

Independent Review of the Scottish Funding Council's Research Pooling Initiative

Written evidence summary

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Introduction

Overall, 82 submissions were received to the call for evidence published by the Independent Review of SFC's Research Pooling Initiative in November 2018. The original call for evidence is available [here](#) and a full list of respondents is available [here](#). It must be noted that the majority of responses received were from representatives of, or individuals/organisations associated with, the research pools. A number of external representatives were invited to respond, including industry representatives, UK research funding and international bodies and Learned Societies. A full list of all those invited to respond is available [here](#).

The following presents a summary of the written evidence received, from which the Advisory Panel drew to organise the oral evidence sessions. The evidence is structured around the key areas of investigation as set out in the call for evidence.

1. The impact of research pooling to date

The call for evidence sought to probe a number of areas in terms of the impact of research pooling. These included whether the original vision, aims and objectives of research pooling have been achieved and what difference, if any, the initiative has made. Respondents were asked to describe the impact to date, with respect to the original objectives and otherwise, and assess whether research pooling has resulted in an increase in Scotland's competitiveness.

1.1 The main impact assertions - attracting and retaining talent, boosting research quality, increased access to infrastructure and leveraging increased research investment

Collectively, the written responses raised a range of different areas of impact as a result of research pooling. These ranged from impact at the individual level on students and academics to impact on the culture of the whole Scottish research community.

A number of responses suggested evidence to show that the intended outcomes of pooling, such as increased critical mass, increasing research income, recruitment of research stars, improving REF performance, increased availability of cutting-edge equipment, bolstered international links and improved access to users, has been achieved.

Several of the responses received made significant claims about the impact of research pooling, a number of which have been sought to be evidenced by the analytical work undertaken as part of the review. A selection of the assertions made about the impact of the pools are below:

Attracting and retaining talent

'SAGES allowed Scotland to recruit top world figures to Scottish universities. We had a double page advert for some 39 (?) posts published in Nature. It had a huge impact both directly in attracting top talent from across the world, but also for the general world image that something interesting was going on in Geoscience in Scotland' Professor David Sugden, University of Edinburgh, (in a personal capacity).

'Most of the pools with which Strathclyde has been involved can also point to tangible benefits in terms of recruiting and retaining research leaders of international standing, improved research quality as determined by successive RAE/REF outcomes, and improved attractiveness to prospective research students compared to the "pre-pools" era' Dr David McBeth, **University of Strathclyde**

'Phase One placed post-doctoral research fellows in participating institutions and brought through a new cohort of doctoral students, who, in quantitative terms, have clearly added significantly to the sum of research capacity in the field' Professor Conchúr Ó Giollagáin, **Soillse**

Boosting research quality

'In RAE2001 (pre-SUPA) there were no physics submissions from Scotland judged to be 5 (RAE2001 scores ranged from 1 to 5*). In REF2014, SUPA collectively exceeded the 'Research Power' of each of the 'big 4' in England (i.e. Oxford, Cambridge, Imperial College, UCL)... All physics submissions from SUPA partners achieved top 15 for 'Impact'. It is widely recognised (across the Scottish physics community and beyond) that SUPA was a major factor in the improved research performance assessed in RAE2008 and REF2014'* Professor Alan Miller, **SUPA**

'There is no doubt that SUPA has substantially increased the status and effectiveness of Scottish Physics' Iain Ritchie, **TERN plc**

'SAGES research metrics [REF2014] in Earth and Environmental Sciences exceed that of Oxbridge plus London combined, by a factor of 1.6. Whilst it is impossible to make quantitative attributions, all partners agree that SAGES has had a positive influence on this type of metric, through all three assessment areas of Impact, Research Environment and Research Excellence.' Professor Mark Inall, **SAGES**

Increased access to infrastructure

'The model of pooled resources is highly effective for medical imaging research; it would be grossly inefficient to set up advanced imaging facilities at multiple institutions in a country the size of Scotland. Through pooling, the investments at individual centres (e.g., 7T clinical MRI at Glasgow, PET-MR at Edinburgh, fast field-cycling MRI at Aberdeen, ultrasound at Dundee, mobile EEG at Stirling) have been made available to researchers across Scotland and are more effectively used as national resources' Professor Alison Murray, **SINAPSE**

