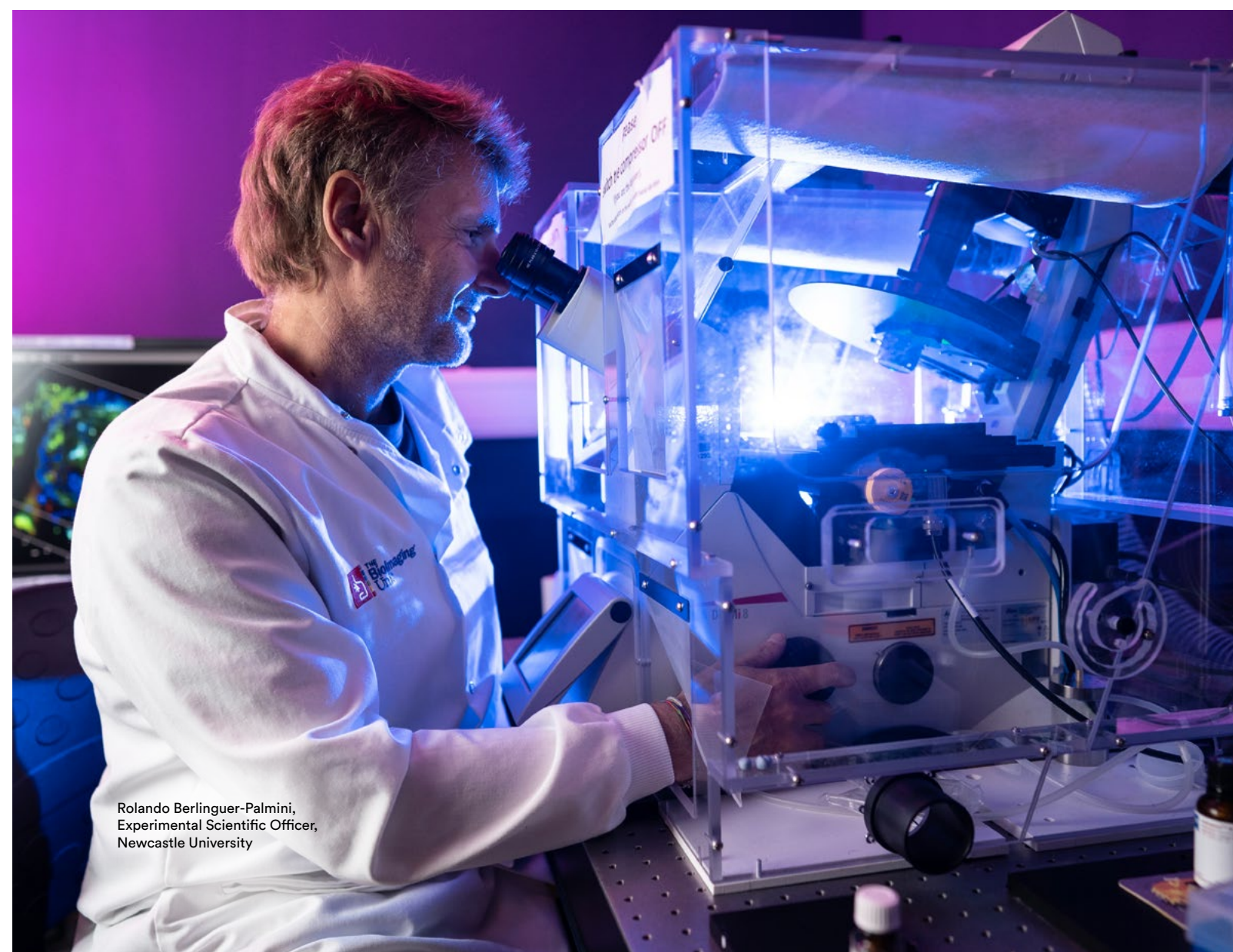
Rolando Berlinguer-Palmini,
Experimental Scientific Officer,
Newcastle University

Staff and students' perceptions of technical staff

We explored the perception of technical staff among their colleagues, students and leaders through a short survey, which asked what respondents think technical staff do, how they work with them, and the value and impact of their contributions.

Perceptions of the role of technical staff

We found that respondents generally recognised a wide range of activities completed by technicians, including, supporting research activities, supporting teaching activities and responses related to equipment, resources and facilities. Participants were more likely to recognise these activities when prompted with a list of options than in response to an open question. For example, when prompted, 81% recognised technicians for their work in health and safety activities, whereas only 8% mentioned these unprompted. Similarly with IT support, 58% of respondents chose it when prompted, but only 8% referred to it in open responses. Providing pastoral support for students was not seen as a common part of a technician's role (23% prompted, 1% unprompted).

Recognition of different technician contributions was particularly high for those who work with them more regularly, or those with a longer history of working alongside them.

Perceptions of the value of technical staff

When asked for a description of technicians and the work they do, 22% mentioned 'essential', 'vital' or 'fundamental' in their response. A further 6% felt technicians were 'invaluable'. There was also recognition that technicians' work is not necessarily valued in HE, with 6% mentioning 'undervalued' or 'overlooked'.

Respondents also gave their impressions of the work and attitudes of technicians. 'Helpful' and 'supportive' were mentioned by 11% of respondents and 'highly skilled' and 'knowledgeable' by 6%.

Respondents were also asked to rate (on a scale of one to 10) how valuable they found technicians' contributions to a range of activities.[83] Over half scored the value of technical staff at seven or more for every activity option (other than 'pastoral care'), suggesting that – for the most part – technicians are valued by their colleagues and students in HE. The lack of awareness that pastoral support is part of a technician's role potentially contributed to its lower score, as indicated by 19% choosing 'not applicable' for this option.

Just over half (55%) found technicians' contributions to supporting research activities very valuable (giving them 10 out of 10), and 52% gave the same rating for contributions to teaching activities. Contributions to health and safety activities were deemed very valuable by 50% of respondents.

Professional services staff were significantly more likely to find technicians' contributions to delivering research activities very valuable, with 36% scoring this 10. However, academic staff were significantly less likely to score the value of contributions to delivering research and teaching activities seven or more.

Those who interacted with technicians daily were significantly more likely to value their contributions to delivering and supporting research activities, providing pastoral support to students, training colleagues and administrative activities – scoring each seven or more.

Perceptions of contribution to research

Academic staff were asked whether they agreed with a series of statements about the contribution of technical staff to research. In total, 64% of these had worked with technical staff on a research project.

82% agreed that technicians are a vital part of the research team, with 59% strongly agreeing. This aligned with the unprompted perceptions around technicians and their work being 'vital' and 'essential'.

Academics also agreed that technicians should be able to apply for research grants (61%). However, only 33% agreed they usually include them on research grant applications.

There was an awareness that technicians are not usually appropriately credited for their contributions to research, with only 20% agreeing they are, and 52% disagreeing. Only 37% of academics agreed they usually include technicians in published research, with biosciences academics more likely to agree (65%) and engineering academics more likely to disagree (36%). However, engineering academics were more likely to include technicians on grant applications (56%) than other disciplines.

Technicians were often included in the planning phase of research projects – 44% agreed they usually do this.

Those who interacted with technicians several times a week were significantly more likely to feel they were a vital part of the research team (90%) than those who interacted less frequently.

Perceptions of impact of contributions from technical staff

In total, 38% of respondents indicated technicians had a strong impact on their work or study, with 21% using the term 'essential'.

Key areas of impact identified were help and offering solutions, teaching on research projects, running labs and lab work, practical sessions, freeing up time and student projects.

Impact of COVID-19 on perceptions

When asked how COVID-19 had impacted the perception of technical staff, the majority (62%) reported no change, however, a third (33%) reported a positive impact. Only 5% suggested there had been a negative impact.

Those who interacted with technicians daily were significantly more likely to report a positive impact than those who interacted with technicians less frequently.

Monika Chhetry, Crop Transformation Technician, John Innes Centre

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[83] Supporting research activities; supporting teaching activities; health and safety activities; training colleagues; IT support, administrative activities; managing other colleagues; delivering research activities; delivering teaching activities; providing pastoral support to students; other.

Representation of technical staff

To explore how technical staff are represented on decision-making committees within their institutions, we carried out an initial audit across eight UK universities and asked a series of questions about representation in the national survey of technical staff, the findings of which were further explored in focus groups.

Initial representation audit

An initial audit of eight UK universities (the Midlands Innovation consortium) indicated there was very limited representation of technical staff at institutional-level, decision-making committees. Technical staff were generally not present on executive institution level committees, though they did enjoy greater representation within departmental and discipline-specific equivalents. If technical staff were represented at institution level, it was most likely to be within an area linked to health and safety, though even this was not the case for most institutions.

At the time of the initial audit, three of the eight institutions had technical staff on an executive committee related to health and safety (although often as a union representative, rather than a specific technical representative), one had a member of technical staff on a committee related to equality, diversity and inclusion, and another regarding people and HR. Another institution included a member of technical staff on a research sub-committee. All other executive committees had zero technical representation, although many highlighted this as theoretically possible, if technical staff were nominated or put themselves up for consideration.

Technical staff's view on representation

The majority (57%) of survey respondents felt technical staff were not adequately represented within relevant decision-making committees in their institutions or organisations, and only a fifth (20%) believed they were. A minority (23%) were unsure, which may suggest they are unaware of possible involvement. Thirty-seven per cent had been in a technical role for two years or less.

Respondents at RIs were slightly less likely to feel technical staff were not adequately represented than university-based staff (44% and 58% respectively). Respondents based in Scotland were significantly more likely to believe technical staff were not represented adequately (69%) compared to the rest of the UK.

There was a positive correlation between perceived value of workplace contributions and belief that technical staff were adequately represented. More than a third (37%) of respondents who believed senior leadership valued their contributions also agreed that technical staff were represented, (compared to 8% of those who felt undervalued by senior leadership).

The majority (71%) of survey respondents said they would consider putting themselves forward to represent technical staff on a committee or were already members of a committee (17%). Just under a quarter (23%) stated they would theoretically consider putting themselves forward for committee membership but did not feel they would be able to do so in practice. When asked why, the most common answers were: they didn't think their opinions would be sufficiently valued (41%); they didn't feel qualified or experienced enough (36%); they had other time constraints (34%); and they did not feel they would be allowed time away from their day-to-day duties (31%). Fewer respondents said they did not like that kind of activity (17%); did not want the extra responsibility (10%), and/or did not feel they had anything to contribute (10%).

Of those who answered 'no', or 'I don't know', just under half (49%) stated they did not enjoy that kind of activity. Following this, the most commonly selected reasons were: they did not feel qualified or experienced enough (39%); they did not feel their opinions would be sufficiently valued (28%); they had other time constraints (27%); they did not feel they would have anything to contribute (24%); and/or they did not want the extra responsibility (24%). Only 9% said they did not feel they would be allowed time away from their day-to-day duties.

Other (open) responses included a lack of incentive to participate, language barriers, temporary contracts, not being well-established or in a senior role, and hierarchical restraints.

As well as institutional-level, decision-making committees, it was clear from the open responses to the change questions that technicians felt excluded from decision-making at various levels.

Representation was further explored in the focus groups. Many participants felt that representation on decision-making committees was vital. One participant said decisions affecting technical staff should be considered 'higher up and earlier on'. It was agreed a member of technical staff should be on relevant committees, although many felt a well-informed representative would also be appropriate. They also felt senior leaders should have adequate knowledge and understanding of the technical workforce and their needs and concerns, to be able to effectively advocate for them at the highest level. In some institutions, participants suggested there was no route into decision-making committees, particularly at the most senior levels – especially where there were no higher-grade technical roles.

Case study

Technical Representation: An 'early warning system' for staff and students
Craig Brown, Loughborough University

Craig is a technical manager who describes himself as 'an early warning system' for what's happening on the ground at Loughborough University.

This new type of role began in 2010, when he joined the Senior Management Team – one of the first roles of its kind.

"I'm a conduit of information both ways," says Craig. "I bring in a different experience that I think enhances what happens with committees, because I've got a different eye for it than someone purely academic or administrative. If I wasn't there, or someone like me, it would be a negative to the school as a whole, not just technical staff."

Craig says he has an eye for health and safety, any dangerous situations regarding equipment, how the university's buildings work and what issues students are experiencing, which other staff, like operations managers, just don't have because he's been there, first as a grade 4 technician to his grade 7 position today. His input helps to overcome issues before injuries or reputational damage occurs. It also helps to build networks and connections, so some issues can be resolved quietly and efficiently, through a conversation or email.

