

Middlesex University submission to the Department for Business, Energy and Industrial Strategy survey on the UK Research and Development (R&D) Roadmap

1. How can we best increase knowledge and understanding through research, including by achieving bigger breakthroughs?

Middlesex University welcomes the importance that the Roadmap places on the UK becoming a global leader in risky, blue skies research. It is, however, important to note that this type of research, the creation of Institutes and the development of new forms of international, multi-lateral research collaboration should not be assumed to be the province of any one part of the higher education sector. We believe that the best recipe for success is the integration of Institutes across institutions, 'moon-shots' drawing on excellent research specialisms from across the UK and international partnerships involving high-quality research from all parts of the sector. This includes input from modern universities, such as Middlesex, as we have a distinctive contribution to make to both the research landscape and to policy debates, through a long-established approach to research that is practice-based and which is simultaneously interdisciplinary and partnership-led.

We also believe that it is important that Government retains a broad perspective on what constitutes science and we welcome the Roadmap's recognition that 'all academic disciplines contribute to the vigour of the research endeavour, including the natural sciences, technologies, medicine, the social sciences, the arts and the humanities.' The value of 'Social Sciences, Humanities & the Arts for the People and the Economy' (SHAPE) should not be underestimated, both on their own, and in a complementary way with STEM subjects, as together they help us to understand the human world around us and to solve complex problems. This can thus enable bigger breakthroughs and greater impact and understanding in addressing societal challenges through a more inclusive approach to science and research.

In this respect, we believe that there is an opportunity for Government to support a radical departure away from current, sometimes narrow, thinking in the sector and to create a truly collaborative culture that puts all of the sector's strengths to greatest impact whilst, of course, resisting the deconstruction of the disciplines and the currency of expertise that institutions carry within. We therefore agree with the Council for Science and Technology's advice to Government on the principles for science and technology moon-shots, that "*a moon-shot team should comprise a wide range of professional skills and specialist knowledge from across disciplines, from researchers to engineers*". There is a need to cultivate a hybrid research culture and the capacity in the UK to transcend current research boundaries, in order to be genuinely interdisciplinary in a more radical way.

To do this, research teams need to be trained to be able to effectively operate in a team of hybrid identity that can handle paradigmatic incommensurability and which cultivates both generative dialogue and productive dissonance. It is through this cross sector, cross-disciplinary work that bigger breakthroughs can be achieved, via effective collaborations that share risk and resource. With this ambition in mind, we would be delighted to discuss with Government how the sector could, for

example, establish a practice of interdisciplinary and industrial secondments, in order to debunk any supposed hierarchy and foster greater collaborative advantage.

2. How can we maximise the economic, environmental and societal impact of research through effective application of new knowledge?

The Middlesex research community believes that research should have a positive effect on the public realm and we have long sought to ensure that our research is directly beneficial and impactful, as can be seen through our REF2014 impact case study grading. We welcome the Roadmap's recognition of the importance of collaboration and co-creation in inclusive research and believe that research that combines an intention to be impactful built into its design, via co-design and co-production, planned dissemination and concurrent knowledge exchange work, can greatly maximise the effective application of new knowledge. At Middlesex, we plan both dissemination and knowledge exchange as fully integrated within our research and we regularly choose a co-design approach, seeking to build trusted relationships with beneficiaries to ensure that the research design itself maximises future impact on the problems and opportunities of businesses and communities. This designing-in of impact can accelerate the transfer of research benefit to create social and economic value and challenges the view that research belongs only within universities.

This approach is particularly important to enable institutions to maximise impact on disadvantaged or excluded groups. At Middlesex, we can reach parts of society that others often can't, due to our distinctive position and demographic make-up. We therefore seek to undertake research that looks to improve EDI in an authentic way. Due to the social and trust relationships that we have established, we can reach into, and learn from, the social fabric of our community and develop a richer understanding of the historical, social and cultural context of an issue.

For example, Middlesex can offer an integrating approach to collaboration, pursuing research that supports the effective application of new knowledge. Our partnership in the innovative Gender, Justice and Security Hub project delivers on the Sustainable Development Goals on gender equality, peace, justice and strong institutions. It is a multi-partner research network coordinated by the LSE, working with civil society, practitioners, governments and international organisations. Middlesex was awarded almost £1.7 million to conduct research in seven countries of Middle East and South Asia. Through the creation of new knowledge, research methods and advocacy networks, we aim to amplify the voices of women and marginalised groups and to motivate reforms that affect global policy change, as well as local policy and practice in community development. Our impact on policy reform, as well as on-the-ground change in communities, is a defining aspect of our contribution.