'The impact of pooling via state-of-the-art equipment investment on research capability and competitiveness should not be underestimated' Dr David McBeth, **University of Strathclyde**

Leveraging increased research investment

'SULSA has leveraged over £400M for the life sciences research sector' Dr Allison Jackson, **SULSA**

'Attracting investment: Just the first two years of funding for Continued Development of the SINAPSE Network (2015-2016) saw a total of over £76M secured – a more than ten-fold increase from the original investment of £7.2M by SFC, CSO and the participating universities in 2007' Professor Alison Murray, **SINAPSE**

'Pooling continues to contribute to the growth of engineering research activities across Scotland's universities with the total annual engineering research income increasing from ~£43M in 2006/07 to ~£108M in 2017/18' Dr Caroline Cantley, **SRPe**

'pools have been widely praised for their ability, through enabling collective action across institutions, to compete successfully for external funding allowing an expansion of their activities'
Royal Society of Edinburgh¹

However, the assertion that pools have been universally successful in attracting research talent was contested by one response:

'the ambitions of pools to attract the best research from around the globe to come to Scotland turned out to be unrealistic. Apart from a few cases, the packages offered were insufficient to attract the research talent at senior level and some who did come then were half-hearted in their commitment' Professor Sir Ian Boyd, University of St Andrews (in a personal capacity).

1.2 The extent of the impact across Scotland

There were a range of views as to whether the impact of research pooling has been felt across the Scottish HEI sector as a whole.

A number of submissions flagged benefits to smaller institutions from research pooling, especially through access to networks and facilities which would otherwise not be available to them:

'This approach is particularly important for less research-intensive universities (such as UWS) as it gives us an opportunity to interact with our peers on a level playing field' Professor Brian Quin, University of the West of Scotland (in a personal capacity)

'Research Pools act as inclusive bodies that have significantly improved collaborative research amongst all the Scottish HEIs. This has been particularly of benefit to the less research intensive HEIs where there are groups conducting world-leading research. Participation had opened up new collaborative opportunities and strengthened networks across Scotland' Professor Norman Turner, **Edinburgh Napier University**

However, there was recognition that smaller institutions benefitted less (as in received less) from the initial funding as they were not able to provide as much matched funding:

'It can be quite challenging for less research-intensive universities to gain the same level of benefit from research pooling as more research-intensive universities' Mary Daly, **Glasgow Caledonian University**

'The perceived benefit of pooling to Scotland has been to make the strong even stronger' Professor Peter Edwards, University of Aberdeen (in a personal capacity)

¹ The RSE response was informed by a working group utilising the experience and expertise of their Fellowship.

1.3 The role of the pools in promoting a culture of collaboration across Scotland

A key theme coming through the written evidence was the effect of the pooling initiative on the collaborative culture in Scotland. Observations on this theme came from individual students and academics involved in pooling as well as institutions and representative bodies and the pools themselves:

'The initiative has helped break down age-old academic rivalries and connected silos. It has also led to more humility whereby all but the largest institutions have faced up to the reality that they cannot conceivably do everything and it is far better and more effective to cover a spectrum of activities collaboratively' Professor John Underhill, Heriot-Watt University (in a personal capacity)

'As a French national, I found it a unique experience to be included in a community with a common goal and spirit towards researching and managing marine systems' Dr Claire Golléty, Centre Universitaire de Formation et de Recherche (CUFR) de Mayotte, France (in a personal capacity)

'We consider that the cultural impacts that resulted from the experience of collaboration and shared planning across the sector in some disciplines have probably been more important than the legacy of specific pools in most cases.' Dr David McBeth, **University Strathclyde**

'One of the earliest features of pools has been their ability to encourage and promote a significant change in the culture of Scottish HEIs' **Royal Society of Edinburgh**

There was some challenge to this view however, suggesting that in some cases competition over collaboration does win out:

'In their current forms, the Pooling Initiatives did not always foster collaborative approaches between Universities, as there is competition for funding. As a smaller research institution, the University of Dundee has been left out of DTC developments driven by some of the research pools and going forward it would be important for us to ensure improved governance to enable a fairer and more equitable distribution of funds' Professor John Rowan, **University of Dundee**