Participants also suggested that many technicians may not feel confident in putting themselves forward for committees or raising their voices and visibility. This was put down to the personality type of many technicians, the sentiment that they have been invisible for so long, and disengagement through feeling undervalued. To raise participation and confidence, participants suggested encouragement and coaching, and having opportunities to see what it is like to participate, as well as ensuring technicians felt heard and were given justification when changes could not be implemented. Focus group participants also said communication around such opportunities was not always inviting for technical staff and reiterated that time constraints were a significant factor in the ability to be on committees. They suggested time could be ring-fenced for this, as well as other professional development opportunities.

> "Technicians weren't really an agenda at [meetings]. To have one technician reporting at each of those every month or every three months has really helped. And to make sure that you have the right person and that they say something, and it's positive, is also really helpful. 'cause it really is important.

Laboratory Floor Manager (Focus Group, July 2021)

> "It's difficult to get people to believe in themselves, especially if it's people that have been there [...] for a long time [...]. And when you spend 15 or 20 years expecting them to disappear back in their hole and get out the way, it's difficult to get people to come forward and actually prove they can do things. Maybe we manage that on a very small scale [...] It's getting them to do small presentations, getting them to try to get [...] professional registration.

Teaching Technician (Focus Group, July 2021)

Raising status and opportunities for technical staff

When asked who was responsible for raising the status and opportunities for technical staff, the majority of survey respondents (79%) felt senior leaders within institutions, as well as technical managers (66%), should have a high level of responsibility for raising the status and opportunities of technical staff.

Other groups identified as having a high level of responsibility were senior academics, professional bodies and/or learned societies and policymakers in government (48%, 41% and 31% respectively). Respondents ascribed medium levels of responsibility to funding bodies, workplace unions and other colleagues (38%, 35% and 37% respectively). Just under half felt technical staff (non-managers) also had a medium level of responsibility.

Technical managers were more likely than the total sample to feel the institution's senior leadership and other colleagues, such as HR and professional services, should have a high-level of responsibility.

When asked what they expected of senior leaders, many focus group participants wanted understanding and respect for technical staff and their contributions. They felt this could lead to them being considered and represented in decision-making and institutional structures.

Managers were seen to have a high level of responsibility for improving the recognition of technical staff, with participants highlighting the dual role of technical managers in supporting those they manage and raising issues with colleagues at higher levels. Some participants discussed how unsupportive managers need to be circumnavigated.

There was also a strong emphasis on the role of individual technicians in making positive changes. Participants discussed the need for technicians to take advantage of opportunities available to them, and to challenge where they felt it was needed. Many participants had examples of when this had been successful, however, it was noted this still needed a supportive manager, and some felt individual technicians should not *always* have to push so hard.

It was also suggested that funders should have some level of responsibility, as they can hold institutions accountable in a tangible way.

Possibilities and priorities for change

In the survey, it was difficult for many respondents to identify one single change that would benefit them or the wider community, and in the focus groups many different things were given as priorities for change, reflecting that a cultural change is needed to improve the perception, recognition and representation of technical staff.

When asked what single change technical staff felt would have the greatest positive impact on them, just under a third (31%) cited greater visibility and recognition. Likewise, when asked a similar question, about a change that would impact the wider technical community, just under half (47%) wanted better recognition of technical staff. Many of these did not expand on this, and just citied increased recognition, visibility and acknowledgement. However, of those that did expand, many stated recognition could be shown through opportunities for career progression, including a defined career path. This was also cited as a priority by several focus group participants. Others also wanted better access and support to undertake training, and for this training to be recognised.

Understanding the technical role and the breadth of activities carried out was identified as a priority, as was understanding technicians' knowledge, skills and expertise and putting these to good use. A major factor for technical staff was inclusion and feeling heard and valued. Many felt better representation and being considered at higher levels in institutions was essential and should be a priority. Raising the profile of technicians nationally was also considered a priority and many felt outreach in schools could be beneficial.

Despite largely feeling valued by their managers, many survey respondents reported wanting more support. There were some who are managed by non-technical staff, which they felt resulted in a lack of understanding of their role, having a further negative impact on how supported – and therefore how valued – they feel.

Networking opportunities were cited as being beneficial ways of sharing best practice and providing opportunities for development. Networking with non-technical staff was also discussed, to further enhance understanding of technical staff and their needs.

Conclusions

Technical staff reported feeling that they, their roles and their contributions were not always understood and valued, particularly by senior leadership in universities. They feel this is reflected in institutional processes and structures. They feel excluded at various levels of decision-making within institutions and that they are not always afforded the same opportunities as other staff groups. These are issues employers can and should address, especially as many staff and students highly value the contribution of technical staff.

Our recommendations

R11 **Employers of technical staff, publishers and other sector bodies (e.g. professional associations and learned societies) should ensure the contributions of technical staff are visible and recognised.** Building on the principles of Contributor Roles Taxonomy (CRediT), publishers should include a required step in the submission process that specifically asks prospective authors to state how they have recognised the contributions of technical colleagues in their manuscript. Higher education institutions should ensure technical staff can be formally recognised as supervisors on student projects where appropriate and develop technical teaching career pathways for technical staff who are leading and developing teaching and learning. Institutions should create opportunities to raise the visibility of technical staff and their roles within the workplace, for example, through institution-wide showcase events. Learned societies and professional bodies should engage more with the technical community by ensuring existing opportunities, conferences and events are inclusive and relevant to technicians and formally support the Technician Commitment. The Future Research Assessment Programme should consider all roles within the research and development ecosystem and explore how teams can be recognised and rewarded.

R12 **Employers of technical staff, funders and sector bodies (e.g. professional associations and learned societies) should ensure technical staff sit on appropriate institution- and sector-level decision-making committees and boards to ensure these groups reflect the community they represent and to provide diversity of views and expertise.** This should be through a seat where possible, or through a designated technical advocate where more appropriate. Employers of technicians should be inclusive of technical staff when discussing sector policy developments, both internally and externally.

11

Emerging Technologies and Technical Skills Required in Research

UKRI (2020)

We want a future where:

There is understanding and recognition of the diversity and complexity of technical roles and their contributions to research, with parity of esteem of skills, knowledge and expertise that matches other staff groups in the sector.

Strategic planning and insight ensures the sustainability of technical skills across the sector, ensuring technical skills and roles meet the demands of emerging technologies and research areas.

Current landscape

Technical staff are vital to research, which is why, with an ever-changing research landscape and the emergence of new technologies, it is prudent to plan for the technical skills of the future to meet demand, both in upskilling current staff and training new entrants into the workforce.

This was captured succinctly by UKRI in their 2020 publication, *The UK's research and innovation infrastructure: opportunities to grow our capability:*[84]

> *To develop the researchers, innovators, engineers, technical professionals and other specialist roles needed to build, maintain and use our infrastructure, we need a strong and interconnected talent pipeline across all sectors and across career stages, and we must offer effective career support. This pipeline must also be flexible, to identify and meet skills and training needs as new technologies develop, or as gaps emerge when supply exceeds demand in both business and academia.*

UKRI (2020)

[84] UKRI. (2020) The UK's research and innovation infrastructure: opportunities to grow our capability. See: **https://www.ukri.org/wp-content/uploads/2020/10/UKRI-201020-UKinfrastructure-opportunities-to-grow-our-capacity-FINAL.pdf** (accessed 14 November 2021)

How our technical staff underpin research

The diverse nature of technical roles means that technicians' input into research is broad, as explained in Section 5. Many of the inputs of technical staff could not be performed by academics and are crucial to research.

To give an indication of the scale of technical staff input in research, of the respondents to the TALENT national survey of technical staff, two thirds indicated they were involved in research activities. In particular, research technicians (95%), research and teaching technicians (94%) and core facility technicians (82%) were highly likely to be involved. As might be expected, those working at a RI (79%) were more likely to be involved in research than those at a university (66%), and those from post-1992 universities were significantly less likely to be involved than those from pre-1992 and Russell Group institutions, reflecting the lower numbers of research technicians in post-1992 institutions.

Those that are involved with research spend a significant proportion of their time doing so, with 31% spending more than half their time, 19% spending 31-50% of their time and 45% spending up to 30% of their time on research activities.

Expected skill requirements

'Skills related to specific apparatus or equipment' (54 %) was the most popular answer selected when respondents were asked what skills they needed to develop over the next three to five years, which was widely chosen by technicians involved in teaching (58%), research (55%) and training (53%). Of particular interest, 38% of technical staff expect to need to develop specific computing-related skills. This indicates there are specific skills technical staff are aware they need to develop to fulfil their roles and future career aspirations.

Current skills challenges

Challenges in meeting future technical skills demand will be significant without strategic planning. In many areas, both academia and industry are already unable to meet demand for technical skills.[85] Employers in advanced materials struggle to recruit experienced, high-quality technicians, the aerospace and automotive industries find it difficult to source technicians with experience of composites, and in industrial biotechnology there is a shortage of control and instrumentation technicians.[86] There is also a shortage of technical professionals with digital, data science and artificial intelligence (AI) skills within the HE sector, with a loss of staff to industry.[87] In 2017, the BBSRC and the Medical Research Council reviewed vulnerable skills and capabilities, identifying computational biologists, bioinformaticians and data analysts across the disciplines surveyed,[88] while current emerging research areas, such as cell therapy, struggle with an adequate supply of technical skills. In the paper, *How to create skills for an emerging industry*, Paul Lewis says this inadequate supply of skills for emerging research areas has two aspects: firstly, it is difficult to recruit staff with the necessary skills in the external labour market. Secondly, the size of the industry in absolute terms is small despite rapid growth, and therefore it is hard to find the necessary suppliers of training to support technical staff's needs.[89, 90]

Emerging research themes and future skills

To understand the skills technical staff need in the future, we first need to understand the areas of research and technology that are emerging. We have worked with Innovate UK and utilised the UK Innovation Strategy, published by BEIS, to identify seven key themes, breaking each into areas of research and technologies (see Figure 19).[91] This has been further supplemented with use of other resources, such as UKRI's 2020 publication, *The UK's research and innovation infrastructure: opportunities to grow our capability*.[92]

However, it is important to note that this is not an exhaustive analysis of all areas of research and, due to the nature of the sources, the examples provided have potential bias for near-market technologies. We call on leaders in other emerging research areas to carry out similar analysis to highlight required technical skills, and to help inform decision-makers target development of the essential skills necessary within sustainable technical workforces.
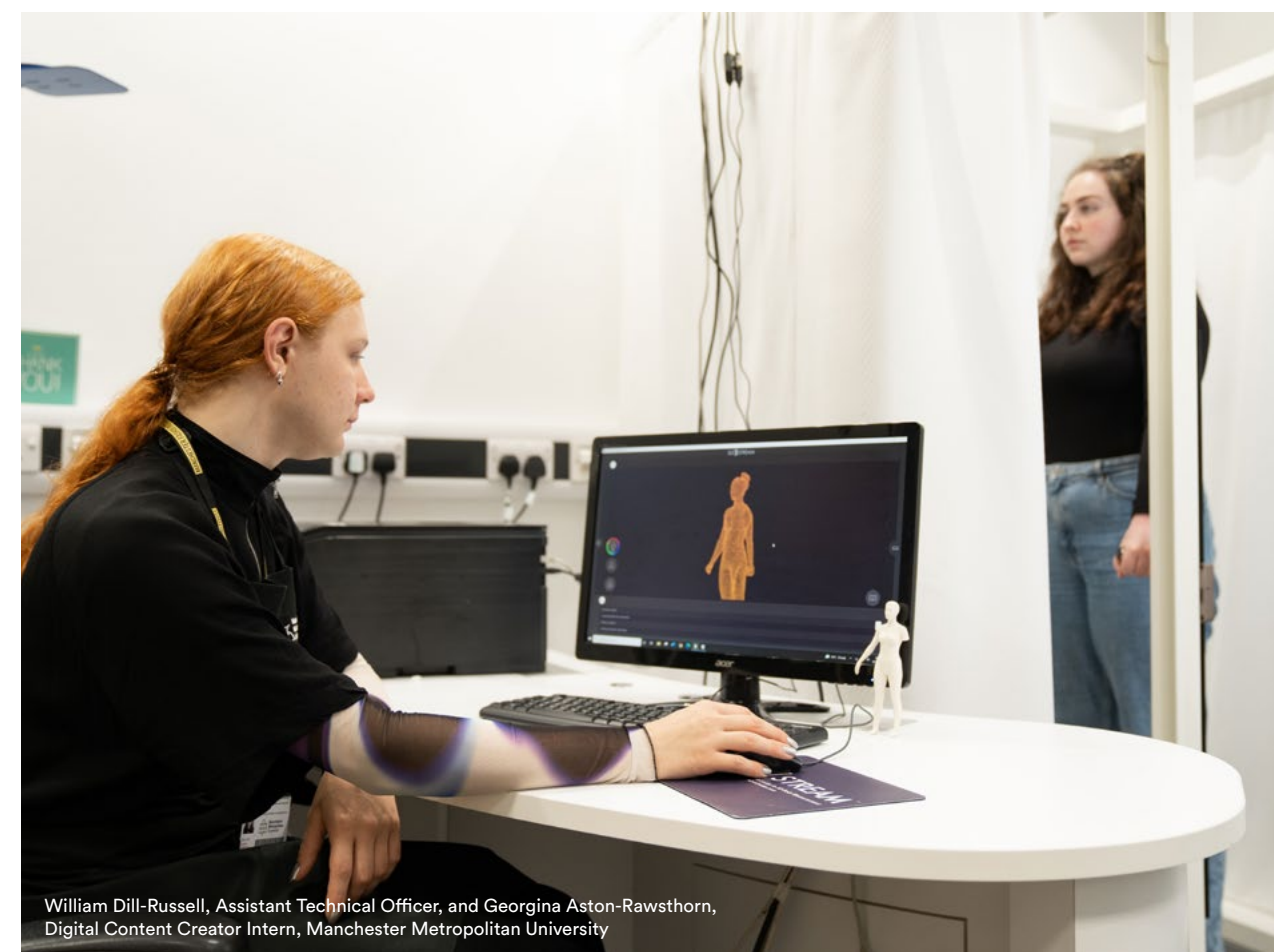
William Dill-Russell, Assistant Technical Officer, and Georgina Aston-Rawsthorn, Digital Content Creator Intern, Manchester Metropolitan University

[85] Russell Group. (2017). Impact of Brexit on the technical workforce at Russell Group universities. See: **https://www.russellgroup.ac.uk/media/5571/impact-of-brexit-on-the-technical-workforce-september-2017-final.pdf** (accessed 14 November 2021).

