Royal Society of Chemistry's response to the Engineering and Physical Sciences Research Council Consultation on the draft Strategic Plan 2016-2020

The Royal Society of Chemistry is the world's leading chemistry community, advancing excellence in the chemical sciences. With 49,000 members and a knowledge business that spans the globe, we are the UK's professional body for chemical scientists; a not-for-profit organisation with over 170 years of history and an international vision of the future. We promote, support and celebrate chemistry. We work to shape the future of the chemical sciences – for the benefit of science and humanity.

The Royal Society of Chemistry (RSC) welcomes the opportunity to comment on the Engineering and Physical Sciences Research Council's (EPSRC) Strategic Plan for 2016-2020. We would be pleased to engage with the EPSRC further to develop both this and the delivery plan, providing input from our wider membership.

Executive Summary

The Royal Society of Chemistry welcomes the EPSRC's ambitious Strategic Plan. The UK's engineering and physical science research community is world-leading and safeguarding its strength will ensure that the UK is able to retain its place as a modern knowledge economy.

Whilst ambitious however, this strategy is too ambiguous, brushing over several points which require more focus, and providing no detail as to how the strategy will be achieved or success measured. There are correspondingly noticeable deficits in the visible strength of support for, amongst other things, diversity and fundamental research, both of which are of paramount importance for the UK's science and innovation system.

The current doctoral training system, without provision for students on individual projects or those starting their careers, does not provide the flexibility nor the nurturing environment required to ensure the UK's excellence in engineering and physical science. The Centres for Doctoral Training (CDTs) provide excellent support for interdisciplinary research, but were developed in a landscape with project studentships, and will result in a contraction of the scope of UK research.

Involvement of the community in decision making has been an area of focus for the EPSRC over recent years and this is very much welcomed. This relationship would be best and most boldly demonstrated by the addition of a core community engagement pillar to the EPSRC's Strategic Plan.

Recommendations

- Remove ambiguities within the strategy to provide a clear statement of ambitions with measurable aims.
- Provide an unequivocal statement of support for fundamental research.
- Provide a statement of contingencies for both reduced and increased funding levels.
- Reintroduce doctoral studentships to ensure a strong, flexible research base that supports emerging talent.
- Include community engagement as a core pillar of the Strategic Plan.

Introduction

The Royal Society of Chemistry commends the "aspirational and ambitious" vision, goals and strategies set out in the EPSRC's draft Strategic Plan 2016-2020. We are pleased to see the breadth of issues covered within the Strategic Plan, many of which are areas of focus for us also. There are however a small number of areas on which we are in disagreement, and also a number of areas in which a higher degree of specificity is required to ensure that the EPSRC's meaning is understood.

Specificity

We understand that a formal delivery plan is to follow this strategy, and that the purpose of a strategic plan is not to delve heavily into the details of delivery, but the clarity of the current draft would be greatly improved with an increased level of detail and specificity.

For example, the objective to "increase the number of world-leading scientists and engineers working in the UK and…encourage them to be more adventurous than ever before", does not make clear what that expected increase will be, how the EPSRC plans to encourage these scientists to become "more adventurous", nor what adventurous means in this context.

This lack of specificity can decrease the impact of statements that should receive high priority, for instance, on diversity. Diversity within the research base is only briefly touched upon – "We are committed to diversity and equity in the research base" – and as such is given neither the prominence nor full sounding that such a commitment requires. As the UK's largest funder of physical science research, the EPSRC has a responsibility to ensure that its strategic aims, delivery plan, funding mechanisms and other aspects of community engagement support and nurture all researchers and work to remove barriers that specific groups of individuals may face more commonly than others.

Ambiguity in strategic aims will lead to a difficulty in measuring and so determining levels of success. It is noticeable that the section of this strategy devoted to measuring success is only one sentence in length, and whilst it clarifies that this measurement will be focused on "research investments and acceleration of innovation", it does not specify how this will be measured, nor discuss the validity or reasoning for these measures. We would encourage the EPSRC to expand upon this section for the benefit of clarity and understanding.

The document also makes a number of claims without recourse to sources or evidence. For example, the draft document states that “in international benchmarking, EPSRC research is judged to be world leading” and that the EPSRC “peer-review processes have been proven effective”. Providing the source for, or an example demonstrating, these claims would increase the confidence of the engineering and physical science community and the public in the EPSRC’s Strategic Plan.

