

Report of the outputs from: Shaping the Future of Doctoral Education –Workshop for Businesses to Support the Review of EPSRC’s Doctoral Education Support.

Summary

These workshops were designed to seek industrial perspective and input into EPSRC’s review of it’s support for doctoral education. The workshops covered the following topics

1. Collecting qualitative evidence on the value of doctoral education and graduates to the economy to help EPSRC influence policy makers and secure future funding in this area
2. Generating of novel and innovative ways of enabling the engagement between non-academic organisations and doctoral education.

The review is being carried out in order to check that the doctoral education EPSRC supports enables the student to acquire the skills and knowledge needed for their careers, now and in the future.

The workshops were attended by members of non-academic organisations that have experience of, or interest in, engaging with engineering and physical sciences (EPS) doctoral students or graduates.

This report provides a summary of the discussions that were had at the workshops.

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Introduction

The review is considering what outcomes in terms of knowledge, experience and skills should be supported through EPSRC doctoral training investments. The changing nature of research means that EPSRC wants to check that the experiences provided by the doctoral education it supports, enables the recipient to acquire the skills for the career they choose now and in the future. EPSRC also wants to ensure that the landscape is adaptable to changes in future skills needs.

The review is covering the following five areas:

- The value of doctoral education: to the individual and their career, to the research landscape and to employers
- Skills and Experiences: What skills and experiences should be provided by a doctorate
- Student Population: how to enable a more diverse student population, including increased mobility between academia and industry
- How the doctorate is provided: including different qualifications, ways of providing the doctoral experience and how support is provided.
- Ways of identifying, developing and responding to strategic priorities: how can the landscape respond to changing directions and needs.

The workshop is one of the methods that EPSRC is using to gather evidence to help us develop recommendations for what outcomes in terms of knowledge, experience and skills should be supported through EPSRC doctoral training investments regardless of investment mechanism or topic area. Other methods include, a community survey, data analysis, literature survey and strategic conversations. The recommendations will be developed in consultation with members of EPSRC's Strategic Advisory Network and Council. The engagement is occurring until the end of 2020 and the recommendations will be developed in early 2021.

Two workshops were held on the 21 and 22 October 2020. These workshops were specifically targeted at members of non-academic organisations so that their views could be canvassed in a targeted manner. A total of 27 attendees came to the workshops and the delegate list can be found in Annex 1.

Opening address

The meeting began with EPSRC welcoming all participants. Shyeni Paul, Senior portfolio manager, EDI & People then gave an opening address and provided an overview of:

- UKRI's Talent Strategy
- EPSRC's Vision and Priority Framework, including the focus on Realising excellence in people
- The purpose of the review of EPSRC's doctoral support
- The scope and proposed timeline for the Review

This was followed by a question and answer session. The slides can be found in Annex 2.

The value of doctoral education for employees

The first session was about collecting qualitative evidence on the value of doctoral education and graduates to the economy to help EPSRC influence policy makers and secure future funding in this area. As part of the review EPSRC is looking to collect evidence of the value of doctoral education to

the individual and their career, to the research landscape and to employers. This evidence will allow EPSRC to make compelling arguments about the need for investment in doctoral education and show the benefits and impacts that investment in people has for the UK economy.

The delegates were asked to identify the benefits of having doctoral graduates in their organisations. They were considering a wide variety of roles within their organisations not just those directly related to research.

On the day, the groups were arranged (where possible) by size of company and sector, however as the points raised by all groups were very consistent, the outputs of all groups have been combined.

The following is a summary of all the discussions held across the two days.

The attendees identified three key areas where doctoral graduates bring benefits to the organisation

- 1) Scientific knowledge which is directly relevant for the company
- 2) General Scientific research knowledge
- 3) Transferable skills gained by completing a doctorate

Where a doctoral graduate has scientific knowledge that is directly relevant to the company, then the graduate is bringing in new technical expertise. This also provides the company with an awareness of competing technologies and gives the company access to a network of academics working in a relevant field. An additional benefit of hiring doctoral graduates with direct technical knowledge is that you are able to bring in technical leadership, start succession planning and accelerate the development process. Where a company is looking to diversify or open up new technical areas, hiring technical experts at the doctoral graduate level allows the company to bring in cutting edge knowledge. This can also lead to the upskilling of other employees.

There are also significant benefits to hiring doctoral graduates who are trained to the doctorate level in scientific disciplines that are not directly relevant to the company. Where the doctoral graduate is going into a research or research related role, doctoral graduates have more practical experience than undergraduates and are able to become acquainted with new areas of science rapidly; this means they require less training.