[86] P.A Lewis. The Training We Need Now: Essays on Technical Training, Life-long Learning and Apprenticeships. (2020) DOI:10.2139/ssrn.3622019

[87] The Royal Society webpages. (2019) See: **https://royalsociety.org/topics-policy/projects/dynamics-of-data-science/?source=post_page** (accessed 24 January 2022).

[88] MRC and BBSRC. (2017) BBSRC and MRC review of vulnerable skills and capabilities. See: **https://mrc.ukri.org/documents/pdf/review-of-vulnerable-skills-and-capabilities/** (accessed 14 November 2021).
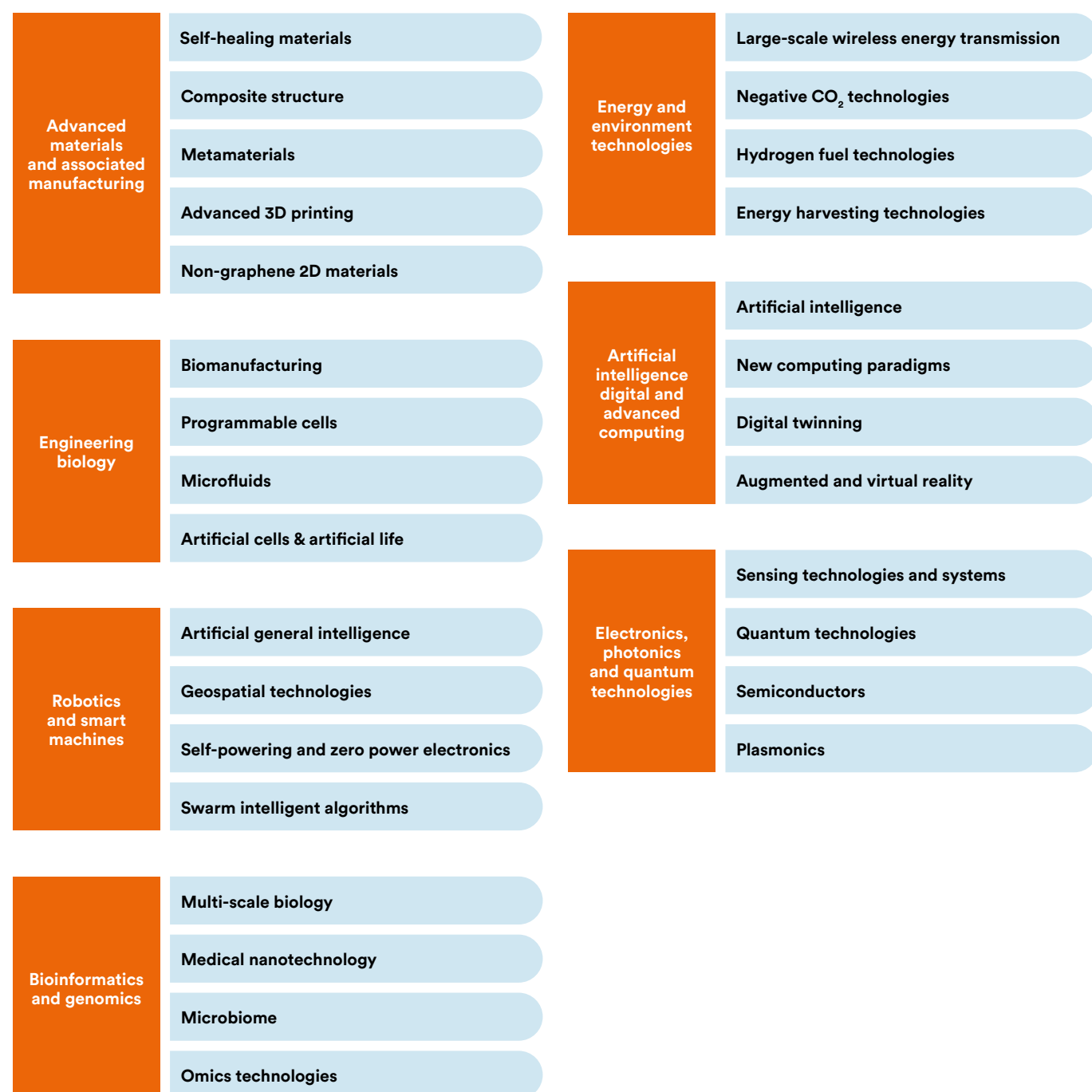
[89] P.A. Lewis (2017) How to Create Skills for an Emerging Industry: The Case of Technician Skills and Training in Cell Therapy. See: **https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2903909** (accessed 14 November 2021)

[90] P.A. Lewis, BJIR, 2020, 58:3, 617-643, Developing Technician Skills for Innovative Industries: Theory, Evidence from the UK Life Sciences Industry, and Policy Implications. **https://doi.org/10.1111/bjir.12532**

[91] BEIS. (2021) UK Innovation Strategy Leading the future by creating it. See: **https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1009577/uk-innovation-strategy.pdf** (accessed 14 November 2021).

[92] UKRI. (2020) The UK's research and innovation infrastructure: opportunities to grow our capability. See: **https://www.ukri.org/wp-content/uploads/2020/10/UKRI-201020-UKinfrastructure-opportunities-to-grow-our-capacity-FINAL.pdf** (accessed 14 November 2021).

Advanced materials and associated manufacturing	Self-healing materials
	Composite structure
	Metamaterials
	Advanced 3D printing
	Non-graphene 2D materials

Engineering biology	Biomanufacturing
	Programmable cells
	Microfluids
	Artificial cells & artificial life

Robotics and smart machines	Artificial general intelligence
	Geospatial technologies
	Self-powering and zero power electronics
	Swarm intelligent algorithms

Bioinformatics and genomics	Multi-scale biology
	Medical nanotechnology
	Microbiome
	Omics technologies

Energy and environment technologies	Large-scale wireless energy transmission
	Negative CO_2 technologies
	Hydrogen fuel technologies
	Energy harvesting technologies

Artificial intelligence digital and advanced computing	Artificial intelligence
	New computing paradigms
	Digital twinning
	Augmented and virtual reality

Electronics, photonics and quantum technologies	Sensing technologies and systems
	Quantum technologies
	Semiconductors
	Plasmonics

Figure 19: Examples of emerging research areas and technologies which will require technical skills and expertise.
Source: BEIS UK Innovation Strategy 2021, and engagement with Innovate UK (UKRI).

This breakdown illustrates areas where research is expected to accelerate and enables us to consider how technical staff underpin this activity as part of research teams.

Advanced materials and associated manufacturing

Development of new materials and their applications will remain an ongoing trend across research and innovation.[93] Areas of focus will include metamaterials, self-healing materials, 2D materials and composite structures. Key to this research will be the synthesis, characterisation, scale up and testing of advanced materials. This means skills will need to be expanded and adapted in these areas. With increasingly complex materials, more sophisticated methods of characterisation will need to be developed, along with the technical skills to use the technology. UKRI has already identified a need to consult the community for coordinated upgrades to national and regional facilities for technologies such as mass spectrometry, while the technical skills underpinning these will require careful consideration.[93]

Alongside material development, advances in the manufacturing of new and existing materials will be pivotal. Areas with significant potential for growth include additive manufacturing, such as advanced 3D and 4D printing, metamaterials and composite manufacture. Adaptation and expansion of highly sought technical skills will be essential to delivering developments in scale up and testing.

Taking printing technology to new scales

Advanced additive manufacturing will rely on a wide range of technical skills. This will include digital design expertise to deliver 3D and 4D structures using mixtures of materials to form complex architectures. 4D printing will require expertise to understand the application of stimuli to change the form or properties of structures. In the implementation and manufacturing step, challenges will include taking printing technology to new scales, from the very small to the large, and integrating multiple materials, including metals. New scales and material combinations will lead to more complex testing and troubleshooting, with technical skills required in the analysing and mechanical testing of these structures.

Engineering biology

Other areas of interest include engineering biology, which will involve the development of biomanufacturing, artificial cells and life and programmable cells using techniques such as CRISPR. Medical biosensors and mobile technologies will need technical skills to develop both the fundamental technology and data transfer, with implementation in non-lab environments, while technical staff will require knowledge of regulatory requirements. It is key to note the cross-disciplinary technical skills essential to understanding both engineering principles and biological materials, so the sector will need to enable technical collaboration across traditional silos and train technical staff with a broad skill set.

Robotics, automation and smart machines

This area is experiencing rapid growth and covers a range of technologies, including artificial intelligence (AI), autonomous vehicles, self-powering electronics, the human machine interface, and technologies using space and satellites, such as geographic mapping. Robotics and AI are areas BEIS believes the UK could become a leader in.[94] However, UKRI has suggested more investment is needed – including in skills – given that the UK ranks third in the world for AI research and innovation, yet 11th for impact.[95]

Other research themes include AI for emotion recognition, swarms containing multiple autonomous machines and robotics that enable accurate, large-scale screening. Even in just these three examples, the technical skills required need to be technology-specific with an underlying commonality. Skills in high demand will include working with big datasets, computational and coding skills, and an ability to integrate technologies such as sensors.

Automated screening – a cheaper and faster discovery process

Robotic automation in the biological and physical sciences offers the opportunity for a cheaper and faster discovery process. Utilising robots to carry out reproducible, high-throughput screening to find new biological targets could become commonplace, as could robot-led chemical reaction screening. This brings with it a need for technical skills to maintain complex robotics, programme their operation and handle the large datasets produced.

93 UKRI. (2020) The UK's research and innovation infrastructure: opportunities to grow our capability. See: **https://www.ukri.org/wp-content/uploads/2020/10/UKRI-201020-UKinfrastructure-opportunities-to-grow-our-capacity-FINAL.pdf** (accessed 14 November 2021).

94 BEIS. (2017) Industrial Strategy Building a Britain fit for the future. See: **https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/664563/industrial-strategy-white-paper-web-ready-version.pdf** (accessed 14 November 2021).

95 UKRI. (2021) Transforming our world with AI UKRI's role in embracing the opportunity. See: **https://www.ukri.org/wp-content/uploads/2021/02/UKRI-120221-TransformingOurWorldWithAI.pdf** (accessed 14 November 2021).

Bioinformatics and genomics

Within bioinformatics and genomics, UKRI noted: "Multiscale biology has emerged as an exciting new area, including the convergence of different approaches to empirical life science data gathering, data integration and mathematical modelling."[96] Due to automated technologies outputting large and complex datasets from technologies such as imaging, and the 'omics' disciplines of biology and structural biology feeding into this approach, bioinformatics support needs to be considered. One can also look at the increasingly intricate and specialist technologies to provide high-quality data, such as ultra-high resolution cryo-electron microscopy (cryo-EM) and mass spectrometry, and the high-performance computing (HPC) or high-throughput computing (HTC) hardware essential to run the datasets. Each of these technologies has their own associated technical support needs.

Other emerging areas of research involving bioinformatics and genomics includes programmable lab-on-a-chip detection of pathogens, microbiome related to humans and agriculture, and medical nanotechnology. Clearly, a strategic approach is needed to ensure capacity is available for this already highly sought after skill set within our technical community.

