Please provide a brief summary of your experience of, or connection with, the research pooling initiative.

While at the University of Glasgow I was involved on the discussions on the bid to SFC to secure the funding to establish SULSA.

Once SULSA was established, I became the institutional representative on the SULSA Executive Committee and was involved in implementation, including the recruitment of the initial groups of Professors and Readers.

As Dean of the Faculty of Biomedical and Life Sciences, at the University of Glasgow, I was responsible for providing the institutional 'matched' funding for SULSA from the University of Glasgow.

I later joined the SFC as Director of Research and Innovation and had responsibility for the Research Pools within my Directorate (2010-2015)

The Research and Innovation Directorate at SFC had responsibility for establishing Scotland's Innovation Centres.

As VP Research at Robert Gordon University I have encouraged and supported engagement of RGU with more Research Pools.

Section 1: Initial research pooling initiative

Q1a. What has been the impact of the initial research pooling initiative?

Has the pooling initiative met its objectives: to enable Scotland to compete effectively for funding, research staff and doctoral students both nationally and internationally; and provide a more attractive research environment?

Yes. Without a doubt.

How can that be evidenced?

'Research Pooling' has delivered by meeting its objectives and has yielded a number of benefits, including:

- the establishment of critical mass in research and the harnessing of diverse and complementary expertise from across Scotland[1];
- the recruitment of leading international scientists to Scotland – that in itself a measure of how our research is viewed around the world;
- an increase in the volume and quality of research outputs;
- access to state-of-art 'shared' equipment and technology platforms;
- an improved ability to translate and develop new strategic alliances with industry;

[1] **Kitagawa.F (2010)** *Pooling Resources for Excellence and Relevance: An Evolution of Universities as Multi-Scalar Network Organisations Minerva* **48**:169–187.

- stronger academia-industry links with jointly-funded studentships;
- extended and enhanced the experiences of our future research leaders – exposing them to an environment of cutting-edge research with additional training in a range of high-level and transferable skills that has significantly improved their employability;
- Increased ability to leverage additional funding and clear success in doing so.

Some of these are easily measureable and I am certain the individual pools will be able to provide precise data as part of this exercise.

Examples of the ways that pooling has impacted on the relations between pooling partners and on how individual partners work with other external bodies.

But perhaps the most important and unintended consequence of research pooling is the way it has engendered a culture of collaboration across Scotland's HEIs that extends well beyond the reach of individual pools. While there always was a degree of inter-institutional collaboration, pooling was both catalytic in driving a much wider multi-institutional engagement, and transformational, in that in most instances Scottish universities seek now to collaborate on new major strategic developments of benefit to Scotland as a default position. In effect pooling has helped drive out unnecessary and counter-productive competition among Scotland's universities.

Of course, this is not perfect in every case and from time to time tensions emerge. The independent, charitable status of our universities places them in competition for resources from virtually all sources of funding available to them but I believe this has been relatively well managed by the Pools' Executives and by the universities

Examples of other outcomes of research pooling, and how they have impacted on the Scottish research landscape.

The pools have been instrumental in improving the performance of the Scottish research base in most of the 'pooled' disciplines but also in forming the basis of a collaborative effort to compete for additional UK and European funds and in establishing international collaborations. Research Excellence Framework outcomes are a good source of evidence.

The research pools were not designed to deliver support for business and industry. Although once established, the research pools were supported and encouraged to diversity their portfolio and take on this role. Most have had some success in doing so.

For example, pooling laid the groundwork for the successful efforts to secure additional academic and industrial collaborations and shared world-class facilities including but not exclusively the:

- Catapult in Offshore Renewable Energy;
- Fraunhofer in Applied Photonics;
- Innovative Medicines Initiative, European Lead Factory in Drug Discovery;
- International Max Planck Partnership.
- Quantum Technology Hub.
- The Scottish Centre for the Application of Plasma-based Accelerators (SCAPA).
- Ultralow Vibration Laboratory,
- HARPS-N Spectrograph (La Palma).

- SUPAScopes 1m Robotic Telescope (Global Network).
- Biophotonics Laboratory.
- MagTEM Microscope.
- Electron Beam Writer.

SULSA was instrumental in securing the IMI European Lead Factory. SULSA identifies a number of benefits for their partners including increased international competitiveness and global partnerships. They also identify the significant financial leverage from SULSA activities which serves to maintain scientific excellence.

SULSA operates research facilities across Scotland and all are open to researchers based at any Scottish university (at local-user rates). SULSA has also expanded research capabilities by creating positions for highly trained technologists, who are providing expert technical support, training facility users, and developing new tools and methodologies. Such arrangements may even lead to co-investment by industry and increasingly HEIs are pooling resources and making joint-bids to secure equipment that is then shared.