Doctoral graduates have a solid training in applying research methods to challenging questions. Over the lifetime of someone's career, it is likely that both the role they are in and the topics of interests to a company will change; by hiring someone who is able and willing to apply their knowledge of research to new areas provides resilience to the organisation as they will be able to redeploy them rather than having to hire new staff.

By coming into an area, doctoral graduates are often able to spot problems or possible improvements, quicker than people who have been working in the area for some time. A doctoral degree, trains someone to think critically about things and to solve problems and also often provides them with the confidence to question why things are being done in a certain way. Identifying these improvements, can result in significant benefits and savings for a company.

Hiring doctorate graduates, means that the company has access to the networks of those individuals. Where the doctoral graduate, is from a related field, this means that the overall network of the company is broader. This means the company may now have awareness of new research that has not yet been applied to their field. This could lead to a competitive advantage.

Many organisations also hire doctoral graduates into non research related roles, although few specifically recruit doctoral graduates to these roles. Having people with doctoral level scientific knowledge and experience in these roles, helps build cross organisational knowledge and is beneficial in engaging with stakeholders. The communication skills developed by completing a doctorate are beneficial in a variety of roles and having employees in non research roles who can confidently and knowledgeably communicate technical aspects help lend credibility to the organisation. In areas of the company that are not strictly research related, but are research adjacent e.g. patents, having doctoral graduates can lead to efficiencies. This is because doctoral graduates are more familiar with the scientific process and able to assimilate information quickly.

Across any role, the following skills were considered to be valuable to the organisation and common in doctoral graduates:

- Independence and resilience – these two aspects mean that doctoral graduates are able to hit the ground running and take ownership of their work. They are also used to facing challenges and have the skills to overcome them
- Analytical skills – EPS doctoral graduates all have high level analytical skills that are beneficial to a wide variety of roles
- Communication skills – The ability to explain highly complex information to a variety of audiences is necessary in both technical and non technical roles.
- Team working – Where doctoral graduates have experience of team working this develops valuable skills as the majority of industry projects are team based.

It was mentioned repeatedly that doctoral graduates who had a broad sector awareness are highly valued. The more general awareness they had of the context of their research and how the industry was positioned, meant the more rapidly they could apply their knowledge to projects in the company. Having doctoral graduates who had worked in the organisation was also valued. This is because the graduate was aware of the company culture and fully understood the role, leading to increased retention. It also gave the company awareness of the graduate before they employed them, meaning it was more likely the graduate would be a good fit for the company. Even where doctoral graduates had worked in other organisations, having this increased awareness of job roles and industry ways of working was highly valued.

The attendees were also asked to identify experiences that made a doctoral graduate more employable

- Time spent working in an organisation – preferably in the relevant sector to the employer but it didn't need to be that organisation
- Experiences that provided an awareness of the context of their research especially from an industrial perspective. Examples provided were: taught courses, industry conferences, industry focussed events, talks from people working in industry, networking activities
- Experiences that demonstrated communication skills, such as publications, conferences and public engagement activities
- Experiences that show project management both within the research and externally e.g. organising a conference or public engagement activity
- Having worked with other academics as this shows they have experience of group working; working across different environments and also widens the academic network they bring to the organisation
- Having defined practical technical skills

- IP training. Even having a basic level of knowledge is beneficial as it means the individual has more awareness of issues that might arise and can put steps in place to mitigate them.
- Relevant transferable skills training. This was considered beneficial because as well as the skills being beneficial, it shows the doctoral graduate has the right attitude, and is thinking ahead to their future career.

Throughout the discussion, it was raised that the quality of a placement can be very variable and this can affect the value of the placement to both the doctoral student and the company. In order for the placement to provide the best value for both the following needs to be in place:

- The length of the placement needs to be determined by the placement project and doctoral research needs rather than arbitrarily determined. In general, slightly longer-term placements were thought to better balance the cost of supporting the student and having a clear benefit to the organisation.
- Both academic and industrial supervisor need to be highly engaged. This means the industrial supervisor needs sufficient time available to be involved in the placement and the academic supervisor has to be bought into the placement and aware of the benefits it provides both the research and the doctoral student.
- The student needs opportunities to meet others in the organisations and experience how the company works as a whole. This is more beneficial than just experiencing on small part of the organisation but requires more consideration from the company on how to provide these opportunities.