Energy and environmental technologies

There is growing interest in energy and environmental technologies. The generation, storage and transfer of energy is a wide field with many different technologies. This includes energy production via nuclear fission or fusion, and next-generation renewable technologies, such as perovskite photovoltaics, floating wind turbines and geothermal. Areas focused on storage include high-energy-density materials and larger-scale solutions for battery technologies, along with hydrogen fuel cell technologies. One area of emerging research for transfer of energy is large-scale wireless energy transmission. To bring these technologies together, there is a need to consider whole energy systems, looking at technology options, policy and regulation, and the use of energy.[96] However, the complexity of such systems, a need to control asset operation, the capability to digitally monitor, and external factors all make this an interdisciplinary problem.

Technologies to mitigate climate impact will emerge, most likely through geoengineering and carbon-extracting materials. Alongside this, enhanced monitoring technologies will be used, with ever-complex sensors on research aircraft working hand-in-hand with machine learning and AI to refine models and provide more accurate predictions.

With such a diverse range of research areas and technologies, there will naturally be a need for a wide range of technical skills at various levels. Some of these will be highly technology specific, such as engineering skills in designing alternative propulsion, chemical knowledge for new battery materials and analytical skills to assess the next generation of photovoltaic technology. Others will be more common and are already emerging as essential skills for our technical staff, such as the need for computational modelling and data analysis.

AI, digital and advanced computing

AI, augmented and virtual reality and cyber security are all areas with tremendous growth potential. Research in this area needs the support of specialists such as research software engineers and systems administrators. These are skill sets that are already in high demand in both industry and HE, and expansion of research will lead to potential skills shortages without strategic planning. Indeed, the Sainsbury Review highlighted the national skills shortage across all sectors in 2016,[97] while the 2019 Augar Review addressed the skills gap at qualification levels four and five.[98]

A raft of new computing technologies are also in development, including quantum computing, biological computing and neuromorphic computing, each with their own unique characteristics. In addition to software development and data handling requirements, it should be noted the technical community will also be involved in fabrication of the intricate architectures for quantum devices and development of nanoscale biological computers.

Enhancing digital skills

With the emergence of research areas and the adoption of new digital technologies across all sectors, there will be an increased demand for computational modelling, development of research software, digital twinning and large datasets. This will mean a need for interoperability, co-location and ease of access to an aggregation of resource, which will be essential in providing an efficient e-infrastructure ecosystem. To achieve this, technical staff with the right skills are critical, such as research software engineers, research data professionals and systems administrators.[99-101]

Electronics, photonics and quantum

Sensors, photonics and electronics are key enabling technologies to many of the research areas already described,[102] so it should be unsurprising that growth in related research is expected, alongside hyperspectral imaging, new sensing technologies and systems, and plasmonics.

We foresee a need to develop technical skills to design and fabricate component technologies, prototype subsystems and integrated systems, embed new software and carry out tests in real-world conditions.

Quantum technologies have potential outside of computing too, including in quantum optomechanics, quantum optics and quantum materials. Technical staff will have a role in fabricating intricate architectures for quantum devices in clean rooms, with the unique properties these technologies have creating challenges for our technical staff running facilities, with a need to adapt their skills to match.

Common Themes

Our assessment of seven key themes for emerging technologies and research areas reveal common themes for future technical skills. As many of the skills will be in high demand within industry, to compete, HE institutions will need to support recognition, competitive pay structures and provide opportunities for progression to recruit and retain technical staff.

The skills underpinning each emerging technology span a range of levels, but it is not immediately obvious what scale of skills is required at each level. This illustrates the need for regular, strategic horizon scanning of skills requirements.

The need for computational skills – including enhanced digital design, software engineering and skills in AI and machine learning – is widespread. Similarly, research is expected to have increasingly large datasets. Technical staff will need an understanding of how to manager and share these, and provide analysis either as part of a role specialising in a technology, or as a specialist in data, such as bioinformaticians.

With increasingly complex systems and materials, the development of analytical methods and technologies will help progress knowledge. Here, technical specialists will push the boundaries of what is currently possible and help research adapt to breakthroughs in technological advancement.

Many of the emerging technologies will require more support from technical staff to commercialise them. This will include taking lab-scale experiments to the next scale, making use of new methods of fabrication and the design and implementation of prototypes. Related to this is the requirement for real-world testing, where technical staff will implement experiments in non-traditional environments, managing, facilitating and coordinating this research.

A multidisciplinary approach to research areas that cut across disciplines will become increasingly common. Technical staff who support this research will need to adapt their skills and potentially widen their understanding to enable this.

In addition to directly supporting emerging research areas, many of the current skill sets within our technical community will remain equally valuable. This includes skills that both directly and indirectly underpin current research. The role of technical staff as both teachers and trainers, providing knowledge to future generations of technical staff and researchers, is vitally important.

[96] UKRI. (2020) The UK's research and innovation infrastructure: opportunities to grow our capability. See: **https://www.ukri.org/wp-content/uploads/2020/10/UKRI-201020-UKinfrastructure-opportunities-to-grow-our-capacity-FINAL.pdf** (accessed 14 November 2021).

[97] The Independent Panel on Technical Education. (2016) Report of the Independent Panel on Technical Education. See: **https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/536046/Report_of_the_Independent_Panel_on_Technical_Education.pdf** (accessed 14 November 2021).

[98] Post-18 Education and Funding Review Panel. (2019). Independent panel report to the Review of Post-18 Education and Funding. See: **https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/805127/Review_of_post_18_education_and_funding.pdf** (accessed 14 November 2021).

[99] MSR. (2017) MADE SMARTER. REVIEW 2017. See: **https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/655570/20171027_MadeSmarter_FINAL_DIGITAL.pdf** (accessed 14 November 2021).

[100] The Royal Society. (2019) Dynamics of data science skills How can all sectors benefit from data science talent? See: **https://royalsociety.org/-/media/policy/projects/dynamics-of-data-science/dynamics-of-data-scienceskills-report.pdf?la=en-GB&hash=212DAE7D599B0A48687B372C90DC3FEA** (accessed 14 November 2021).

[101] UKRI. (2020) The UK's research and innovation infrastructure: opportunities to grow our capability. See: **https://www.ukri.org/wp-content/uploads/2020/10/UKRI-201020-UKinfrastructure-opportunities-to-grow-our-capacity-FINAL.pdf** (accessed 14 November 2021).

[102] Innovate UK. (2019) Electech sector: a roadmap for the UK Enabling the digital future. See: **https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/830845/Electech_Roadmap_report_FINAL.pdf** (accessed 14 November 2021).

Conclusions

The input from technical staff into research is already diverse and wide-ranging. In some areas, there is already an acute shortage of technical staff with the skills required to meet sector demand, such as bioinformaticians. With the emerging technologies and research themes outlined above requiring technical staff with an increasing number of computational skills, and the ability to handle and analyse large datasets and progressively complex and sensitive analytical techniques, strategic planning into how these needs are met is essential. Institutions must ensure they can offer recognition and remuneration to enable them to compete for the top technical talent, in addition to a positive working environment and culture.

It is important that the emergence of any area of research has analysis of not only the research workforce and skills, but also the technical roles and skills required to underpin its development. We recommend future work enabling continual strategic horizon scanning of the technical roles and skill requirements of research, with a dialogue between national academies and the technical workforce.

Our recommendations

R1 **Employers of technical staff, funders, and government departments (e.g. BEIS, DfE) should employ a strategic approach to ensure the sustainability of technical skills and careers, at both a local and national level.** This includes succession planning in individual organisations, investment in a new pipeline of technical talent and horizon scanning new and emerging technologies and skills. Institutions should follow the good practice of institutions including King's College London, the University of Bristol and the University of Nottingham, and appoint a strategic lead for technical staff and skills in the organisation to lead on this agenda in collaboration with technical managers. Funders should establish resource provision to ensure the development and training of technical professionals, boosting skills, knowledge, and career development, and building capability and capacity in the UK to meet future pipeline needs. Eligibility requirements of existing schemes should be reviewed to ensure inclusion of technical staff where appropriate.

Eimear Tubritt, Technical Officer, Manchester Metropolitan University

12

Technical Staff as Teachers

We want a future where:

There is understanding and recognition of the diversity and complexity of technical roles and their contributions to education, with parity of esteem of skills, knowledge and expertise that matches other staff groups in the sector.

Strategic planning and insight ensures the sustainability of technical skills across the sector, ensuring technical skills and roles meet the demands of an evolving education landscape.

Current landscape

Technical staff play a vital role in teaching and/or supporting the learning of students within UK HE. They are increasingly relied upon to design and deliver teaching and learning activities (rather than support the delivery of others), and engage in formative and summative assessment. Despite this, their role within UK HE teaching is seldom considered, explored or recognised within their faculties, institutions or the wider sector.

Despite an increasing focus on the professionalism of academic staff who teach, there has been very limited published research focusing on technical staff and their role within teaching and learning at HE level. The bulk of relevant material in this area originates from two of this report's own commissioners.[103, 104]

When reporting on UK science and engineering technicians, Lewis noted variation in the perceived role of technicians, regarding whether technicians support teaching, or whether they actually teach students:

> *Technicians' formal duties extend beyond simply facilitating practical classes to carrying out some of that practical teaching themselves. [Where] not formally involved in teaching, they often do so unofficially, either by providing informal assistance to students in laboratory classes [...] or by helping students who are working on projects to learn how to use scientific instruments and carry out experimental procedures.*

Lewis (2013)

Within the creative arts, Savage reported a significant recent increase in the number of technicians applying for AdvanceHE/HEA Fellowships at the University for the Creative Arts, suggesting technical roles within the creative arts have evolved to include more sophisticated teaching and greater teaching responsibilities:

> *[Creative arts technician] participants believed their teaching had evolved to resemble academic practice-based teaching rather than demonstration or process instruction, combining both concept and context with technique.*

Savage (2019)

103 P. A. Lewis and H. Gospel. (2011) Technicians under the Microscope: A Study of the Skills and Training of University Laboratory and Engineering Workshop Technicians. See: **https://www.gatsby.org.uk/uploads/education/reports/pdf/he-techn-final-report.pdf**

104 T Savage, Art, Design & Communication in Higher Education, 2019, 18:2, 201-218, Challenging HEA Fellowship: Why should technicians in creative arts HE be drawn into teaching? **https://doi.org/10.1386/adch_00007_1**

Technical teachers

When asked, over three-quarters of respondents to the TALENT national survey of technical staff said they were involved in teaching or supporting the learning of students in some way (see Figure 20).

Respondents within the creative arts (including design and performing arts) were significantly more likely than others to be involved with teaching activities (95% compared with 75% for all other respondents) and they were also more likely to identify as a teaching technician when asked about their job title.

Respondents from post-1992 universities were more likely to be involved with teaching compared to those from Russell Group universities or other pre-1992 universities, all of which were at least nearly twice as likely to be involved than respondents from RIs (41%, nearly half of which were for postgraduate students only). These findings can be partly explained by post-1992 universities generally favouring teaching-focused activities and more applied discipline areas (two-thirds of creative arts respondents worked in a post-1992 university, for example), in contrast to other universities and RIs, which traditionally favour a greater focus on academic research and less applied disciplines.
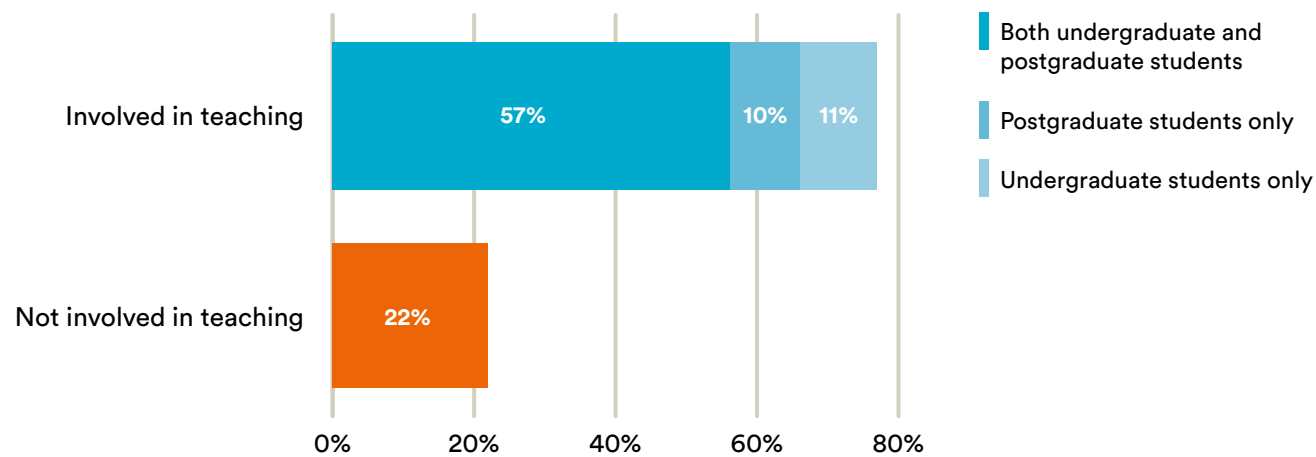
Involved in teaching: 57% 10% 11%

Not involved in teaching: 22%

Both undergraduate and postgraduate students

Postgraduate students only

Undergraduate students only

Figure 20: Level of involvement of UK technical staff with teaching HE students.