In some cases, collaboration extended to joint RAE/REF submissions, although this was not universal. Two pools, SUPA and SICSA, highlighted joint discussions and even strategy around REF. For example, SICSA:

'in 2014, the Pool [SICSA] coordinated a group of all 14 member-institutions to create a joined up and collaborative approach to REF2014. The group, comprised of Departmental/School REF champions, initiated a number of information-sharing workshops to ensure a joined-up approach to that exercise, with the result of increasing Scotland's overall standing in the discipline' Steven Kendrick, **SICSA**

However, collaboration did not appear to extend to Scotland's research institutes. Only one of the six research institutes which make up SEFARI (the Scottish Environment, Food and Agriculture Research Institutes) responded. Biomathematics and Statistics Scotland (BIOSS) were critical of the lack of engagement, largely due to them not being eligible to receive SFC funding:

'The initiatives have largely excluded the SEFARI from participating' Dr Mark Brewer,
Biomathematics and Statistics Scotland

A lack of engagement with research institutes was also highlighted by one other response:

'Pooling has failed, at least in my view, to address the future of the Scottish research landscape in the form of the relationship between its academic investments and its Main Research Providers (with the possible exception of marine science where Marine Science Scotland is included in MASTS). I think this has been a major failing' Professor Sir Ian Boyd, University of St Andrews (in a personal capacity).

1.4 National (Scotland/UK) perceptions of pools and international perspectives

There was little submitted evidence from a UK-wide or international perspective. Most responses which indicated views in this area came from organisations and institutions within Scotland. In some cases, the pools themselves provided suggestions of their international esteem/impact. These included visits from international teams interested in the pooling model, hosting large international scientific conferences and being asked to accompany Ministers on international trade visits.

There was suggestion that the research pooling model had inspired similar models in other parts of the UK:

'research pooling has also had a wider influence on developments across the UK. It can be argued, for example, that Scottish pooling had an influence on the formation of SEPnet in England involving physicists in nine universities in the south-east of England in a structure similar to a research pool'
Royal Society of Edinburgh

MASTS received the most input with regards to international impact, with two submissions from outside Scotland – from a partner in the Pitcairn Islands and from the European Marine Board (on which MASTS represents Scotland):

'pooling has created a large enough consortium for marine science to be heard at the European level, and through the Galway Statement, Belem Statement and All Atlantic initiatives, and also at an international level' Professor Sheila Heymans, **European Marine Board**

1.5 Industry engagement and policy impact

There were few direct responses from industry. The evidence which was received indicated that views on the extent and value of industry engagement from the pools varied depending on the subject area:

'I have been very disappointed with the level of industrial engagement and business formation arising from informatics research in Scotland. I have been involved in enterprise competitions in Scotland and with the Royal Academy of Engineering for the whole UK. There is no doubt that the 'golden triangle' (Imperial, UCL, Cambridge, Oxford) are regularly generating exciting new businesses - Scottish informatics is lagging badly' Ian Ritchie, **Tern plc.**

'From the perspective of facilitating a robust interface between industry and science, the role MASTS has been significant. Industry seeks an efficient way of reaching out to the science

community and seeking to gain an understanding of what science can offer industry. MASTS provides that efficiency as a point of entry for industry as individuals or as groups such as the Society of Underwater Engineers or Oil & Gas UK and indeed my own Programme INSITE' Richard Heard, **INSITE Programme**²

The response from the Royal Society of Edinburgh included a selection of positive quotes from industry about the value and effectiveness of the research pools. SUPA was particularly cited as a key actor from the perspective of industry.

A number of the research pools themselves submitted evidence of their engagements with industry, these particularly focused on joint PhD studentships.

Following the lack of external industry response to the Advisory Panel's call for evidence, the SFC Executive contacted the Industry Leadership Groups (through Scottish Enterprise) and the six Scottish business organisations with some directed questions. The response received from the Life Sciences ILG indicates a mixed picture:

'Comments from LSSILG members regarding the SFC consultation reflect the varying levels of experience when it comes to using research pools for accessing academic expertise. A number of members have pre-existing links to academic talent so won't necessarily use the pools as a first port of call, although are aware of them. Conversely, some members have little knowledge of the pools, how they operate or how to engage with them'

In terms of policy engagement, again most responses came from the research pools themselves as opposed to external organisations. SAGES and MASTS in particular suggested evidence of their interactions with policy partners and SULSA and SINAPSE also appeared to have been active in the policy space.

