

Nurse Review of Research Councils: Call for Evidence

Response Form

Please state whether you are responding as an individual, or on behalf of an organisation:



This is an **Institution of Chemical Engineers** (IChemE) response to the government's call for evidence on the Nurse Review. This response was developed by **IChemE's UK Research Committee** – with support from IChemE's technical policy team – which promotes chemical engineering research with representatives from both industry and academia.

IChemE is the global professional membership organisation for individuals with relevant experience or an interest in chemical and process engineering. Founded in 1922, IChemE has grown to its current status of over 42,000 members across 120 countries.

We are the only organisation to award Chartered Chemical Engineer (CEng) status and Professional Process Safety Engineer. We are also licensed to award the titles Chartered Scientist (CSci) and Chartered Environmentalist (CEnv) to suitably qualified members.

Our Royal Charter and charitable status confers upon us an obligation to advance chemical engineering for the benefit of society as a whole and support the professional development of our membership, which spans a wide range of individuals from industry, regulators, academia and consultancies.

We can call upon our members' expertise in these fields without bias or favour, in order to reach objective advice based on sound science. IChemE welcomes the opportunity to comment on this call for evidence.

Words: 199

Please write here your name/ the name of your organisation and contact details. This would help us to contact you if we have further questions.

For further information please contact:

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Please provide evidence and views in relation to the following themes:

1. Strategic decision-making

Funding Themes: Research Council funding schemes used to support research are considered broad enough to encompass most areas, attract people into new research areas and offer routes to novel technology solutions. However, it is important to ensure that the research undertaken is appropriate to fit these themes and not 'shoe-horned' in.

There is a need for balance between managed research themes and more responsive funding of research activities. We propose that money to support responsive research is ring-fenced.

Multidisciplinary Research: A large part of EPSRC's portfolio supports engineering, but this is not replicated in other Research Councils (eg BBSRC, NERC, MRC). EPSRC is the specialist council for engineers but the scope of chemical engineering is very broad and spans the remit of other Research Councils; it needs their support (eg biochemical and bioprocess engineering (BBSRC, MRC) and medical implants (MRC)).

Modern research is multidisciplinary. Therefore, the need for the current compartmentalisation of research funding is questioned. Many emerging areas do not fit within one Research Council; a review of the structure of the Research Councils should examine if there is a need to segregate science and engineering in this way.

Levels of Funding: Greater consideration needs to be given to advances in chemical engineering technology, with particular focus on the full range of Technology Readiness Levels (TRLs) and how Research Council and Innovate UK funding interacts. Equally, the importance of Manufacturing Capability Readiness Levels¹ (MCRLs) is overlooked. The full ranges of TRL and MCRL should be managed together in an integrated way, with full support from the Research Councils alongside other funding sources (eg Innovate UK).

Greater support for both fundamental and applied research is essential. The UK lags behind many countries in the amount spent on R&D as a percentage of GDP. Since 2004, the UK has invested in research at below the EU average; with total government spend on science, engineering and technology falling by a billion pounds (£12.7bn to £11.7bn)².

Lord Krebs, former Chair of the House of Lords Science and Technology Committee, has voiced his concern saying: "unless investment in science in the UK keeps pace with that elsewhere in the world, the UK could lose its competitive edge in science and innovation, with consequential impacts on the economy³." IChemE echoes Krebs' concern.

The UK has been successful in building strong foundations for research and performs well above the global average. We see this as an excellent opportunity to build upon and to bring even greater benefit to UK plc by linking research investment more strongly to GDP growth.

Priority Setting: A unified method of working across Research Councils is needed in order to prioritise research. EPSRC's approach to identification of priorities with the research communities is a good model. This approach achieves a balance of top-down Government priorities versus bottom-up community prioritisation and should be emulated.

Despite the effectiveness of the Strategic Advisory Teams⁴ (SATs) and Networks (SANs) some concern has been expressed at the lack of broader industry involvement in determining research priorities relevant to UK plc. Action is required to ensure more companies recognise and value opportunities for Research Council engagement.