Source: TALENT Survey of UK Technical Staff 2021: "Within the last three years, has your role involved you teaching and/or supporting the learning of students within higher education?" (n=1760)

Richard Walker, Technical Team Leader, Manchester Metropolitan University

Specific teaching activities

Those involved in teaching and support activities most commonly identified specific activities involving the provision of background support. Over half of those asked identified preparing physical materials and resources, providing one-to-one support to individual learners, delivering instructions and/or teaching to groups of up to 10 learners, and designing and/or co-designing teaching and learning resources (see Figure 21).

There was also a significant minority who delivered instructions and/or teaching to groups of more than 10 learners, and who designed and/or co-designed lesson plans, further suggesting technical staff have teaching roles and responsibilities stretching beyond simply support.

Further, a quarter of respondents delivered formal feedback to learners, and a similar proportion designed and/or co-designed curricula for specific courses or modules, highlighting that some technical staff are performing duties more traditionally expected of academic teaching staff.

As might be expected, respondents who identified themselves as teaching technicians, or research and teaching technicians, were more likely than others to perform each of the individual teaching activities.

When exploring differences across disciplines, respondents specialising in creative arts were significantly more likely to be involved in teaching activities when compared to all others. They were more than twice as likely to design course curricula or lesson plans (and were also significantly more likely to provide formal feedback to learners, deliver instructions and/or teaching to groups, provide one-to-one support and design teaching resources).

Because the survey was conducted during February and March 2021, respondents could indicate if their involvement in these activities had been affected by COVID-19-related changes in the previous year. Activities most affected included preparation of physical resources and materials, delivery of instructions and/or teaching to groups, and providing one-to-one support to individual learners, likely linked to a sector-wide reduction or discontinuation of face-to-face, on-campus teaching. While there were generally low numbers of respondents who indicated they had only begun involvement in a particular activity during this time, there was a disproportionate increase in those designing and/or co-designing teaching and learning resources. This was likely caused by an increased demand on some technical staff to create resources for online and blended teaching to replace face-to-face methods.
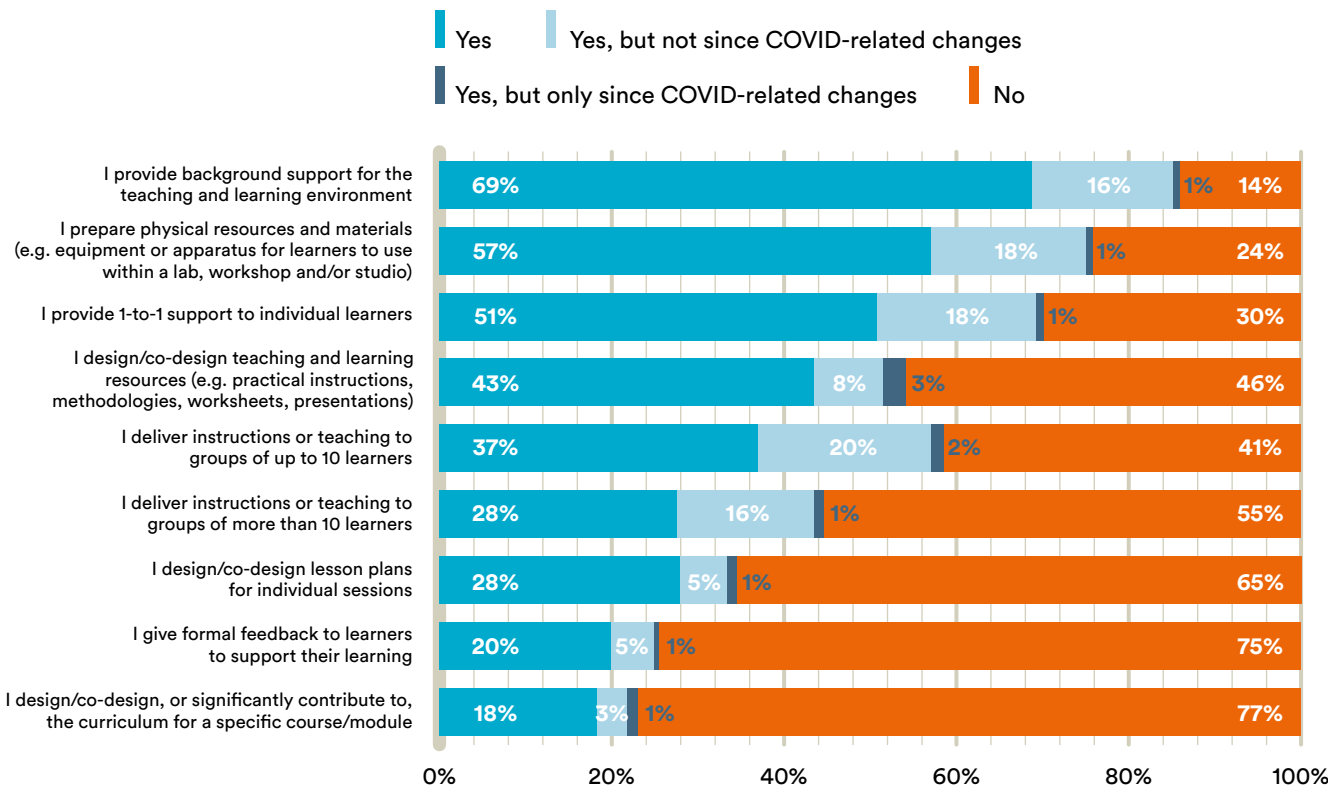

Legend:
- ■ Yes (dark blue/teal)
- ■ Yes, but not since COVID-related changes (light blue)
- ■ Yes, but only since COVID-related changes (navy)
- ■ No (orange)

Activity	Yes	Yes, but not since COVID-related changes	Yes, but only since COVID-related changes	No
I provide background support for the teaching and learning environment	69%	16%	1%	14%
I prepare physical resources and materials (e.g. equipment or apparatus for learners to use within a lab, workshop and/or studio)	57%	18%	1%	24%
I provide 1-to-1 support to individual learners	51%	18%	1%	30%
I design/co-design teaching and learning resources (e.g. practical instructions, methodologies, worksheets, presentations)	43%	8%	3%	46%
I deliver instructions or teaching to groups of up to 10 learners	37%	20%	2%	41%
I deliver instructions or teaching to groups of more than 10 learners	28%	16%	1%	55%
I design/co-design lesson plans for individual sessions	28%	5%	1%	65%
I give formal feedback to learners to support their learning	20%	5%	1%	75%
I design/co-design, or significantly contribute to, the curriculum for a specific course/module	18%	3%	1%	77%

Figure 21: Specific teaching activities technical staff are involved in within HE teaching and learning environments.

Source: TALENT Survey of UK Technical Staff 2021: "Please indicate which of the following statements apply to your role within teaching and/or supporting learning in higher education." (n=1384; asked to all those involved in teaching)

Blurred lines: the increasing responsibilities of technical teachers

During a series of focus groups, UK technical staff from a range of disciplines reported that lines have become blurred between the responsibilities, duties and expertise of teaching technicians and teaching academics. One engineering technician said they now plan, teach, mark and help design curricula, across a number of different modules. One technician within a creative arts discipline described finding themselves convening two entire modules. It was suggested there are now two extremes of teaching technicians: one primarily supporting the teaching activities of academic staff; the other effectively performing the duties of academic teaching staff, despite not being recognised or remunerated as such. These views supported some of those seen within our national survey.

> *I deliver the training that contributes to approx. 65% of a student's grade for many modules. These are practical film modules and are assessed on the quality of the work. This can only be taught in practical workshops and demonstrations and with continued discussion with, and support for, the students.*
>
> Teaching Technician (Survey of UK Technical Staff, March 2021)

Technical staff reported that, although students are often thankful and can recognise and appreciate the valuable input they provide, this was not reflected by members of academic or senior staff: recognition or acknowledgement was often missing from any formal documentation or publicity, and any awareness or acknowledgement of the contributions that technical staff make was increasingly absent among those further up an institution's hierarchy.

One creative arts technician highlighted a recent example involving the production and delivery of a faculty showpiece event, for which a programme brochure had been published including only the names of academic staff, despite many of these individuals only being present and/or involved with very little of the work towards the event. The participant said it was the technical staff who were present throughout the entire process, providing significantly greater face-to-face time, support, teaching and guidance for the students, but no member of technical staff was recognised, acknowledged, nor referred to in the final programme brochure.

Another point raised was technical staff can often be better suited to teaching practical skills and expertise than academics and, particularly with certain subjects, what students can learn from technical staff may be of greater value than what they might learn from academics, especially in terms of real-world applicability and employability of graduates. Building on this point, one creative arts technician said they would like to be allowed more involvement within curriculum design processes to ensure technical aspects were properly considered.

When survey respondents were asked what single change would have the greatest positive impact on them as technical staff and/or the wider technical community, many made direct reference to technical staff's roles within teaching:

> *More visibility and respect for the input we have[,] not only in research (which is often visible due to grant success) but crucially within teaching as well. We have so much to offer students but are treated like second-class citizens in favour of academics [whose] knowledge is regularly far too weak or specific to be of any use to anyone outside of their own research community.*

> *Acknowledgement of the technical teaching that takes place within our faculty.*

> *Acknowledgement of the teaching contributions I make (ideally with pay/progression, but any acknowledgement would be good).*
>
> Technical Staff (Survey of UK Technical Staff, March 2021)

Training and accreditation for technical teachers

Nearly two-thirds (63%) of respondents involved with teaching activities said they had not received any training on how to teach or support teaching within HE. Fewer than a quarter (22%) had received training that contributed towards part or all of an externally recognised qualification. Of those who spent more than half of their time on teaching activities in a typical pre-COVID-19 week, only 56% reported having received any training on teaching and/or supporting teaching.

Those specialising in the creative arts were significantly more likely to have received training compared to those in other disciplines (49% compared to 34% for all other respondents), including a much higher proportion who received training towards externally recognised qualifications.

More than a quarter of all survey respondents (27%) wanted to develop their teaching and/or teaching-related skills over the next three to five years, rising to 44% for all creative arts technical staff, and to 65% for all those involved in teaching activities who were yet to receive any relevant training. Specific suggestions included formal teaching qualifications, as well as development of online delivery skills, formulating lesson plans and engaging learners.

HESA staff records include information about teaching qualifications, accreditation and AdvanceHE Fellowships held by staff within UK HE. While these data partially support our findings of a sector-wide lack of training for technical teachers, the data primarily highlight a sector-wide lack of *reporting*. While reporting of teaching qualifications and/or accreditations is mandatory for academic staff, this has never been the case for technical staff, leading to many gaps in these records. In 2018/19, for example, when reporting teaching qualifications held by staff, 96% of technical staff were reported simply as 'N/A' (2% were 'not known', 1% 'no academic teaching qualification held', leaving only 1% known to hold a qualification). Nearly two-thirds of HE providers submitting data that year reported 'N/A' or 'Not known' in this field for all of their technical staff. The limited remaining data did suggest an increase in the numbers of technical staff with some form of teaching qualification/accreditation since 2012/13, including Postgraduate Certificate in Higher Education (PGCHE)-level qualifications and Advance HE accreditation.

This increase was not spread evenly across disciplines, however, with staff within HESA's Art & Design cost centre being significantly overrepresented in all total reported cases, increasing trends. This links well to patterns previously suggested by Savage[105, 106] but, due to data gaps and extremely small sample sizes, is difficult to extrapolate.

When compared to data from the TALENT national survey of technical staff, and data obtained directly from Advance HE regarding HEA accreditation, it is clear that HESA records provide a significant underestimate of technical staff with externally recognised training.

Sector-wide underreporting makes tracking trends in emerging practice difficult and limits possibilities for detailed analysis.

Creative Arts disciplines: learnings for the sector

As already highlighted, technical staff in the creative arts seem to have a particularly strong link to the teaching and learning of students. Compared to other disciplines, creative arts technical staff were significantly more likely to be involved in all suggested teaching and teaching-design activities, and were more likely to: identify solely as teaching technicians; have received training for teaching activities; and have completed part or all of an externally recognised qualification/accreditation.