Breadth

An unequivocal statement of the EPSRC's support for fundamental research would provide the UK research community the security of knowing that the long term future of UK science is being supported. We are pleased to see mention throughout this document of both challenge-focused and fundamental research. However, the latter is described separately in multiple ways, with the effect that there is no strong statement putting forward the EPSRC's support for basic research. Public funding of research provides support for speculative science which is essential for ensuring a strong research base and innovation system, but is outside the scope of the private sector. By funding excellent research without obvious immediate practical outcomes, the EPSRC provides the fertile ground from which the next generation of paradigm shifting inventions will spring. In an international science ecosystem advances in knowledge and technology can come from anywhere in the world, but it is only by ensuring that we have a strong skills base, covering the breadth of fundamental science, that we will ensure our ability to capitalise on those discoveries and turn them to the UK’s economic advantage.

We are concerned that the current draft Strategic Plan appears to provide no suggestions of what will change should the level of funding given to the research councils change. In 2010, EPSRC's introduction of Shaping Capability in response to a reduction in funding from government was met with disquiet from the community, who felt that these changes were made without warning or consultation. Should such drastic changes be required again, pre-warning of routes may assist the community in adapting. We would be interested to know how the EPSRC would work with the community to deal with more drastic cuts should they occur, and more optimistically, at what level an increase in funding would allow a relaxation of the constraints of Shaping Capability.

Studentships

Supply of world class doctoral students is central to both the scientific and economic success of the UK.

The work that the EPSRC has done to ensure that the quality of student experience is high is very welcome, but the removal of project studentships neither achieves this goal, nor best supports the academic research community. CDTs were developed in a research ecosystem that included project studentships to fill the broader need for researchers. The removal of these project studentships in 2011 left a funding landscape lacking in a national strategy and providing uneven coverage both by subject and location.

The introduction of CDTs has provided a great number of success stories, with benefits in:

- improving provision for interdisciplinary research,
- building cohorts for internal support,
- ensuring the quality of training and soft-skills provision.

However, it also leaves gaps in the provision of studentships in some areas of science and engineering.

Interdisciplinarity
CDTs work well in encouraging students to pick up skills from range of disciplines and acting as a hub at which academics from across a university can interact. However, this system of doctoral student provision will inevitably create 'specialist' universities, as research groups cluster around the centres relevant to their field where they can ensure a continuous supply of students. This will inherently reduce the number of topics that people in a university will work on and consequently limit the number of disciplines that can interact more widely to develop new interdisciplinary projects.

Cohorts
A unique selling point of the CDT experience is the introduction of ‘cohorts’ or tightly-knit year groups, a feature which has both champions and detractors. At its best, a cohort system can provide students with support by allowing individuals seeking help from fellow CDT students, even across year groups. It has however been suggested that a well-run departmental intake could simulate this cohort system; some universities in particular have worked to ensure this by creating a coherent experience for all first year PhDs.

Training
The quality of training and soft-skills provision is important. We are pleased that it is an area of focus for the EPSRC, and our CDTs are generally viewed as successful in this manner. However, removing project studentships does not provide the solution to ensuring a quality experience. Prior to the instigation of CDTs many departments were already delivering training with the implementation of the ‘Roberts Report’,[i] and several universities have now opened the soft-skills section of their CDT to all PhD students. Providing project studentships in the cases where a programme for wider training for PhD students can be outlined (if necessary in conjunction with a CDT) would allow the quality of studentship experience to be maintained.

Recipients of research council grants must be empowered to flexibly assemble the team that they need to carry out the work. The role of PhD students as primary researchers is an important one. Principle investigators should be allowed to judge the best make-up of the research team, including the number and proportions of postdoctoral researchers, students and technicians.

The removal of project studentships is consistently highlighted by members of the community as being a significant barrier to conducting research. The current mix of doctoral training provided by the EPSRC through doctoral training partnerships, centres of doctoral training, and industrial CASE studentships does not provide the

diversity and flexibility required to ensure that we remain a world leading scientific nation.