The response from the Cyber Resistance Unit at Scottish Government demonstrated a positive impact of the research pools on policy:

'Using SICSA as a 'portal' to their 14 universities across Scotland via a host university allows easy placement of contracts and funding. SICSA's ability to internally, seamlessly carry out activities and projects across their community through their SICSA established inter-university contracts and agreements gives access to the universities' expertise. Consequently, this was recognised with the Government funding the £430k SICSA Cyber Nexus programme. SICSA is a key stakeholder reporting to the Government at board level through the National Cyber Resilience Leaders Board'
Clare El Azebbi, Cyber Resilience Policy, Scottish Government

The Chief Scientific Advisor, Chief Scientist (Health), CSA Environment, Natural Resources and Agriculture and CSA Marine did not respond to the consultation nor were they able to attend an oral evidence session. Following the oral sessions a fresh invitation to submit was issued and the CSA ENRA submitted [this](#) response.

²INSITE is an independent research programme, funded by Industry and in its second Phase, NERC

Following the oral evidence sessions, the Scottish Government were invited to respond to some further questions. Their submission is available [here](#).

2. The research pools in the present-day research environment

The call for evidence sought to probe a number of areas in terms of what the perception and role for the pools is in the present-day research environment. This included exploring how the pools have evolved over time, particularly with regards to the second phase funding, and how pooling impacts on the current focus on interdisciplinarity and challenge-led research.

2.1 A significantly different research landscape

There was clear recognition throughout the evidence received of the changing research landscape in which the pools sit. Acknowledgement of growing emphases on inter-disciplinarity, challenge-led funding and the importance of 'place' as well as a move to large collaborative funding opportunities were evident in many responses.

There were however a range of views as to the pools' positioning to meet these challenges within the changing research landscape, to take two opposing quotes from institutional responses for example:

'The collaborative relationships and cultural shifts that have been created as a result of research pooling have positioned Scottish HEI sector in a good place to address the current funding landscape' Dr David McBeth, **University of Strathclyde**

'Pooling is not the best way of promoting interdisciplinarity, to achieve this probably needs much more targeted research centres and a more challenge-led approach.' Professor Derek Woolins, **University of St Andrews**

The relevance of the pools in the current research landscape was questioned by a number of respondents:

'At the time of initiation, the pool programme was novel but we increasingly see more strategic collaborations in nations or regions of the UK which aim to drive up quality and competitiveness across the UK' Ruth Meyer, **Universities Scotland**

'The review also needs to ask 'What is distinctive about the research pools in 2019?' Many other collaborations (joint Universities such as the N8, G4W, or thematic networks) have existed that make the Scottish pools seem out of date' Linsey Dickson, **University of Stirling**

An increasing international focus was another area of change identified within the current research landscape. A number of responses commented on a possible international role for pools:

'The pools also have a strong role in promoting Scottish research at the international level and providing a unified voice for supplying evidence to governmental, financial and other organisations' Sian Henley, University of Edinburgh (in a personal capacity).

2.2 The relationship between the Innovation Centres and the research pools

A key theme throughout the written evidence received was the relationship between the research pools and SFC's Innovation Centres. Most of the evidence received highlighted a lack of engagement and suggested that more could be done to increase links between the two initiatives:

'There was a missed opportunity not to engage with Pools when Innovation Centres were conceived and set up. Scotland was ahead of the game in setting up Pools and then ICs [ahead of UKRI], but has now been overtaken with the vision of fusing R and I within the single body of UKRI' Professor Mark Inall, **SAGES**

'With some exceptions, it has been difficult to work effectively with the ICs. Their industry led funding model means we must often react instead of lead' Dr Scott Lilley, **ScotCHEM**

However, there were exceptions to this, for example:

'There is a good level of interaction between MASTS and the innovation centres, particularly the Scottish Aquaculture Innovation Centre (SAIC), with whom I primarily interact' Professor Brian Quin, University of the West of Scotland (in a personal capacity).