This can partially be linked to a limited focus on research within many creative arts disciplines and departments, and these subjects' increased prevalence within post-1992 universities, but another key factor is the high level of dependence of these disciplines on the application of technical skills and expertise of skilled practitioners.

While technical staff within the creative arts appear to be towards one extreme end of a spectrum of technical teaching roles and responsibilities, it is perhaps useful to consider it a foreshadowing of things to come to a wider extent throughout the sector. Through discussions with UK technical staff from a range of disciplines, it is apparent they are also taking on ever-increasing teaching responsibilities, in many cases blurring the lines between 'academic' and 'technical' teaching duties.

Conclusions

Technical staff make a significant contribution to the teaching and learning of students within HE, and in many cases are being increasingly relied upon to deliver, plan and design teaching activities and take on roles and responsibilities more traditionally attributed to academic teaching staff, rather than technical teaching staff. Accordingly, technical staff have a clear and direct impact on the quality of education provision for HE students, and therefore contribute to linked implications such as student retention, student progression, and student employability. These implications are likely to become increasingly important in an evolving HE landscape which favours market competition for students and uses linked metrics to compare performances of HE providers, such as the OfS' new Proceed Metric,[107] OfS' pre-existing National Student Survey,[108] and AdvanceHE's Postgraduate Taught Experience Survey.[109]

However, this vital and expanding role of technicians as teachers remains poorly understood and can go unacknowledged by academic staff, senior leaders and others not directly involved in these activities. This perception of being an invisible and undervalued workforce mirrors the general feelings found across all technical staff within UK HE, but in some cases was reported to be worse when considering contributions to teaching compared to contributions to research. This was due in part to perceived differences in scope to be formally acknowledged in research outputs, without comparable equivalents in a teaching context.

While many technical teaching staff reportedly relish engagement with students above many other aspects of their job, their teaching responsibilities are not always being matched by accompanying recognition, acknowledgement or reward. There is a noticeable inconsistency regarding expected teaching contribution – and recognition for these contributions – across different institutions, and departments within the same institution, particularly when dealing with workforces of differing size.

Creative arts disciplines appear to be at the forefront regarding technical staff as teachers, and the resulting blurring of lines between academic and technical teaching responsibilities. However, the creative arts do not hold a monopoly on these developments, with technical staff within many other disciplines indicating many of the same areas of concern.

As the scale and type of some technical staff's teaching responsibilities are expanding, there is an increasing appetite for professionalism and skill development through training and formal recognition, qualifications and/or accreditation. However, this appetite for development opportunities appears not to be matched by provision. Because technical staff impact student education and overall experience, and therefore subsequently impact institutional performances within national student surveys and comparative outcome metrics, it will likely be increasingly in an institution's best interest to ensure its technical teaching staff are appropriately trained, accredited, well-resourced, and acknowledged for their contributions.

Our recommendations

R2 Funders and employers of technical staff in higher education and research should recognise the blurred boundaries between technical and academic roles. They should provide opportunities and mechanisms to move between career pathways and across sectors.

R3 Employers of technical staff should collect, report and analyse data on their technical workforce, with careful consideration of those roles at the interface with academic roles. This should include capture of numbers of technical staff involved with delivering teaching and learning activities, and whether they are provided with training, qualification or accreditation opportunities.

R10 Employers of technical staff, funders, and sector bodies (e.g. professional associations and learned societies) should ensure provision and access to a range of professional development opportunities tailored to technical roles and careers, including those relevant to teaching.

R11 Employers of technical staff, publishers, and other sector bodies (e.g. professional associations and learned societies) should ensure the teaching contributions of technical staff are visible and recognised.

[105] T. Savage, Journal of Art, Design & Communication in Higher Education, 2018, 17:2, 237–53, 'Creative arts technicians in academia: To transition or not to transition?', **https://doi.org/10.1386/adch.17.2.237_1**

[106] T Savage, Art, Design & Communication in Higher Education, 2019, 18:2, 201-218, Challenging HEA Fellowship: Why should technicians in creative arts HE be drawn into teaching? **https://doi.org/10.1386/adch_00007_1**

[107] Office for Students webpages. (2021) See: **https://www.officeforstudents.org.uk/publications/proceed-updated-methodology-and-results/** (accessed 24 January 2022).

[108] Office for Students webpages (2021). See: **https://www.officeforstudents.org.uk/advice-and-guidance/student-information-and-data/national-student-survey-nss/** (accessed 24 January 2022).

[109] AdvanceHE webpages. See: **https://www.advance-he.ac.uk/reports-publications-and-resources/postgraduate-taught-experience-survey-ptes** (accessed 24 January 2022).

13

Technical Partnerships within the UK

We want a future where:

Organisations work together in strong partnerships between higher education, research institutions, further education, and industry, and ensure the provision of high-quality training and career development for the technical community.

Current landscape

To understand future opportunities and potential, we were keen to understand the extent to which different institutions within UK education and research share their technical innovation, skills and expertise through formal or informal partnerships and/or shared training.

There are a range of new institutions seeking to bridge the gap between further and higher education – for example, National Colleges and Institutes of Technology (IoTs). Alongside these are a series of institutions and agreements actively seeking to bring together industry and education – for example, Catapult Centres.

We undertook a review to identify and categorise these institutions and partnerships, setting out similarities and differences in terms of how technical innovation, skills and expertise are shared.

Partnerships with other educational institutions

The main partnerships between universities and other types of educational institution are National Colleges and IoTs, both of which involve working with FE Colleges. FE Colleges vary in different areas of the country, with some catering mostly for 16 to 18 year olds taking level two and three qualifications, and others focusing more on adult education. Some FE Colleges deliver higher education, usually at levels four and five, with local universities providing top-up level six qualifications, and so these FE Colleges tend to have existing links and partnerships.

Mark Brett, Animal Research Team Lead,
Newcastle University

Partnerships with National Colleges

National Colleges are new institutions set up with FE and HE partners, which has led to challenges around accreditation and the ability to offer certain courses. Originally, five National Colleges were established to meet the shortfall of higher-level technical skills in key growth areas: creative and culture skills; digital skills; nuclear; high-speed rail; and oil and gas.[110] They had significant support from industry and four opened between 2016 and 2018 following an initial tender in 2014. There were several challenges with these new institutions, partly in building their reputations as new initiatives, which led to student recruitment problems and often retention problems for staff, according to a 2020 evaluation by the Department for Education.[111]

One National College, focusing on high-speed rail, experienced problems due to delays in government decisions on the HS2 project. However, demand from industry to fill skills gaps meant the institution was able to develop, getting significant equipment and people support from industry to operate. This National College moved into the University of Birmingham in May 2021.

In terms of delivery, National Colleges providing HE often do so with accreditation via local universities. The partnerships can be solely about the university accrediting a course they were keen to deliver but did not have the appropriate equipment or industry link to deliver themselves. The National College for Advanced Transport and Infrastructure (NCATI – formerly for high-speed rail) reported that expertise on technology, as well as equipment, comes from industry, often via secondment. The equipment can surpass that which university partners are able to provide, and so theoretically, technical staff from universities could work with industry within these colleges. It is worth noting that in FE, technicians typically do not teach learners and formal teaching responsibilities might create contractual problems, although they could be asked to cover if necessary. This means that a FE leader running a National College might not consider requesting HE technician support for teaching or facilitating learning.

The university side of the partnership puts forward staff to work on and support courses for the National College. In discussions with those running National Colleges, it is clear they require staff who are able to teach and support on courses. However, universities are putting forward academics to teach and support courses, including apprenticeships, rather than teaching technicians. This could be a great opportunity for technician development due to the focus on project-based learning, where facilitation is more appropriate than formal teaching, and much of the support needed relates to technical theory and equipment. Currently the partnership with National Colleges appears to allow technical innovation, skill and expertise to be shared between industry, FE Colleges and university academics. There is a clear opportunity here for technicians too, which could be better exploited by universities.

Case study

An international leader in mammalian study

As one of the first research institutes to be established at the Harwell Science and Innovation Campus, MRC Harwell Institute is an international leader in the study of mammalian models of disease.

MRC Harwell is at the forefront of genetic research in the UK and, since 2004, is the only facility offering a mixture of practical and theoretical courses in laboratory animal science and genetics. As a member council of UKRI, MRC Harwell aims to answer the growing skills gap in technical roles through their new Advance training centre, which opened in July 2020. It offers versatile laboratory and practical training rooms for a range of scientific training needs.

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[110] Although the last of the five was paused and never happened.

[111] Gov.uk webpages. (2020) See: **https://www.gov.uk/government/publications/national-colleges-process-evaluation** (accessed 24 January 2022).

Partnerships with Institutes of Technology

IoTs were considered the next iteration of National Colleges, but instead of being set up as entirely new institutions, they have to have a FE or HE lead partner, with a selection of other FE and HE partners, alongside industry partners.

There were 12 established in an initial phase, followed by a further nine (see Figure 22), and most have FE Colleges as their lead partner, although the University of Lincoln leads the Lincolnshire Institute of Technology,[112] and all have universities and FE Colleges in the partnership. Government funding is for capital spend, and most employers involved in IoTs have provided equipment and technical support, where appropriate. This need not be in person – for example, the South Central IoT focuses on digital skills and has Microsoft and other technology companies as industry partners, so most of the software and technical support is remote.
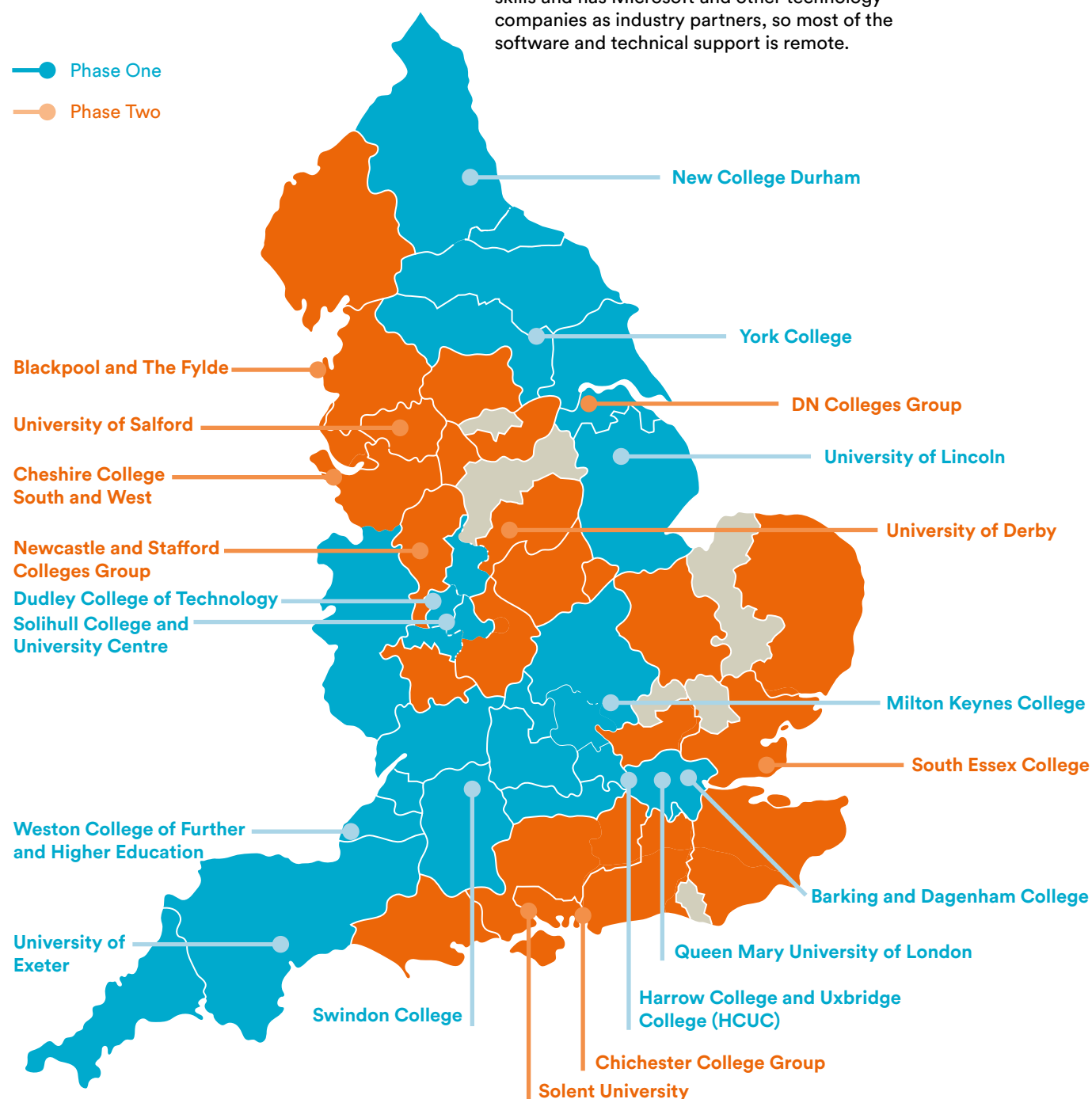
IoTs will deliver level four and five qualifications, with some as higher-level apprenticeships, where the college or university can accredit the learning, and some as qualifications accredited by awarding organisations. In some cases, the university partner will support the teaching and delivery of these qualifications, although this is not typical. The IoT in West London, run by the merged Harrow College and Uxbridge College in partnership with Brunel University London, has used PhD students from Brunel to facilitate some of the project-based learning in the level five qualification. This helps learners to lead into the level six top-up qualification planned for Brunel to deliver. However, it appears that it is exclusively PhD students supported by academics who are chosen to facilitate project-based learning, and not technicians.