3. How can we encourage innovation and ensure it is used to greatest effect, not just in our cutting-edge industries, but right across the economy and throughout our public services?

Innovation in industry and the public sector has a critical role to play in growing the economy, particularly in areas such as health, social, education, the arts and creativity. We think that funding should regard innovation not just as an opportunity for investment (in spinouts, for example) but also as a source of productivity gains. Innovation in the policing and justice system can have a multiplier effect on productivity and innovation in the area of mental health can have significant impact on employee absence rates and efficiency. If we are to capture the full benefit of Britain's excellent

university research and knowledge exchange performance, this impact must be recognised in both research and knowledge exchange funding.

An example of Middlesex's work to support innovation in the public sector is co-ordinating the European Commission-funded project, Visual Analytics for Sense-making in Criminal Intelligence Analysis (VALCRI). VALCRI, an intelligence and investigative analysis tool using data exploration and visualisation, was planned to support intelligence-led policing and involved the development of unique software tools. A prototype version was deployed at West Midlands Police, Belgium Federal Police and Antwerp Local Police and our team work with over 25 law enforcement agencies in nine countries and over 100 analysts to promote and evaluate the project. That work included training and capturing the evidence of practitioner responses to VALCRI so that, as the project evolved, researchers could refine and extend the benefit to police forces. Now transferred to the private sector by exclusive licence, the research has resulted in a product that we hope will revolutionise policing and security.

We would reiterate that to achieve greatest impact, inclusiveness of voice is critical to encouraging innovation right across the economy and throughout our public services. With a focus on EDI and applied research, at Middlesex our work is intentionally inclusive. With this objective, purposeful technology for social impact is a key theme running through our research profile, combining both STEM and SHAPE disciplines and end-users, and with a focus on ensuring that this technology is of maximum public benefit and accessible to all.

With much of our research, we hold a view of technology as a means to making targeted interventions that assist the operation of mechanisms of support for vulnerable or excluded groups. For example, Middlesex is collaborating on an international research project with the University of Genoa, jointly funded by the EU and the Japanese Government, to develop and evaluate the world's first culturally-aware robots, aimed at assisting in caring for the elderly. We are also working on communications technology that supports positive engagement between young people and youth offending team workers, to help tackle youth crime and empower young people on the margins of society, and another which helps homeless people access healthcare that would otherwise be hard for them to reach because of stigma and organisational constraints. Our work is of interest to the Prime Minister's Council for Science and Technology in their work on inclusive innovation.

4. How can we attract, retain and develop talented and diverse people to R&D roles? How can we make R&D for everyone?

Research should not only be designed for deployment and end benefit, but it should also be designed to be inclusive to achieve this. That means seeking out the best talent from the widest pool and reflecting the social and community diversity of Britain in research design. Middlesex believes it would be beneficial to establish principles on this with the representative parts of the academy and would be delighted to work with these bodies to formulate these principles.

We welcome commitment to invest in talent and recognition of the importance of recruiting international researchers, and hope to see policies, for example on contracts and use of overseas development funding to assist with joint work, that allow talented people from overseas to work on UK research projects on a short-term basis, allowing more flexible joint working between people from different cultures in the UK and outside.

We would like to see greater emphasis in the Roadmap on the development of 'in house' researchers, particularly UK-based early career researchers (ECRs). Job security is a concern for post-doctoral researchers and those funded through short, fixed-term contracts funded via competitive grants. This is a precarious existence at a time when many potential ECRs have multiple personal responsibilities, but also require an element of luck as to whether the start of new grant funding coincides with the completion of their PhD, or end of their previous contract. Much talent is leaked due uncertainty and such concerns are likely to increase significantly over the coming years as the economy recovers from the pandemic. There should also be particular focus on flexible careers in addition to 'straight line' pipelines. This means paying attention to all protected characteristics and enabling people to join research teams during and after first careers in industry.

Middlesex would like to work with Government to find solutions for increasing researcher job security, via initiatives such as bridging awards direct to researchers, or host institutions, to maintain their employment between grants, or significant expansion of post-doctoral awards (e.g. 5-year duration) for promising talent. Knowledge exchange and the practical attractiveness of research careers could be improved by fostering a cultural shift to encourage universities and business to value and encourage the two-way movement of researchers between academia and private sector. Universities, with industry, can and should offer distinctive practices to nurture talent and there is a role for industry to lead a programme of a new form of secondments for researchers into industry settings, and vice versa, to develop co-designed forms of knowing and doing.

A crucial work strand is the development of researchers and academics from BAME and other less-represented groups. Significant achievements have been brought about through Athena SWAN and programmes such as Aurora, but more could be done in a similar mode to offer genuinely equal opportunities to other groups, particularly those whose access to education and mobility is limited by economic conditions and personal lack of resource. Middlesex would be keen to discuss with Government practical steps for achieving this.