'We have had the significant and meaningful engagement with SICSA and work with the SICSA team and members on a weekly basis on activity and support' Gillian Docherty, **DataLab**

Professor Paul Hagan, in his response via Robert Gordon University using his perspective as Director of R&I at SFC at the time of establishing ICs, commented:

'It is important to recognise that Pools and ICs have totally different functions and drivers but having had a hand in both, I wonder if there was something we missed that would have exploited the willingness to collaborate from both the Pools and ICs that would have brought them closer together?' Professor Paul Hagan, **Robert Gordon University**

2.3 The switch from the first phase of pooling to the current lower funding model

A number of responses referred to the two stages of research pooling, particularly the significantly lower level of funding available in the second phase:

'A much less generous second phase of "maintenance" funding has meant reduction of ambition and a focus on fewer key deliverables among the pools, often focusing on the graduate Schools at the expense of other equally important areas of development such as post-doctoral and early career researcher opportunities' Michele Christian, **Government of Pitcairn Islands**

'Whilst the Pool works efficiently and delivers excellent value for money; reductions in funding... have no doubt reduced the potential impact of SICSA in recent years. Reduced budgets have meant scaling back on various activities, including programmes related to the SICSA Graduate Academy'

and most notably the SICSA Knowledge Exchange Programmes; including SICSA Industry Internships and Early Career Industry Fellowships' Steven Kendrick, **SICSA**

2.4 PhD studentships/ graduate schools, including the advent of new models for doctoral training

The importance of PhD studentships in research pool activity as well as their role in establishing pan-Scotland graduate schools was a key theme articulated within the written evidence received.

A number of the pools themselves, as well as institutions involved in pooling, picked up on the impact of the pools in the changing environment for doctoral training:

'I believe that the most important research contribution was in funding for postgraduate students. The SICSA Graduate school was very successful indeed in both conventional research metrics (PhDs awarded, papers published, etc.) but also in fostering collaboration across the Scottish university community' Professor Ian Somerville, University of St Andrews (in a personal capacity).

'Of particular benefit to us have been the pan-Scottish Graduate Schools which have improved postgraduate provision, improved mobility of students, encouraged and supported internships' Marlis Barraclough, **University of Aberdeen**

A number of respondents suggested links between pool activity in establishing graduate schools and securing Doctoral Training Programmes (DTPs) and Centres of Doctoral Training (CDTs). Assertions of impact from within the written evidence included:

'the creation via the pooling initiatives of a culture of collaborative, multi-institution cohort-based PGR Training environments / Graduate Schools has allowed Scottish institutions to have success in winning and delivering e.g. Research Council Centres for Doctoral Training, that may not otherwise have been achieved and in attracting high quality research students to the pools' Dr David McBeth, **University of Strathclyde**

'SICSA established a working group to ensure a joined-up approach to the 2018 EPSRC Centres for Doctoral Training (CDT) call. This brought together representatives from all 14 SICSA institutions to share ideas and potentially create consortia. SICSA organised a number of well-attended workshops and wrote supporting letters for 8 Scottish proposals, including several multi-site proposals. The Pool also took an active role in mock interviews for Scottish proposals – coordinating mock interviews for those that required them and lending expertise in the form of SICSA panels' Steven Kendrick, **SICSA**

2.5 Other lessons learnt from research pooling to date

A number of themes in terms of other lessons learnt across the research pooling initiative emerged from the written evidence. These included: the importance of leadership and a clear strategic vision; importance of transparency and fairness in building trust; acknowledgment that building collaborations takes time and patience (and money); the importance of joint studentships and shared access to cutting edge equipment in cementing collaboration; the success of joint graduate schools; and that small amounts of funding can have large impacts.