Sandpit and community workshop events are good. However, there is general agreement that they need to be more effective. This could be achieved through wider participation, offering stakeholders,

¹ <http://www.publications.parliament.uk/pa/cm201213/cmselect/cmsctech/348/348we21.htm>

² <http://sciencecampaign.org.uk/CaSE2015InvestmentBriefing.pdf>

³ <http://www.parliament.uk/business/committees/committees-a-z/lords-select/science-and-technology-committee/news/call-to-increase-science-budget/>

⁴ <http://www.epsrc.ac.uk/about/governance/sats/>

including industry representatives, the opportunity to comment, avoiding narrow participation and bringing greater transparency to the process.

Industry Engagement: Greater clarification of the mechanisms and processes undertaken by Research Councils is required to achieve better industry engagement. Opportunities for co-funding mechanisms must be made more transparent.

SATs and SANs are excellent examples of Research Councils striving to achieve greater industry involvement. Industry needs to be better at recognising this opportunity and its value.

Public Engagement: Decisions on which areas to fund should be in response to societal pressures and areas of research interest. However, the decisions must be based upon the real impact of the research rather than the excitement it generates.

Ongoing government funding for effective education across all STEM subjects is required⁵. The future health of our research base depends on choices made at school.

Words: 685

2. Collaborations and partnerships

Cross-Council Working: There is a lack of cohesion between Research Councils. More should be done to support cross-Council work with sharing of good practice between Research Councils, National Laboratories, Catapult Centres and Innovate UK.

Major multidisciplinary advances could be facilitated through closer alignment between the physical and life sciences. The Research Councils should work collaboratively to promote such advances to avoid opportunities that are being missed due to current Council segmentation. In an era of increasingly multidisciplinary research, IChemE questions whether such segmentation is now appropriate.

For instance, cross-Council working is essential in robotic surgery, which requires research and skills that reside across BBSRC, EPSRC and MRC Research Councils need to work more closely with academia and industry to link clinical, scientific and engineering skills to ensure research projects achieve successful outputs.

A clear, joint strategy across Councils should be formalised, including interlinked websites. This will ensure more diverse, fundamental and interdisciplinary technology development. Currently this is not visible, even though there are many excellent examples of grants and projects supported by more than one Research Council. Chemical engineering research, being highly multidisciplinary, suffers from this lack of cross-Council cohesion.

There is a large amount of confusion associated with interactions with National Laboratories and Research Council Institutes. Clearer direction about when and how to engage with these bodies is required.

International Funding: Research Councils need to work more closely with international funding bodies to ensure that UK research does not miss out. For example, the UK does not appear on the list of WaterWorks2014 Funding Partner Organisations⁶.

Researcher Mobility: Research Councils can lead by example to address and improve the two-way mobility of researchers between industry and universities. The replacement of academic researchers on secondment should be properly funded and promoted. The benefits eg improved problem selection, innovative ideas and long-term collaboration, require more vigorous promotion.

⁵ <http://sciencecampaign.org.uk/CaSE2015EducationandSkillsBriefing.pdf>

⁶ http://www.waterjpi.eu/images/WaterWorks2014/WW2014_FPOs_EC_Commitments.pdf

Additional public funding mechanisms are needed to facilitate academic secondments and to ensure reciprocal exchanges with industry. This funding should cover issues such as: providing additional teaching support while academics are in industry to stop secondments being seen as absences; and to offer greater support to those who undertake them. The Royal Academy of Engineering Industrial Secondment Scheme⁷ is an exemplar.

Knowledge Transfer Partnerships⁸ are good at supporting industry, but we feel that the Research Councils could do more to encourage academics. The EPSRC 'Manufacturing the future' theme⁹ has used Manufacturing Fellowships to support transition of industrialists to academia – this is an example of a practice IChemE would like to see more often.

Academia-Industry Collaboration: There is strong support for industry-academia collaborations but the Councils need to be more proactive about promoting them with specific incentives. Successful collaborations should involve Research Councils working with universities, industry and the Government.

Intellectual property (IP) and the rights to commercial exploitation is a key barrier to industry involvement. Universities should be incentivised to make IP available to sponsoring companies on acceptable terms through Research Council processes. A formal review to identify the most effective mechanisms and alternative IP sharing practices is needed. IChemE proposes that the Research Councils support the creation of a forum for sharing good practice and information on collaborations.