Summary

It was made very clear that scientifically literate individuals are beneficial to companies that do scientific research, even when they aren't recruited to research roles. The majority of the companies that participated in the workshops have significant engineering and physical sciences research and development capability, and therefore it is likely that it is easier for these organisations to identify the value of a doctoral graduate. That said, all companies identified a series of transferable skills that were developed during the completion of a doctorate, that would be beneficial to any company, even those that don't have a research and development capability.

Innovative ways of engaging with EPSRC doctoral students

The second session of the workshop was about identifying novel and innovative ways of enabling companies to engage with EPSRC doctoral students. As part of the review, EPSRC is considering how the mechanisms of investing in doctoral education might need to change to ensure that the doctoral education provides the best outcomes in terms of knowledge and experience to the doctoral students. This includes considering how companies can be enabled to engage with doctoral education in a variety of ways. The delegates were asked to come up with a wide range of innovative ideas. The ideas were organised into 4 areas:

1. Engaging around the research
2. Ways of funding studentships
3. Engagement through training
4. Other

The outputs of all groups from both workshops have been combined and summarised below.

Ways of engaging around the development of the research project

- There should be more opportunities for Business led development and/or business ownership of the research project
- There needs to be a route for the rapid funding of studentships, 6 months was identified as a appropriate amount of time between funding and the student starting.
- When EPSRC is scoping strategic calls for doctoral education, there should be more involvement of industry in identifying the priority areas
- A way of maximising the value from national institutes in relation to doctoral education needs to be found
- EPSRC should carry out more horizon scanning, to ensure that people are being trained in future proof areas
- There should be a way to prioritise the funding of students in areas where there are currently fewer doctoral students. This is especially critical when there are periodic large investments that place students in specific research areas for a long time period.
- More widespread availability of 'alternative' doctorates e.g. by portfolio, EngD. These are often more compatible with companies projects and objectives.
-

Ways of funding studentships

- More funding for doctoral students
- Specifically, regarding the ICASE scheme, the attendees wanted to see:
 - More doctoral students funded through the ICASE scheme
 - More companies to have access to the ICASE scheme
 - A mechanism for SME's to access the ICASE scheme. One idea posited was that SME's could sign up to a lottery system to be allocated ICASE vouchers.
 - The ability to use the ICASE vouchers at any university (currently can only be used at DTP holding institutions)
 - Standardisation of how the ICASE top-up is used by universities.
- EPSRC to encourage/mandate that universities accept more in-kind support, instead of only cash contributions.
- EPSRC to allow companies to fund a higher proportion of a studentship. Currently only 50% of a studentship can be funded by a partner (with the exception of CDT incorporated students). The benefits of funding a higher proportion would be that the company would have more ownership of the IP and project direction.
- Schemes which allow companies to contribute different levels of funding as opposed to stating a specific amount the company must provide.
- Schemes which consider the company's ability to contribute and scale the required contribution, instead of having a fixed rate.
- A pot of funding that universities can apply to, to fund collaborative doctoral projects with companies
- EPSRC to pay companies to take on PhD projects
- The development of ways that reduce the financial risk for SME's. Ideas included: Paying SME's to take a PhD studentship; having a larger company take on financial risk on behalf of the SME
- Continuity of funding within the CDT model, rather than a large exercise periodically that causes dramatic changes to the landscape

- The ability to use the Level 8 apprenticeship levy
- For more students to be paid above the minimum stipend. It needs to be made clear to universities that they can request above the minimum stipend.

Ways of Engaging through the training of students

- Companies should participate in advisory boards
- Enable student to have access to the companies training schemes
- Companies should Co-create and deliver the training modules with the university
- Companies could provide training/talk/workshop on aspects of IP to ensure the students can apply the relevant knowledge to their own project; It was raised that this training should also be provided to supervisors
- Companies should consider how they can enable placements within their global networks and not just sites in the UK
- When setting up placements, the length should be carefully considered not arbitrarily decided. It was mentioned that often the placement needs to be 3 or more months long, to provide a benefit to company
- The company to provide lectures/workshops/training on kit or techniques
- Buying out the time of staff members would incentivise participation in delivering training some companies but for some limit is capacity of the organisation
- Allow company employees to participate in the training being provided by the university
- More industrial training for the student
- Provision of supervisor training for both academic and industrial supervisor
- The creation of small workshops for students, where a company or companies can pitch ideas and students work to develop the ideas. These could be hosted by companies, universities or EPSRC.