The university element of the partnerships can also be difficult, as older universities seek to maintain a more national perspective, while newer universities with existing relationships with FE Colleges can be easier to bring into an IoT. For example, an interview undertaken with an IoT lead with an FE background working with two different kinds of university, highlighted that working with the newer university is more straightforward, perceiving the older university to have less consideration for local employers given their national, rather than local, focus on skills.

Equally, some FE Colleges are accustomed to teaching level four and five qualifications, with most IoTs, at least initially, stating that they did not need to recruit additional staff for the IoTs as they could be taught by existing staff from colleges. Those IoTs which were, and are now, actively recruiting teaching staff are aiming to recruit staff with technical skills. This could be a role for some HE technicians, but that has not, thus far, been considered, partly as universities seem to be putting forward academics to engage with IoTs, and are not, apart from a few exceptions, working with the IoTs on level four and five qualifications.

Figure 22: Regional distribution of Institutes of Technology (IOTs) within England, by phase (phase one = initial announcement; phase two = finalised in late 2021).

[112] University of Lincoln webpages. See: **https://www.lincoln.ac.uk/home/instituteoftechnology/** (accessed 24 January 2022).

Case study

A centre of excellence for apprenticeships and CPD
Advanced Manufacturing Research Centre (AMRC)

The AMRC Training Centre is regarded as the 'Centre of Excellence' for apprenticeship and continuing professional development delivery within the Yorkshire & Humber region. Its state-of-the-art centre offers the very best in practical and academic training. Working with employers, it identifies and provides the skills manufacturing companies need to compete globally, from apprenticeship to degree level. For employers, they provide qualified employees with a tailored set of skills and hands-on experience by making use of access to state-of-the-art machinery and technology. For the young people of the Sheffield City Region, it provides the foundation for a rewarding career in some of the world's most innovative industries.

The AMRC Training Centre is led by a team of respected specialists who have experienced the challenges of developing world-class talent, and learning specialists who understand the requirements of the manufacturing sector. They draw on a wealth of world-class resources, links and partnerships to create a flexible approach to learning and development that is tailored to business needs.

Partnerships with other universities

Regionally, universities have been working together to collaborate on areas of shared interest for some time. These regional HE partnerships, like Midlands Innovation in the Midlands, N8 in the North, and GW4 in the West (see Figure 23), provide an opportunity for technical innovation, skill and expertise to be shared.

N8 Research Partnership (N8)

University of Liverpool
University of York
University of Leeds
Durham University
The University of Sheffield
Lancaster University
The University of Manchester
Newcastle University

Midlands Innovation

Aston University
University of Birmingham
Cranfield University
Keele University
University of Leicester
Loughborough University
University of Nottingham
University of Warwick

Midlands Enterprise Universities

Birmingham City University
Coventry University
University of Derby
De Montfort University Leicester
University of Lincoln
Nottingham Trent University
University of Wolverhampton

Science and Engineering South (SES)

King's College London
Imperial College London
Queen Mary University of London
University College London
University of Cambridge
University of Oxford
University of Southampton

Great Western 4 (GW4)

University of Bath
University of Bristol
Cardiff University
University of Exeter

Eastern Arc

University of East Anglia
University of Essex
University of Kent
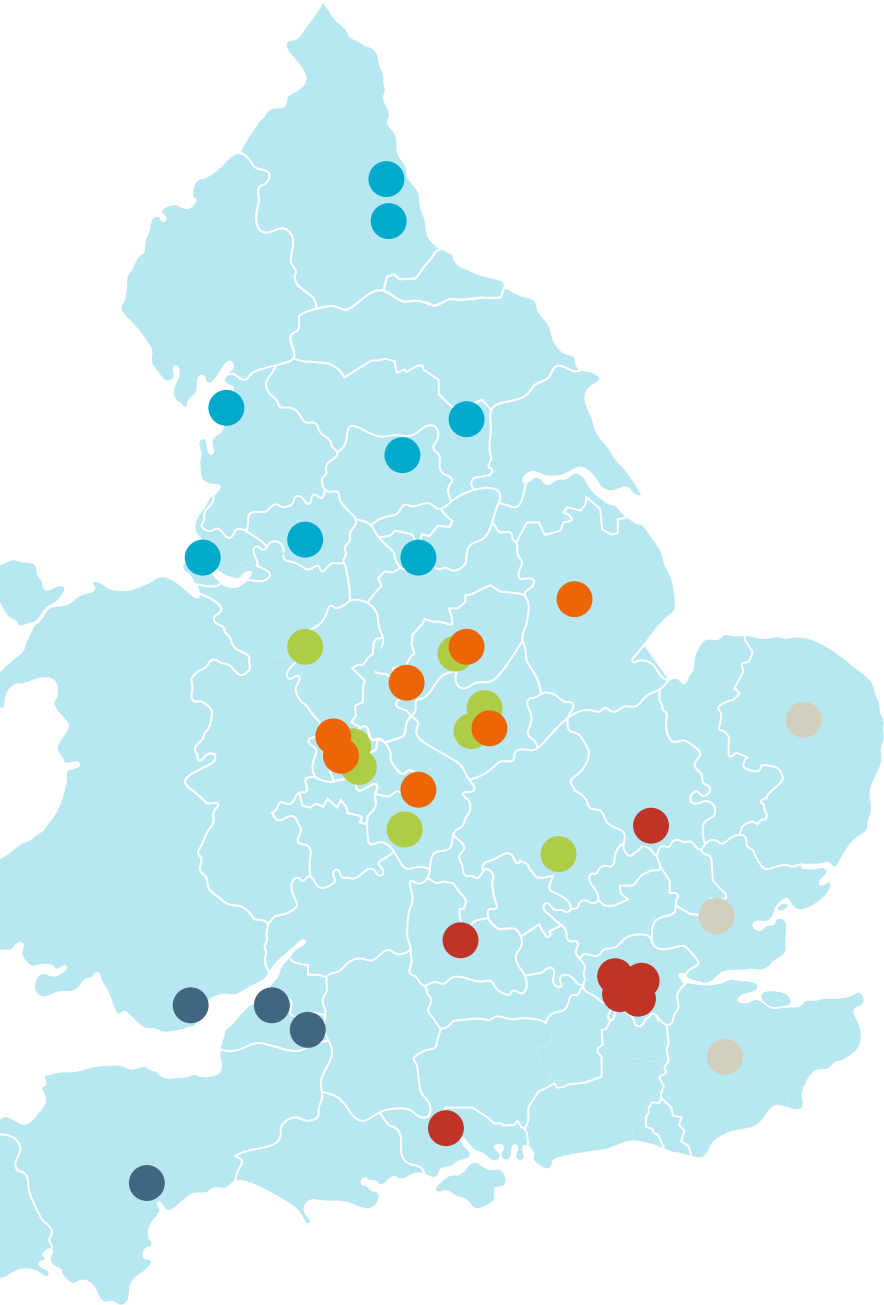
Figure 23: Examples of formal research partnerships between groups of universities within England and Wales.

In addition, partnerships such as the Institute for Coding provide a subject-led space for partnerships across universities and RIs. The myriad of partnerships show that universities frequently work together through academic collaborations, but there are limited examples on how these partnerships are supporting the sharing of technical expertise.

Partnerships supporting technical skills, roles and careers

Midlands Innovation, through the Research England-funded TALENT programme, has dedicated funding to enable, develop, test and grow partnerships to support the 2,500+ technicians across its eight universities and beyond. Alongside funding opportunities and technician-specific training and development opportunities, a key area is making it easier for placements and work shadowing to take place, enabling technicians in similar areas to share best practice on specialised equipment and techniques. Research suggests technicians can be at the forefront of innovation that comes from extending the use of equipment or techniques by considering them in different ways.[113] Participation in work shadowing at different institutions with individuals working in similar roles, or with similar equipment, fosters this kind of innovation.

Small pots of funding or cross-institution commitments to enable technician placements or work shadowing exist in technician networks in London and are aims for other networks, such as the Research Institutes Technician Commitment network. This is most often driven by demand or interest from technicians themselves. This is a clear benefit, but there could be ways of building this in more formally, potentially as part of existing partnerships between universities and RIs, or through the Technician Commitment, so that it becomes part of 'business as usual'.

The GW4 research partnership recently launched a GW4Ward programme to drive the professional development of their circa 1,300 technical staff. This consists of a travel bursary to support technicians to complete work shadowing across the partnership, funding for professional registration, support for facilities management and a webinar series.[114]

Webinars, seminars and conferences are a long-standing practice in academia, but are less common in the technical community. This type of activity provides an opportunity for cross-institution sharing of technical expertise, where individuals share practice, and the introduction of the Technician Commitment has led to an increase in events of this kind. For example, N8, in partnership with the National Technician Development Centre, ran a Technician Partnership Conference online in 2020.[115] In 2019, the UK Higher Education Technician Summit (HETS) – an event for HE and research technicians focusing on networking and training held in the Midlands – attracted 700 technicians from 70 different institutions. These events provide continuing professional development and a space to build networks and relationships among technicians across institutions.

To help enable new partnerships and collaborations within the technical community, the Technician Commitment launched a small grant scheme in 2021 to encourage institutions to collaborate to advance visibility, recognition, career development and sustainability of technical skills, roles and careers across HE and research.

[113] P.A. Lewis. (2019). Technicians and innovation: a literature review. See: **https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3405406** (accessed 14 November 2021). **http://dx.doi.org/10.2139/ssrn.3405406**

[114] GW4 webpages (2020) See: **https://gw4.ac.uk/gw4ward/** (accessed 14 November 2021).

[115] Technician Partnership Conference 2020 (Virtual). See: **https://nationaltechnicianscentre.ac.uk/technician-partnership-conference-newcastle-2020/** (accessed 14 November 2021).

Partnerships with industry

There are many different partnerships between HE and industry. It is challenging to build an understanding of how technical staff in universities and RIs link in with these industrial partnerships, as the roles of technicians in this context traditionally lacks visibility.

Learning factories

A key type of formal partnership between HE and industry are Learning Factories. These have been described as: "A facility with aspects of an authentic production environment designed and used primarily for the purpose of learning. It is not a simple duplicate of an industrial factory but designed to best suit and serve an intended experiential learning process."[116]

Learning Factories tend to focus on engineering and manufacturing and provide opportunities for project-based learning. They have significant potential for the sharing of technical innovation, skill and expertise because although they have university links, they can operate at a range of different levels and therefore require a range of expertise.

The National Centre of Food Manufacturing at the University of Lincoln is a recognised Learning Factory designed to serve, in one place, the needs of industry, FE and HE for research and innovation in food manufacturing. It grew from an FE base and currently delivers courses at a range of levels, from level two to level six. It is part of both the University of Lincoln and allied to the Lincolnshire IoT.

Given the focus on industry, it delivers part-time courses for adult learners and has recently started delivering apprenticeships. The industry partnership is well established and provides scope for research and innovation through project funding and support for employees to study on professional short courses. There are also employer links that provide guest lectures, visiting teaching fellows and support for members of staff.

As Learning Factories have a more flexible approach to HE, they may be more likely to involve technicians in the sharing of technical expertise. The National Centre of Food Manufacturing has technicians listed and describes their role as supporting research and teaching.[117] When discussing recruitment for new teachers, most were expected to come from industry and be trained in teaching, but the nature of a centre with a diversity of staff means that some progression and development is available for those technicians that are interested.

Catapults

Catapults are typically physical centres with cutting-edge equipment, technical staff and expertise and are considered more formal than Learning Factories, which can be physical or virtual centres. These Catapults bring together researchers – including technicians – and industry to innovate and develop new technical solutions.[118] In 2020, Catapults were responsible for 14,750 industry collaborations and 5,108 academic collaborations.[119] They can provide significant space for the sharing of technical expertise, however, there is a variety of interest and engagement in technical skills and training across Catapult centres.[120]

Catapults, particularly in engineering and the sciences, provide increasing examples of how these partnerships are delivering apprenticeships, including higher-level technical apprenticeships. The Catapult Centre focusing on cell and gene therapy grew their apprenticeship numbers from an initial 29 at 11 companies in 2018, to 100 apprentices from 32 employers in September 2020.