Innovate UK: It is unclear how Research Councils and Innovate UK work together at the interface between industry and academia. There is a perception amongst some industry researchers that funding from Innovate UK and Research Councils is not easy to access and application processes are opaque.

Research Councils and Innovate UK need to work together to provide coherent funding mechanisms across the different TRLs/MCRLs and to encourage inter-company collaboration with universities on pre-competitive research through larger, long-term projects to feed the innovation pipeline.

Calls for proposals from Innovate UK should encourage stronger collaboration between industrial R&D centres and universities. Currently, universities are allowed to be funded for 30% of the total budget, which severely limits the possibility for meaningful collaboration.

Catapult Centres¹⁰ offer an excellent way for companies to share the risks of collaboration. They allow business to access concentrated expertise, cutting-edge equipment and specialist facilities to develop and test ideas. Future academic-industry centres of excellence should be formed with joint support from Innovate UK and Research Councils to address short-, medium- and long-term research needs.

The Hauser Review¹¹ highlights the advantage to countries where substantial funding programmes are in place. For example, the Fraunhofer Institutes in Germany now have a turnover approaching €2 billion. However, they were established in the 1950s. This demonstrates the level of investment required in both time and money to make the UK Catapult centres effective and sustainable.

Words: 759

⁷ <http://www.raeng.org.uk/grants-and-prizes/schemes-for-people-in-industry/industrial-secondment-scheme>

⁸ <http://ktp.innovateuk.org/>

⁹ <http://www.epsrc.ac.uk/research/ourportfolio/themes/manufacturingthefuture/>

¹⁰ <https://www.catapult.org.uk/>

¹¹ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/368416/bis-14-1085-review-of-the-catapult-network.pdf

3. Balance of funding portfolio

Engineering Research: The multidisciplinary nature of engineering research makes it difficult to assess the balance of funding for engineering across the Research Councils. IChemE would like to see more explicit funding for engineering projects, particularly with Councils other than EPSRC, to better reflect the changing nature of chemical engineering and its interactions with biology, medicine and the natural environment.

Multidisciplinary Research: Lack of cohesion between Research Councils is particularly apparent in cases of multidisciplinary, cross-Council research – there are problems with defining and identifying who funds chemical engineering research, even within themes inside individual Councils. For example food engineering research spans different agencies: primary production (BBSRC/DEFRA); processing (EPSRC); nutrition (BBSRC); health related diseases (MRC); environmental impact (NERC); links with industry (Innovate UK).

A joint Council strategy would remove the problem of researchers submitting grant proposals to one Council only to be told that they should be going to another. Chemical engineers work in and across many fields that require interdisciplinary approaches; this is a major problem when applying for funding.

More efficient and effective funding mechanisms for multidisciplinary research are required at the interface between science and engineering; these require specific funding allocations. The promotion of multidisciplinary institutes should be a focus of Research Councils (eg the highly effective MIT Centre for Bits and Atoms¹²).

Recognition of the importance of significant and sustained levels of funding is essential. IChemE sees the move towards Research Hubs in the EPSRC Manufacturing the Future theme as a positive step. This type of working offers openings for collaboration between research themes (eg healthcare and manufacturing) and should be encouraged.

Priority Topics: Research Council focus should be on priority research topics as well as choosing appropriate locations. Large teams deliver greater research impact but it is the individual that generates the innovative ideas; a balance between team-led and individual-led research is important. A review of the viability and the success of Centres of Excellence and large, managed themes is recommended to better understand this issue.

The ability to access and process big data is crucially important. IChemE believes that this will drive fundamental change across all research areas. For example, the ability to access and process data faster will be key to the design and delivery of more efficient healthcare systems. The challenges associated with data management and integration need stronger Research Council support.

The Haldane Principle¹³ should be observed to ensure that decisions made about topics come from researchers not politicians. IChemE encourages the Research Councils to be more influential in steering discussions and actions surrounding research priorities when working with Government. In particular, to support of large capital investment.

IChemE sees the Engineering Grand Challenges as an excellent means of prioritising research, offering opportunities across disciplines, academia and industry.