Other ideas

- There should be better visibility of EPSRC funded doctoral projects
- EPSRC to perform a match making service between companies' problems and academic groups. This could be in the form of a portal or ad service
- EPSRC to arrange Networking activities between companies and academics that are meaningful
- The creation of a networking hub alongside calls to help with building connections
- EPSRC should provide information on all mechanisms by which companies can engage with students
- Training for companies on how to engage with RO's/studentships provided by RO's or experienced organisations
- Development of a buddying system where larger/or more experienced companies can mentor smaller/or less experienced companies
- EPSRC to promote and encourage in-kind engagement and encourage universities to allow it.
- Methods of enabling current employees to undertake doctoral training need to be developed
- EPSRC to host workshops or conferences that allow students to present to industry
- The new mobility scheme is positive step but still carries a high cost to the company

- Creation of a mentoring scheme for students, whereby they can have an industrial mentor even if the company is not directly involved in project
- Increased career guidance provided for students
- Creation of opportunities for companies to advertise problems and students to pitch solutions/research projects
- Development of IP arrangements between the company and university are more flexible
- Provision of guidance on how to set up IP arrangements between companies and universities

Summary

A wide range of novel ideas were identified by the companies. There was a strong theme for the need for more investment in collaborative doctoral education across all discussions. It was also interesting to see that the need for clearer guidance and support for companies on how to engage was identified, even though the majority of attendees already engage with EPSRC funded doctoral students. Some of the ideas raised, are possible on EPSRC's current schemes even if they aren't necessarily utilised, so there needs to be a consideration of how to incentivise the behaviours EPSRC would like to see beyond just making them possible.

Next Steps for the review

The outputs of these workshop are being reviewed by a group of members from EPSRC's Council Strategic Advisory Network (SAN). They will be combined with the outputs of other engagement activities that are happening as part of the review of EPSRC's doctoral education support. The advisory group will be using the combined evidence to develop a series of recommendations for what outcomes in terms of knowledge, experience and skills should be supported through EPSRC doctoral training investments. EPSRC will then use those recommendations to develop its future approach to doctoral investments, in the context of direction in UKRI and the national funding landscape.

Annex 1: Delegate List

Carla Barbatti; Constellium UK

Paul Beasley; Siemens

Allan Colquhoun; Leonardo

Simon Gibbon; AkzoNobel

Mark Jefferies; Rolls-Royce

Peter Loftus; Evalu8ion Ltd

Hadi Moztarzadeh; University of Warwick

Mark Purdie; AstraZeneca

Anja Roeding; University of Exeter

Jonathan Sinclair; University of Central Lancashire

Matt Ball; Thales UK

Richard Burguete; National Physical Laboratory

Ambreen Chohan; University of Central Lancashire

Norman Godfrey; AWE

Winfried Hensinger; Universal Quantum

Jon Hyde; National Nuclear Laboratory

Andrea Kells; Arm

Peter Levison; Pall

Clare Morgan; Microsoft

Jeremy Morley; Ordnance Survey

Catherine Price; Shell

Luke Savage; Sony Interactive Entertainment

Rick Short; Nuclear Decommissioning Authority

Malcolm Skingle; GSK

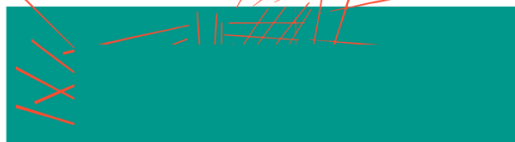
Paul Swift; P&G

Silvia Villarroya-Lidon; Swansea University /SPECIFIC

Annex 2: Slides from opening address

EPSRC Doctoral Support Review

Shyeni Paul, EPSRC, EDI & People
21/10/2020



Our vision and mission



Our vision is for an outstanding research and innovation system in the UK that gives everyone the opportunity to contribute and to benefit, enriching lives locally, nationally and internationally.



Our mission is to convene, catalyse and invest in close collaboration with others to build a thriving inclusive research and innovation system that connects discovery to prosperity and public good.



Delivering our vision and mission

- The research and innovation system is complex and multidimensional and must be considered holistically. This is reflected in the interconnected nature of our four mission statements. They are not separable, and all contribute to multiple outcomes.
- In this corporate plan we set out our objectives for the current year grouped under our four mission statements, matching them to the statement to which they are most relevant, while recognising that these statements are deeply interconnected.



We will **convene and catalyse**, by listening to and connecting diverse communities to create new combinations, working in partnership with others. And we will help to make things happen, catalysing new activities through our work and investment.



We will **incentivise** the development of a research and innovation system that realises our vision through all the choices we make, how we behave, and in our policies and activities.



We will **invest** in people, ideas and infrastructure, through a portfolio of investments that ensures public benefit from the system as a whole, informed by engagement and evidence. We will fund well – efficiently and effectively.