Methods should be instigated to ensure that Doctoral Training Partnership funds are still available for broader use and not used to subsidise CDTs. The House of Lords Science and Technology Select Committee were concerned with the decrease in breadth of UK research which could be caused (and perpetuated) by the current system without project studentships, and have recommended that a diversity of studentship provision is maintained.[ii] It has been reported that CDT studentships are 60% more expensive than traditional doctoral funding models.[iii] As this additional cost is not provided for in totality by EPSRC, universities are forced to make up the financial shortfall. Whilst the mid-term review did note some success in leveraging industrial funding,[iv] it also reported that Doctoral Training Grant (now Doctoral Training Partnership) funding is often being utilised to plug the financial gap. This increase in cost and redirection of funds can only have a negative effect on research volume, whilst at the same time further decreasing the breadth of provision.

There are a number of concerns about the stability of a postgraduate studentship system based upon CDTs. Funding CDTs for only a fixed period with limited likelihood of repeat funding means that some CDTs will inevitably need to close for financial, rather than scientific or pedagogical reasons. Many if not all centres will have difficulty replacing EPSRC funding with that from alternative sources, as industry may either not find the research area of interest, or find cheaper industrial CASE studentships more economical. This will lead to both major disruption to the research system and significant waste of accumulated resources and expertise.

The removal of studentships from First Grants has reduced the UK's ability to nurture and support emerging research talent. Not only are PhD students an essential part of a well-functioning research group, but in this system newly started independent Principal Investigators (PIs) often have difficulty recruiting postdocs and so starting their group at all. Talented and ambitious postdocs looking to build a career in research want to work with well-known and respected academics in order to build their own skill-set and prestige, and are unlikely to choose to work with a newly appointed PI who is not yet known in the community, and has little resource or stock of equipment. This puts UK researchers at a detriment to their peers internationally, and risks us losing our most talented emerging researchers to countries with more flexible funding schemes.

The EPSRC strategy should include an explicit statement that the landscape of doctoral studentship provision will continue to meet the short and long term needs of the research community. To ensure that the UK continues to be world leading in engineering and physical science research it is essential that this vital component of the UK research and innovation system continues to both support the current community, and build the researchers of tomorrow.

Community engagement

As the largest funder of physical science research, it is crucial that the EPSRC maintains and grows its relationship with the research community it supports. We would agree that in order for the EPSRC to achieve its worthy vision of making the UK "the best place in the world to research, discover and innovate", it must put active researchers right at the heart of the decision making processes.

We are pleased to see the EPSRC's aim of developing its delivery plan "in cooperation with the research community", however the draft strategy does not give due prominence to the important role that the research community should have in the EPSRC's Strategic Plan, and we would encourage the EPSRC to make the importance of community engagement and strategic advice more prominent in this Strategic Plan.

We recently provided written evidence for a recent consultation into the EPSRC's Strategic Advisory Routes which provides more in depth comments regarding suggested improvements the EPSRC can make in how it obtains and communicates its strategic advice. We have included this written evidence as an appendix to this response.

Short time frames for consultation are detrimental to the level of interaction and standard of response. We note that the EPSRC often provides short time frames for stakeholders to input into important decisions. For example, the window of opportunity to provide input into this consultation, on the EPSRC's Strategic Plan for the remainder of the decade, has been less than 4 weeks (18 working days). In addition to the short time frame, this window also falls over the summer holiday period and covers a bank holiday.

Such short time frames do not allow sufficient time for in-depth thought for research communities to develop a considered position. The community would feel better consulted, and the standard of evidence available to assist the EPSRC in decision making would be higher, if a consultation period of at least 12 weeks was adopted, a period laid out as best practice by the Cabinet Office.[v]

Conclusion

The UK has a world-leading science base, which forms a fundamental component of our modern knowledge economy. The EPSRC plays a crucial role in nurturing the engineering and physical science communities, and one with rising complexity as levels of funding decrease in real terms. It is for this reason that ensuring this Strategic Plan meets the current and future needs of the research community is so important.

As it stands, the Strategic Plan does not lay this out clearly enough, and we would be happy to work with the EPSRC, on both this Strategic Plan and the forthcoming delivery plan, to ensure they meet that need.

[i] SET for success, Sir Gareth Roberts (2002)
[ii] Higher Education in Science, Technology, Engineering and Mathematics (STEM) subjects, House of Lords (2012)
[iii] Research intelligence - Eyes front in the 'top-down' centres, Times Higher Education, 2012
[iv] EPSRC mid-term review of CDTs
[v] Consultation Principles, Cabinet Office (2013)