5. How should we ensure that R&D plays its fullest role in levelling up all over the UK?

To level up across the whole of the UK, it is important to avoid channelling funding to fewer institutions with a higher cost base and to ensure that agile, fleet-of-foot, quality, research groups in institutions engaged in both teaching and research are supported to make their contribution. These institutions are pivotal to levelling up, as they typically support higher numbers of disadvantaged students and researchers to fulfil their potential. We also have research and innovation priorities which naturally support this agenda. It is also crucial that there is understanding of 'place within place', as broad brush regional perspectives can miss the socioeconomic difference that can be measured, for example, street by street in London.

In some regions, maximising the benefit of having diverse institutions will be key. The region surrounding the Innovation Corridor (London-Cambridge) houses 7 higher education institutions, some strong in curiosity-driven research, some in impact-driven research and some in CPD and skills. To reach its full potential and thrive as an innovation-driven economy, the region needs to harness the strengths of all, with all of their conduits to economic impact, such as skills development, social shaping of impact, public adoption and social innovation. Genuine innovation relies on high-trust relationships. Due to Middlesex's focus on practice-based research, we have developed long-term relationships with industry through which risks can be taken and research outcomes are co-designed such that there is already commitment to delivering their benefits.

The Roadmap calls for strategic partnership and a strong role of civic leaders, highlighting the need for local input into decision-making. Universities are well-placed to take a leadership role within their local community's recovery from the pandemic, working with local authorities who may lack the

recovery apparatus and range of connections that universities have to build back prosperity. Universities must be able to fulfil their wider civic role in this time of crisis and realise their important function in rebuilding society and the economy and to best support levelling up and prosperity goals. Long-term civic planning and associated funding policies will greatly support universities to deliver this ambition.

Universities have a role to encourage innovation in the community as brokers/enablers in knowledge exchange. Universities can do more to support scale-up, innovation transfer and support businesses into sustainability that will make a valuable contribution to boosting prosperity. Small and micro businesses find it difficult to develop the capital for innovation projects at scale, but universities can help by bringing such businesses together in a facilitated mode to share in mutually-beneficial innovation. This helps both survival of micro businesses and their growth. This facilitating/brokering role is often particularly important for modern universities, as anchor institutions plugging skills gaps in their local community. In Middlesex's Borough of Barnet, over 90% of c.24,800 registered businesses employ less than 9 people and could be particularly vulnerable to the possible contraction in economy post-COVID. We are developing a strategy day with Barnet Council, to identify areas where we can work ever more holistically to support economic prosperity and innovative entrepreneurs.

6. How should we strengthen our research infrastructure and institutions in support of our vision?

We believe that achieving sustainability in research requires an increased share of the cost of research to be paid by entities other than institutions themselves and, importantly, that funders are supported by Government to not (as a result of an increase in the cost to them of funding research) fund less activity in fewer parts of the sector. Successive RAE/REF exercises have shown that the UK's relatively small higher education sector has pockets of international excellence throughout and that more selective funding would, in effect, act as a further element of cross-subsidy to infrastructure. Where more fleet-of-foot, quality, research groups can achieve research outcomes of equal or superior quality, it is important that they are not prevented from carrying out excellent work because fewer institutions with a higher cost base would be funded from less overall resource. Selectivity of the wrong sort can mean supporting less, and more costly, research.

With regards to QR funding, for example, we note MillionPlus' observation that modern universities make up 47% of the institutions that receive QR funding in the UK, yet for each of the last four years, older "pre-92" institutions have collectively received more than ten times the amount of QR funding than all modern universities combined, due to highly selective criteria used in allocating resources from REF2014 by Research England, focussed on a particular understanding of 'excellence.' Assuming that funding remains competitive, but is costed on the assumption of reduced cross-subsidy, the sector should consider making specific commitments in a new concordat with Government:

- (i) to generate research outcomes that are internationally recognized as significant;
- (ii) to increase the proportion of in-kind funding for research, notably collaborative research;
- (iii) to work with the Government to diversify sources of research funding and commit to grow the share of philanthropic funding for research in particular to 5% of total research spend;
- (iv) to grow the returns from the commercialisation or exploitation of research;
- (v) to increase the public benefit captured from full cost contract research where possible.