As well as specific apprenticeship training, there is a potential opportunity for Catapult Centres to deliver training and professional development for existing and future technicians. This may already be underway in individual HE institutions, but it would be beneficial for Catapult Centres to be explicit in their engagement with technicians and technical training.

Conclusions

There is some evidence of how universities and RIs are beginning to work together to share technical expertise and training, partially driven by the Technician Commitment. This is a space that is collaborative, rather than competitive, and is driven predominantly by the technical community themselves. Initiatives such as the TALENT programme have raised awareness of this practice with organisational leaders and the wider sector.

There is currently limited evidence of universities and RIs working with IoTs and Catapult Centres to share technical expertise and training. The growth of higher technical education provides opportunities for new and highly relevant forms of training for technicians across all sectors. For example, IoTs could provide technical training in collaboration with universities on a regional basis, ensuring provision in an economically viable way, which could support the government's agenda on levelling up and place.

There is evidence that technicians in universities and RIs are working with industry, but this activity lacks visibility and recognition. This is explored in the report: *The Role of Technicians in Knowledge Exchange* published in November 2021.[121]

Our recommendations

R13 **Employers of technical staff should form partnerships with organisations and initiatives that provide technical and vocational training (e.g. Catapult Centres in the UK and Institutes of Technology in England) to ensure sharing of knowledge and skills, to facilitate the identification of skills needed to deploy emerging technologies, and to inform the development of suitable future training syllabi.** Universities and research institutes should work together to deliver technical training on a regional or discipline-specific basis and to provide network opportunities for the sharing of technical expertise.

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[116] FE News webpages. See: **https://www.fenews.co.uk/exclusive/learning-factories-what-they-are-and-why-their-time-has-come/** (accessed 12 January 2022).

[117] University of Lincoln webpages. See: **https://www.lincoln.ac.uk/holbeach/** (accessed 14 November 2021).

[118] Catapult Network webpages (2021). See: **https://catapult.org.uk/about-us/why-the-catapult-network/** (accessed 14 November 2021).

[119] Catapult Network. (2019-20) Creating the future through innovation recovery and resilience. See: **https://catapult.org.uk/wp-content/uploads/2020/12/Catapult-Network-Impact-Brochure-2020-FINAL.pdf** (accessed 14 November 2021).

[120] P.A. Lewis, Researchgate, (2020), Innovation, technician skills, and vocational education and training: filling a gap in the innovation systems literature. See: **https://www.researchgate.net/publication/346386792_INNOVATION_TECHNICIAN_SKILLS_AND_VOCATIONAL_EDUCATION_AND_TRAINING_FILLING_A_GAP_IN_THE_INNOVATION_SYSTEMS_LITERATURE**

[121] MI TALENT (2021), The Role of Technicians in Knowledge Exchange: An Explorative Report. See: **https://www.mitalent.ac.uk/write/MediaUploads/PDFs/TALENT_Technicians_and_Knowledge_Exchange_web.pdf** (Accessed 24 January 2022).

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Conclusion

Conclusion

This report provides the first step to building greater understanding of the technical community – a community whose skills, expertise and experience are critical to HE and research. We must think about the technical community in a more strategic way and be fully inclusive of technicians when considering the HE and research workforce. Our report makes 16 headline recommendations – which we then break down further to align with key stakeholder groups to include employers in HE and research institutions, government and policymakers, professional bodies and learned societies, funders and technicians themselves.

Our vision is that the UK will be a global superpower in science, engineering and the creative industries, enabled by its technical capability across academia, research, education, and innovation. Technical skills, roles, and careers will be recognised, respected, aspired to, supported, and developed.

To achieve this we need collective action from across the sector.

We need to ensure the inclusion of technical colleagues in policymaking - to ensure that policy decisions are representative and inclusive of all roles within HE and research. There needs to be a diverse range of entry routes to the technical profession at all levels. We urgently need to generate a new pipeline of technical talent and ensure that technical education routes into HE and research are viable. More action is needed to ensure a diverse and inclusive technical workforce. Equality, diversity and inclusion initiatives must encompass technical staff.

Patterns of underreporting for the technical population aggravate the 'invisibility' of the technical workforce compared to others within UK HE and research. This is exacerbated by recent coverage changes to HESA staff records. Policymakers need to ensure that we collect, report and analyse data on our technical community so that we can track and monitor workforce trends.

We also need to ensure that technical colleagues are costed appropriately on research grants, and they can, and should be included as investigators where appropriate.

The sector needs to further appreciate and build understanding of the expertise and contributions technical staff bring to their workplace – at all levels. It is important that the emergence of any area of research has analysis of the technical roles and skills required to underpin its development. Future work enabling continual strategic foresighting of the technical roles and skill requirements of research, with a dialogue between national academies and the technical workforce, is critical. In addition, institutions must ensure they can offer recognition and remuneration to enable them to compete for the top technical talent, in addition to a positive working environment and culture.

Technical staff have a direct impact on the quality of education provision for HE students, and therefore contribute to associated factors such as student retention, student progression, and student employability. The role of technicians as teachers remains poorly understood and can go unacknowledged. These contributions need to be recognised and institutions should ensure technical teaching staff are appropriately trained, accredited, resourced, and acknowledged for their contributions.

We must ensure increased provision and access to professional learning and development opportunities for technical staff. One way to do this is by working in partnership. Our research demonstrated that organisations are beginning to work together to share technical expertise and training and that there are many more opportunities to explore in this space.

By working collectively and collaboratively, we can change the culture within which the technical community operates, and ensure technical skills, roles and careers are afforded the status and opportunities they deserve.

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Appendices

Appendix A: Glossary

AI	Artificial Intelligence
AMRC	Advanced Manufacturing Research Centre
BBSRC	Biotechnology and Biological Sciences Research Council
BEIS	Department for Business Energy and Industrial Strategy
CPD	Continuing Professional Development
CRediT	Contributor Roles Taxonomy
CRISPR	Clustered Regularly Interspaced Short Palindromic Repeats
CT	Computed Tomography
DA	Directly Allocated
DI	Directly Incurred
EDI	Equality Diversity and Inclusion
DfE	Department for Education
DfENI	Department for the Economy Northern Ireland
EU	European Union
FE	Further Education
FTE	Full-Time Equivalent
GCSE	General Certificate of Secondary Education
GW4	The GW4 Alliance - a consortium of four universities: the University of Bath, the University of Bristol, Cardiff University and the University of Exeter
HE	Higher Education
HEA	The Higher Education Academy (now AdvanceHE)
HEFCW	The Higher Education Funding Council for Wales
HESA	Higher Education Statistics Agency
HETS	The UK Higher Education Technician Summit
HNC	Higher National Certificate
HND	Higher National Diploma
HPC	High-Performance Computing
HR	Human Resources
HS2	High Speed 2
HTC	High-Throughput Computing
IT	Information Technology

MI	Midlands Innovation - a consortium of eight universities: Aston University, the University of Birmingham, Cranfield University, Keele University, the University of Leicester, Loughborough University, the University of Nottingham and the University of Warwick
MRC	The Medical Research Council
N8	A collaboration of eight universities in the North of England: Durham University, Lancaster University, the University of Leeds, the University of Liverpool, the University of Manchester, Newcastle University, the University of Sheffield and the University of York
NCATI	The National College for Advanced Transport and Infrastructure
NI	Northern Ireland
NTDC	National Technician Development Centre
NVQ	National Vocational Qualification
OD	Organisation Development
OfS	Office for Students
PCR	Polymerase Chain Reaction
PGCE	Postgraduate Certificate in Education
PGCHE	Postgraduate Certificate in Higher Education
PI	Principal investigator
PS	Professional Services
QR	Quality-related (research funding)
RE	Research England
REF	Research Excellence Framework
RI	Research Institute
SFC	Scottish Funding Council
SOC	Standard Occupation Classification
SOL	Shortage Occupation List
STEM	Science Technology Engineering and Mathematics
STEMM	Science Technology Engineering Mathematics and Medicine
TRAC	Transparent Approach to Costing
UKRI	UK Research and Innovation
VR	Virtual Reality

Appendix B: The TALENT Commission Terms of Reference

1. Background

TALENT is a project which will lead and influence change to advance status and opportunity for technical skills, roles and careers in UK HE and research. It is led by the Midlands Innovation (MI) consortium of eight universities in collaboration with key stakeholder and industry partners. It is the largest ever investment into the technical community in higher education and research, whose specialist skills often go unrecognised despite the crucial role they play in the success of universities, research and development and the growth of the UK economy.

TALENT is underpinned by a grant of more than £3 million from the Research England Development Fund. The rest of the funding is provided by the consortium university members and key partners, including the Science Council, Technician Commitment, Wellcome, British Geological Survey, Manufacturing Technology Centre, Rolls-Royce Plc, Unilever, Thales Alenia Space, Cobra Biologics and Midlands Engine.

TALENT was announced by the Science Minister on 27th February 2020. The four-year programme commenced on 1st March 2020. TALENT will:

o Build an understanding of the future requirements for skilled technicians in the UK HE and research sector through a national policy commission.

o Work collaboratively across the UK to advocate and deliver a change in culture that will raise the profile of technical careers, roles and contributions, enhancing career pathways and possibilities.

o Deliver a programme of training and development opportunities for the Midlands Innovation technical community of over 2100 FTE and share the learning with the sector across the UK.

o Advocate and develop opportunities for technicians in the UK HE and research sector, ensuring technical careers are supported, developed, respected and ultimately aspired to.

2. The TALENT Commission – Purpose & Scope

A major work stream of TALENT is the creation of a national policy commission. The TALENT Commission will investigate the HE and research sector's future need for technical talent and how these needs can be met. The TALENT Commission will be led by an independent Chair, Professor Sir John Holman, and a Board of Commissioners. It will gather evidence from a range of stakeholders before putting together a range of recommendations for the sector.

Members of the Board of Commissioners were announced in June 2020.

3. Membership

The TALENT Board of Commissioners is an independent group that will advise, inform and challenge the UK HE and research sector (to include universities and research institutes) to ascertain the required future technical skills requirements and identify and promote effective practice to support the development of technical skills, roles and careers.

Professor Sir John Holman has been appointed as Chair of the TALENT Commission. He will be supported by the TALENT project team, led by Kelly Vere.

In addition to the Chair and the supporting TALENT secretariat, a number of commissioners will be appointed. There will be at least four commissioners who represent the technical voice. A list of Commissioners is available at **https://www.mitalent.ac.uk/project-team**

The membership aims to reflect the diversity of the HE and research sector and include leaders, practitioners and representatives of key stakeholder organisations.

The Commissioners will be appointed, in the first instance, for the term of the Commission (June 2020 – September 2021).

4. Responsibilities of the TALENT Commission

The Commission should be a credible and influential source of advice and challenge to the sector.

The Commission will help the sector by providing new knowledge and understanding on the present and future skills and roles of technicians and provide strategic insight into the key challenges and opportunities facing the technical community. A number of resulting recommendations will be made in a sector-wide report to be published in September 2021.

In order to fulfil its role, the Commission will:

a. Take a strategic view of the sector across the UK, informed by Commissioners' own knowledge, the technician's voice, and robust, independent research and evaluation

b. Meet no less than 3 times between June 2020 and June 2021.

c. Engage and influence the sector in developing high quality evidence and use this to implement effective practice

d. Challenge the sector where appropriate by providing high-quality evidence and guidance on effective practice

e. Work collaboratively with each other to encourage and incentivise collaboration across the HE sector

f. Ensure its work is effectively promoted across the sector

5. Responsibilities of the TALENT Project Team

The TALENT Project Team commits to providing:

a. A full secretariat and support function to the Commission, primarily working with the Chair but also supporting all the Commissioners to fulfil their roles and achieve the TALENT Commission agreed objectives

b. Value for money through effective project management and compliance with the Research England conditions of grant

c. Regular dialogue with the principal funder (Research England) including quarterly updates

d. Appropriate resource to support the Commission with research, policy development and communications

e. Secretariat support for other ad hoc thematic working groups, linked to the Commission (for example, workshops and focus groups), which could be convened by Commissioners to explore different themes affecting the technical community.

6. Behaviours and Values

The TALENT Project Team and all Commissioners commit to:

a. Professional and respectful conduct always

b. Robust and open discussion that results in taking shared responsibility for decisions reached

c. The declaration of any conflicts of interest whenever and wherever they arise

d. Discretion and judiciousness in all public comment

MI TALENT

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