We will **conduct** high-quality research and innovation and provide critical national capabilities through our centres, units, and institutes.



UKRI talent in numbers

- In the financial year 2020/21 UKRI has an investment budget of more than **£9,000m**.
- UKRI invests about £600m** annually in talent programmes, including approximately **£400m in doctoral training**
- £260m is invested per year in England through the **Research Degree Programme (RDP)** Supervision funding, and about **20% of QR** (approx. £210m) is used for attracting and retaining talent, training and doctoral students
- Fund **1,500 research fellows**
- Support over **27,000 active students**, approximately 7000 starts in the last year.
- We also support more than **24,000 researchers** on research and innovation grants



EPSRC Vision: Corporate Plan 2020/21



▪ Delivering economic impact and social prosperity;

To decrease the timescales between discovery research and impact through our Productive, Connected, Healthy and Resilient Nation priorities.

▪ Realising the potential of engineering and physical sciences research;

To support and draw together people, expertise and facilities from across institutional boundaries to maximise the potential of the UK research base, promoting excellence across all our investments.

▪ Enabling the UK engineering and physical sciences landscape to deliver

To invest in the core foundations of the research base to ensure the UK remains globally competitive and maintains its world-leading position for research and innovation including investing in research facilities and accessing talent through equality, diversity and inclusion.

How do we achieve our vision?

- community engagement and partnership
- work effectively with our community, partners, advisory groups, learned and professional societies and government to position our portfolio of funding
- be effective in articulating our future portfolio needs and directions
- may need to respond at pace



The Priority Framework

Objective 2: Realising the potential of engineering and physical sciences research

To unlock the potential of EPS research by stimulating and challenging the research community to open up new areas of science; supporting talented people; and strengthening engagement with users and business



Promoting Excellence in Research



Realising Excellence in People supporting researchers to work across university and business sectors



Connecting the Research Landscape to Accelerate Impact continue and extend IAA activities



Enhancing Business Engagement



Engineering and Physical Sciences Research Council

Realising Excellence in People

To be productive and competitive, the UK needs a diverse workforce with the right skills.

- **People** with world-leading research ideas;
- **People** with the analytical, critical thinking, and other skills that employers need to lead and deliver innovation;
- **People** to help achieve the economic and societal impact that research has the potential to have.



Engineering and Physical Sciences Research Council

Reasons for doctoral training

- EPSRC is a major funder of doctoral students, funding 25 to 30% of all EPS doctoral studentships in the UK
- Well-established and recognised approach to developing and training highly skilled researchers and innovators
- Research outputs are recognised and important
- Future of the R&D workforce which will encourage the growth of the UK's capacity and capability in emerging research challenges.



Realising Excellence in People

Supporting researchers to work across university and business sectors

EPSRC Doctoral Education review

Ensuring that the doctoral education we support :

- enables the recipient to acquire the skills and knowledge needed for the careers that doctoral students take-up
- ensure that our investments are helping the research and innovation system adapt to changes in future skills needs



Realising Excellence in People

Supporting researchers to work across university and business sectors

EPSRC Doctoral Education Review

- Phase 1 2020 -2021 :

What

Developing principles for EPSRC's doctoral education support

Mechanism and budget agnostic

- Phase 2 2021:

How

Develop recommendations for EPSRC's future approach to doctoral investments

EPSRC Doctoral Education Review

The value of doctoral education: to the individual and their career, to the research landscape and to employers

Skills and experiences: What skills and experiences should be provided by doctorate

Student population: how to enable a more diverse student population, including increased mobility between academia and industry

How the doctorate is provided: including different qualifications, ways of providing the doctoral experience and how support is provided.

Ways of identifying, developing and responding to strategic priorities: how can the landscape respond to changing directions and needs.



EPSRC Doctoral Education Review

Phase 1:

- Working with all stakeholders
- Workshops
- Strategic Conversations
- Student Focus groups
- Call for evidence
- Recommendations developed by EPSRC SAN and Council members



EPSRC Doctoral Education Review

Phase 2:

- Comparing the recommendations to the current investment mechanisms
- Developing the future of EPSRC Doctoral Education investments, within the context of UKRI developments



Centres for Doctoral Training



Doctoral Training Partnerships



Industrial CASE



Next Steps for the Review

Engagement activities are continuing

EPSRC will be developing the recommendations with the Strategic Advisory Network and Council. These will be published (~Late Spring 2021)

Phase 2 of the review will then commence, looking at implementing the recommendations