We do however believe that Government should look at tax aspects of collaborative funding and R&D investment in university research by businesses and philanthropists and believe that there should be further co-ordination of research and knowledge exchange funding with more 'follow-on' funding. Celebration of best practice examples by the research councils would be welcome, as would peer-to-peer best practice development in research strategy, development and management akin to that expected to flow from the KE Concordat. Finally, as expressed throughout the consultation we believe that there should be more active efforts to share research resources ('hub and spoke' models for research infrastructure) to ensure inclusion of all parts of an excellent higher education sector.

7. How should we most effectively and safely collaborate with partners and networks around the globe?

Middlesex University is a global entity with over 160 nationalities on our London campus, including 3,200 EU students and 2,860 international students in London. Furthermore, as one of the first to develop overseas campuses and with 39,000 students on Middlesex programmes around the world, Middlesex has a key role to play in the Government's post-Brexit export agenda and positioning London as a gateway to the world. With this global reach, we would be delighted to support Government, and other institutions without international campuses, by maximising the networks of our international campuses to further increase the international reach of UK higher education. This could include, for example, the offer 'Preparation for UK research study' courses to prospective students abroad, assessment of English, skills/methods courses and help with application. This could help to speed up quality recruitment of PhD students that are needed for the talent ambitions of the Roadmap and could even be extended to recruitment preparation for established academic staff, offering courses and event to aid their understanding UK higher education and networking opportunities.

We welcome the Roadmap's ambition to fully associate to Horizon Europe and Euratom R&T if we can agree a fair and balanced deal and the commitment to establish an alternative funding mechanism for international collaboration if this is not realised. We strongly support the British Academy of Management's observation that associated access to Horizon Europe, in conjunction with additional new UK schemes to fund international collaborative research, would undoubtedly reduce negative disruption to the R&D ecosystem.

Our global perspective also means that we are well-placed to lead on multinational, collaborative innovation work as the UK moves post-Brexit and seeks to maintain and strengthen ties with our international research partners. Furthermore, areas of international collaboration where we feel we can adopt a leadership role are those that focus on EDI and which build upon 'lived experience', as our research is problem-focused, and produces solutions and tools that empower people.

An example of one such collaboration is our Dance through Life project, involving an interdisciplinary team of academics from Japan's Oberlin University Institute of Gerontology and Middlesex University's Research Centre. The team are examining the role of dance and creativity in the well-being of the elderly, addressing the challenges of each country's ageing population. This topic is critical for both the UK and Japan, as the social and financial costs of conditions such as dementia are considerable and is exacerbated by isolation, which also cited as a key issue for society as those over 65 years old. The team are drawing Middlesex researchers' investigations of creative processes to test the role of creativity in enhancing cognitive stimulation and in achieving a sense of well-being

and fulfilment, in order to develop the provision of meaningful activities that best enhance quality of life for elderly people, in order to try and tackle this issue.

8. How can we harness excitement about this vision, listen to a wider range of voices to ensure R&D is delivering for society, and inspire a whole new generation of scientists, researchers, technicians, engineers, and innovators?

There is work to be done by universities and Government to further encourage the public to see the benefit of research and to prepare society to accept and work with the benefits of research. It is important that the higher education sector holds more community-based discussion about the role of research in society and more engagement with beneficiaries of research on the Government's vision, particularly as the sector moves towards more place-based funding and the levelling up agenda. Middlesex University endeavours to adopt this approach, as we have a long track record of successful of community-focused work. As mentioned previously, Middlesex will shortly be holding a Strategy Day with our local Borough of Barnet, with the aim of creating a problem sandpit and identifying areas of collaboration in the new Barnet Plan. This will include exploration together of how our data and research can best support the Barnet community and future joint projects that could be of mutual benefit. We have also developed an approach to generative dialogue which is particularly helpful in engaging end-users and practitioners in research co-design.

In order to harness excitement amongst future generations, we believe that more communication about the role of research in society at a younger age would greatly enable this. An example of one of our models of practice is our SMASHfest UK, a Middlesex and Greenwich University collaboration that generates immersive disaster narrative experiences designed to inspire children about science and creativity. It is aimed at communities underserved by STEM and arts (STEAM), informal education and underrepresented in STEAM education and careers. Our collaboration has won many national awards, including the prestigious THE 2018 – Outstanding Contribution to the Local Community award and the Royal Academy of Engineers Ingenious Award.

As stated previously, to ensure a range of voices, it will be important that Government is informed by perspectives from the whole sector as it considers the future of university research, knowledge exchange and the development of UK research capacity. This means including institutions engaged in both teaching and research activity, as well as representatives of SHAPE disciplines, alongside STEM. For example, we understand that there is to be a high-level steering group to further oversee work on the Roadmap's vision and would urge that this group include representatives from all types of providers, including modern universities. It will be important to ensure that the diversity, which is such a strength in the research sector, is reflected in this group's work.