Review Funding Success: A balance must exist between continued support for a particular research area and its measurable impact. There should be priority areas and groups with continuous long-term funding so that risky, but potentially high impact, research can be undertaken. However, this should be periodically reviewed to assess its impact. Improved evidence-based approaches, building on the REF case study approach, should be developed.

More effective post-mortem evaluation of funded research activity will: improve the allocation of future funding; facilitate an understanding of whether funding is being provided to the appropriate group; and whether the work will offer a long-term benefit.

¹² <http://cba.mit.edu/>

¹³ <http://www.publications.parliament.uk/pa/cm200809/cmselect/cmdius/168/16807.htm>

Balance of Fundamental and Applied Research: Funding allocation for applied research should not compete with the allocation for fundamental and “blue skies” research. Both aspects of research are equally important and separate pools of funding are necessary. Clearer translation mechanisms between the different TRLs/MCRLs will ensure effective, joined-up funding of research and its exploitation. It is important that innovative and emerging science is encouraged and that both Innovate UK and industry are held accountable for translation.

Words: 633

4. Effective ways of working

Peer Review Process: The peer review process is not perfect, but it works. For some research areas, including chemical engineering, there is difficulty in finding the right panels to support the breadth of the area (eg chemical engineering research has been reviewed by automotive, aerospace and mechanical engineering panels).

Peer review should be revised to include more industry and engineering expertise. The system should allow the refinement of ideas by the proposers and some flexibility on how the work is funded (eg funding could be given for only part of the proposed work, or sequenced depending on outcomes).

Research Council peer review panels should be provided with effective training on how to offer appropriate and constructive comments; the panels should have a clear understanding of the review process. Excellence in the peer review process should be rewarded with stronger incentives for academics to participate and penalties for poor reviewers.

Strategic Alliances: Research Councils should pro-actively encourage submissions that involve strategic alliances to stimulate collaborations using open bids for funding (as per the recent call by EPSRC towards Engineering Grand Challenges¹⁴). One often stated reason for not collaborating is a lack of knowledge of who is already working in a particular area. Stimulation of strategic alliances by calls open to all would remove this barrier. However, collaborations must arise naturally – they should not be forced.

Research Council User Interactions: Academic and industrial researchers need to work more proactively with Research Councils to better encourage and support closer interactions on the evolving research landscape. Institutions and societies, including IChemE, should be supported to participate in discussions that influence and drive future research. IChemE has taken a lead by inviting EPSRC and BBSRC representatives to attend its Research Committee meetings.

Standardisation Across Research Councils: Greater clarity regarding the similarities and differences between Research Councils is required, and where possible a single methodology adopted. Standardisation across Research Councils would be more “user friendly” for researchers, particularly those working in a cross-disciplinary environment. Greater clarity around the methodologies applied within a particular council would improve understanding.

Words: 342

¹⁴ <http://www.epsrc.ac.uk/funding/calls/towardengnrcc/>

5. Any other comments?

This call for evidence covers similar areas to the recent Dowling Review. The Nurse Review team should collaborate with the Dowling Review team in order to reach compatible and consistent conclusions about academia-industry research collaborations.

Key Recommendations:

Cross-Research Council working should be improved to better support modern multidisciplinary research, with standardisation of strategies and practices across Councils.

Multidisciplinary research requires more efficient and effective funding, targeted at the interface between science and engineering, through cross-Council working. The segmentation of the current Research Council structure presents many barriers and may no longer be fit-for-purpose.

Academia-industry collaborations need to be better supported by the Research Councils through improving researcher mobility, engagement with industry and Innovate UK, and the creation of a forum to share good practice.

The peer review process should be revised to include more industry and engineering expertise. There should be stronger incentives for researchers to participate, with rewards for excellence and penalties for poor reviewers.

Engineering research needs to be better represented across all relevant Research Councils with a well defined balance of fundamental and applied research funding.

Words: 179
Total word count:2797

The closing date for responses to this call for evidence is **Friday 17 April 2015 at 23:45**.

Please provide your response in Microsoft Word format. In order to be considered, submissions should be no longer than 3000 words.

Please email or post the completed response form to:

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