On leadership of the pools it was suggested:

'the most successful pools appear to be those that have clear leadership not dominated or structured by the policies of a single institution' **Royal Society of Edinburgh**

Geography was rarely referred to as a limiting factor for collaboration and engagement, although there was one view that pools could be more geographically inclusive:

'Central belt dominance of SULSA, partly due to the largest Universities (Glasgow and Edinburgh) being there, but Aberdeen, in particular, sometimes felt "peripheral". More effort could go into mechanisms to include less centrally located institutions, and we are implementing changes to counteract this in future' Dr Allison Jackson, **SULSA**

Respondents also highlighted inclusivity:

'Inclusiveness is better than elitism. The original goals of the pooling initiative were solely focused on research and this encouraged the creation of pools that limited membership, and which were uneasy collaborations of competing institutions. Whilst these may well have contributed to research improvement, they are fundamentally brittle collaborations that are unlikely to contribute to culture change' Professor Ian Somerville, University of St Andrews (in a personal capacity).

3. The future of research pooling

The key questions posed by the call for evidence surrounding the future of research pooling included exploration of whether pooling impact is sustainable without further investment and if pools can/should evolve to fit the changing research environment.

The majority of the written evidence received was positive about a continued future role for research pooling in the Scottish research landscape. A number of key themes emerged outlining what this could be, including several costed scenarios from pools.

The following section summarises the main suggestions within the written evidence about the future role of research pooling. However, it must be acknowledged that not all evidence received was positive about potential continuation of some form of research pooling:

'While Dundee support a role for pools ... they also propose 'Alternatively, providing individual block grants for impact acceleration to universities would allow universities such as Dundee to nurture excellence in strategic areas, thus allowing us to focus and generate impact' Professor John Rowan, **University of Dundee**

'No - they have run there [sic] course and I would prefer to see the funding (and energy) applied elsewhere' Professor Peter Edwards, University of Aberdeen (in a personal capacity)

3.1 Further support from the SFC is suggested as essential

Many respondents noted that in the continuation phase of pooling, where pools have operated with reduced funding, less impact has been achieved. Therefore, there was a consensus that a continued low level of funding would be inadequate to sustain relationships at a suitable intensity to maintain the initial gains.

The overall view from the pools was that without continued support from SFC the pools would not continue. Though some pools indicated that members had already committed, at least informally, to continue funding. A selection of views from the pools in this area is below:

'The consensus is that without the leverage offered by SFC's financial support, the pools would cease to function. Perhaps not immediately, but a subscription-only model would fail eventually' Professor Mark Inall, **SAGES**

'If funding were to cease, the consensus is that pooling would not be sustainable long-term. Buy-in from partners would diminish, as well as scope of activities' Dr Allison Jackson, **SULSA**

'Without continuation of support from the Government / public sector (to maintain the triple-helix approach to collaboration between universities / public sector and industry) the Pools would be unlikely to be sustainable in the longer term' Dr Caroline Cantley, **SRPe**

'A recent informal census among the SICSA member-institutions (Heads of Schools) demonstrated widespread support for the continuation of the Pool beyond 2020' Steven Kendrick, **SICSA**

A number of institutions also shared the view that pools would cease to function without further investment:

'It is unlikely that institutions will remain committed to pools if the level of support, and benefits received, are consistently less than the subscription' Professor Derek Woollins, **University of St Andrews**

'this will need, in our view, ongoing funding support from the Scottish Funding Council, and in return for this the identification of clear performance and outcome measures linked to the national priorities. Institutional contribution is an appropriate consideration as is funding from industry or business, but the level of core funding from the Scottish Funding Council is critical if the research pools are to have maximum utilisation' Professor Neil Simco, **University of the Highlands and Islands**

'UWS is an enthusiastic supporter of research pooling. Our continued commitment to research pooling is demonstrated very recently (January 2019) through increased investment to join SULSA.... However, due to aforementioned challenges, if the research pools are not sufficiently funded, the institutional support at current levels might not be possible' Helen Kennedy, **University of the West of Scotland**

3.2 Reviewing SFC's role

There was suggestion across the written evidence that there would be value in re-assessing the level and the nature of the interaction between the SFC and the research pools. A number of respondents proposed that increased involvement of the SFC in certain areas could be beneficial:

'...light-touch approach has given the pools freedom to be strategic, which has allowed the pools to be relevant to their particular discipline. However, we have felt that at times, we could benefit from a little more SFC interaction – as they are closely connected to government and UKRI' Dr Allison Jackson, **SULSA**

In particular, development of metrics for evaluation and impact were suggested within some of the responses received:

'the RSE would encourage the SFC to develop a new evaluation methodology which would allow regular evaluation of the impact and success of pools' **Royal Society of Edinburgh**

'It is important that specific key performance metrics be carefully tailored to drive performance and validate the investments' Dr Caroline Cantley, **SRPe**

Ensuring the outcomes and impact desired matches with the level of investment was suggested by a number of the pools:

'The expectations of pooling, even under the 'Continued Development' phase is very ambitious given the current very modest SFC funding. Future funding should better match the ambition of the initiative' Professor Alan Miller, **SUPA**

'Adequate long-term funding that supports the ability to plan ahead, based on a firm commitment and increased resource, would deliver greater returns and allow the Pools to address the ambitions set forward in their strategic plans. Support and improved coordination of the organisational infrastructure (ICs and Pools) that has been created by the SFC can set Scotland apart as an exemplar of national research cooperation and impact' Professor David Paterson, on behalf of all research pools.

3.3 Building on the pools' collaborative foundations to address key challenges

One particular reoccurring suggestion was building on the collaborative foundation of the pools to encourage further joint working/partnerships focused on challenge areas. This was highlighted in terms of both inter-pool collaboration and links between pools and other organisations, especially Innovation Centres.

The Royal Society of Edinburgh highlighted the potential of cross-pool collaboration:

'The pools should also consider how they collaborate together and make inter-pool collaboration a clear focus for the future. Some of the pools have already begun to work in this way. For example, in the field of medical imaging, there has been collaboration across seven Scottish universities and five

pools: SUPA (physics), SICSA (computer science), SULSA (life sciences), and EastChem and WestChem (chemistry). Research pooling has helped drive interdisciplinary research; disciplines which have strong leadership and administration are in a good position to organise themselves to work together with others to tackle interdisciplinary research problems and projects. Therefore, encouraging inter-pool collaboration could place pools in a better position to align with changed national strategies' **Royal Society of Edinburgh**

A number of respondents highlighted the potential role for collaboration between pools and Innovation Centres to respond to the increased focus on challenge-orientated funding:

'An initial step could be to consider how to enhance collaboration between pools and other structures such as Innovation Centres to address challenges. Further, challenge-focussed research will necessitate the greater involvement of a wider range of research disciplines including the social sciences. These subjects are not well covered across the current pools and this review seems timely to consider how to bring together researchers from different disciplinary background to tackle challenges.' Ruth Meyer, **Universities Scotland**

'Responding to the changed landscape will require close alignment between pools, policy-makers and industry with a specific need for closer association between pools and Innovation Centres (and similar initiatives) and a need to consider the role pools might play in supporting continuing collaboration with Europe and international partnerships' **Royal Society of Edinburgh**

There was also recognition of the importance of multi-disciplinary approaches and a number of respondents envisaged a role for the research pools beyond their single disciplinary focus to address key challenges:

'greater emphasis on interdisciplinary research would be welcome (cross-cutting sciences and humanities for instance). Furthermore, challenge-based research - and research contributing to inclusive development, sustainability and resilience - could be more central to any subsequent initiative' Linsey Dickson, **University of Stirling**

'while inter/cross disciplinary and challenge led research is dominating the funding landscape at present, in order to ensure it is successful, rather than simply exploited as an easy funding stream, it is dependent on high quality, fundamental, academic research as a base from which to grow. Pooling unquestionably has a role going forward as it provides ready-made groupings, focused on fundamental academic research, well able to tackle the challenge led research coming to the fore' Professor Brice Rea, University of Aberdeen (in a personal capacity).

'There is a clear opportunity for the research pools to be aligned more closely with BEIS/Scottish Government priorities, especially in regard to the Industrial Strategy... There is an opportunity for a clearer alignment between the national priorities in research and development and the Scottish contribution to these' Professor Neil Simco, **University of the Highlands and Islands**

'A new generation of interdisciplinary research pools, with an international outlook, aligned to grand challenges and developing synergies with an expanded range of innovation centres may be

the most cost effective and beneficial way forward' Professor Derek Woollins, **University of St Andrews**

However, not all respondents thought that wholly challenge-orientated research pools would be a positive step forward:

'I completely support the notion that research pools should contribute to economic development, but I think it is important not to be constrained by 'development priorities' as set by government and Scottish Enterprise. These make it more difficult to explore new, risky, areas of collaboration that have significant potential' Professor Ian Somerville, University of St Andrews (in a personal capacity).

There was recognition of the importance of developing a strategic plan for future pool activity:

'I suggest that the pools should be challenged to come up with strategic plans for their own research fields and that those should be at the next level of ambition to the process of establishment of sustainable activity in the chosen research field. These plans should be about ensuring Scottish research is on the global leading edge but, more importantly, that it supports the economy of Scotland and the health and welfare of Scottish people' Professor Sir Ian Boyd, University of St Andrews (in a personal capacity).

3.4 Using the pools to leverage increased investment in Scottish research

Another key theme from the written evidence is the potential for the research pools to be strategic actors to attract increased research funding to Scotland. A number of respondents highlighted that potential future SFC investment in the pools should be viewed in this context:

'In practical terms, direct financial support of pools generates substantial leverage in terms of the ability of the pools to win external funding, whether from public or private sources (especially from industry and business), from the UK, Europe or more widely.' **Royal Society of Edinburgh**

'Enhanced Pool funding for strategic level pump-priming activities and engagement would deliver further increased value to the Scottish economy. Increased provision of funding for sponsored industry-doctorates (PhDs) would be highly effective in further strengthening the collaboration between industry and academia' Dr Caroline Cantley, **SRPe**

'the large-scale investments that the subject-based research pools have received in their initial phases are no longer the optimum approach for SFC's future strategic investments in Scotland's research base. Instead, the funding available through SFC should be used as a source to gear the investment of funding from outside Scotland' Dr Tanita Casci, University of Glasgow (in a personal capacity).

In the changing research landscape, there was suggestion that the pools could have a role in boosting research capacity and capability across Scotland:

'As the research environment is facing more complex challenges, we feel that junior partners in the pools would benefit from an increased drive towards active inclusion by the more established players, so that pockets of excellence could be nurtured to the benefit of the national research landscape' Mary Daly, **Glasgow Caledonian University**

3.5 A particular focus on graduate schools

As previously indicated, the impact of the pools on Scottish postgraduate training was a significant theme across the written evidence received. While the pools have the potential to increase research investment in Scotland, respondents suggested that graduate training in particular could be an area of focus:

'renewed SFC investment in studentship support would attract additional funding from industry partners and enable the delivery of interdisciplinary PhD training to additional researchers furthering Scotland's global reputation for medical imaging innovation' Professor Alison Murray, **SINAPSE**

'Combining forces to offer graduate education is cost effective and provides Scotland with an edge; we are able to offer training that would not be feasible otherwise' 'Competitive Prize studentship awards provided very effective ways of attracting top students from around the world (against UKRI policies which limit this) and creating esteem for the Graduate School. A funding stream in this direction would be very effective both for the short-term benefit, and in the longer term by bringing (and retaining) some of the brightest brains in the world to Scotland' Professor Alan Miller, **SUPA**

3.6 Promoting an increased international outlook

Another theme which emerged from the written evidence is the suggestion that the pools could have an increased international outlook, particularly in the context of the UK's decision to leave the EU:

'In my opinion Pools should be encouraged to develop other UK and international partners so that they can operate in the global environment, characteristic of modern research in almost all areas' Professor Sir James Hough, University of Glasgow (in a personal capacity)

'The RSE believe that pooling should continue to have a significant role within the Scottish and UK landscape, and more widely in international interactions. This is particularly important in the context of Brexit with the pools having an important role to play in supporting continued collaboration with Europe and facilitating wider international partnerships' **Royal Society of Edinburgh**

3.7 Developing the pools to foster better links with industry

Industry engagement was another key theme with the suggestion that the pools could play a greater role in developing academia-industry links:

'The pools should have greater support in reaching out to industry. We were unable to proceed with plans for a Business Development Manager' Dr Scott Lilley, **ScotCHEM**

'Engagement with partners, in particular with industry, is an important aspect of pooling. With any engagement you need something to put on the table. Expertise and facilities are helpful, but the ability to offer joint funding is often a deal maker.' Professor David Wyper, University of Glasgow (in a personal capacity)