From time to time, the Scottish Government was able to provide additional capital investment and this is often targeted at specific projects. On the basis of the success of SULSA in securing the Innovative Medicines Initiative investment to establish the European Lead Factory for Drug Discovery, they were awarded an additional £8m by the Scottish Government to purchase equipment to support the National Phenotypic Screening Centre. This would not have happened without SULSA. In a clear example of the mature nature of the collaboration, the partners agreed this facility should be located at the University of Dundee.

Have pools made an impact on Scotland's reputation? What are the national (Scotland/UK) and international perceptions of pools?

A good example of how pooling has changed collaborative approaches in international engagement comes from the formation of the International Max Planck Partnership on "Measurement and Observation at the quantum limit". Established in 2013 this links the five SUPA universities that hold the appropriate expertise in this area, with five Max Planck Institutes in Germany.

Other examples include the Fraunhofer in Applied Photonics and the Innovative Medicines Initiative, European Lead Factory in Drug Discovery. These collaborations had research excellence as a central driver and the added value and research excellence evident in Scotland's research base, as a consequence of pooling was a factor in securing the collaborations. Scotland would not have these successes without the impact research pooling had made on our reputation for research excellence.

The Graduate Schools of the pools have been hugely successful. They have attracted the top students in their disciplines and provided them with world-class training environments providing experiences that individual institutions would simply be unable to match. The model used by each of the pools is not exactly the same but the added value from the approaches is clear.

What has been the impact of pooling outside of the academic sector, on policy and industry? Can you provide examples of this?
Have there been missed opportunities, where pooling could have had an impact but didn't?

I have combined the response to these two questions. The success of pooling and the evidence of the willingness to collaborate and the success from those collaborations influenced the next step in collaboration in Scotland with the formation of the Innovation Centres (ICs).

While some of the same researchers are involved in both pools and ICs, I am not convinced that we managed to shape the engagement between the two entities in the most effective way.

This is not a major criticism but simply a reflection of the reality since ICs were established. 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? SUPA and CENSIS, SICSA and DataLab, SULSA and Industrial Biotechnology, MASTS and Aquaculture may be examples where reasonable effective linkages were established but it would be better to seek input from them and the other pools directly. Over the years though, the extent of the collaborations between pools and ICs and linkages with industry has grown.

What is clear, is that Scotland has benefited from the efforts of both and that both have had significant success.

Q1b. What lessons can be learnt from the research pooling initiative?

> We are interested to hear what lessons can be learnt from the initiative both to identify and share good practice, to understand better collaborative relationships and to inform development and management of future SFC investments. You may wish to comment on:

What lessons can be learnt about making collaborations work effectively?

It is all about the people. Researchers are for the most part collaborative in nature and if provided with a supportive environment and resources to 'oil the wheels' of the collaboration will deliver beyond their individual capabilities and circumstances. This is also evident in European research programmes.

At the outset there was some suspicion of pooling, certainly at the Senior Management Level in some universities. There was concern that institutional strategies might be derailed and that institutional resources would be sucked into activities that were neither aligned with, nor desirable, for individual universities.

It took a little while, and some success, to demonstrate that by collaborating everyone could benefit and that research excellence could be sustained and grown as a consequence of a joined-up approach. Pressure on budgets can still mean that identifying institutional resources to back researchers closely involved in research pooling can still be a challenge.

For researchers close to the pools, they simply wanted to work with colleagues to do high-quality research.

Have particular pooling models been shown to work well/badly, in all cases/in specific contexts?

There were a variety of models and most have worked well. Those that have been most effective are those where collaboration has added most value.

Were particular elements of pooling more effective than others? From your perspective what evidence can you give regarding what worked well, or didn't? Why? You may wish to consider: academic posts; improved facilities and equipment; graduate schools and studentships.

Undoubtedly pooling has attracted high quality researchers at all levels to our universities.

In terms of facilities there are examples across most of the pools of world-class research facilities being secured and made available.

Several of the pools operate graduate schools that offer world-class training experiences to our students. I would encourage the review to ensure that the views of current and past cohorts of students from the pools are captured.

Are there lessons to learn from the range of pools supported? Were the disciplines covered by pools the right ones? Some pools were focused on discrete discipline areas while others were broader / interdisciplinary – are there lessons to be learned from the different models? Were there missed opportunities in other areas? What happened in those areas?

This was always going to be a challenge. The opportunity to secure additional investment in a discipline is always likely to lead to other disciplines coming forward to seek resources to allow them to form a pool. Given the resources available to SFC, I think they got it about right in the disciplines they supported and in allowing the pools to shape their own model.

Are you aware of examples of location impacting on or limiting institutions' involvement in research pooling and/or of examples that overcame any limitation?

Not really, travel, even in a country as small as Scotland is still a challenge, but as SUPA has demonstrated, there are ways to overcome this. All of our universities have significant European and Global collaborations and would not flag their location as being a problem. So why would it be an issue within Scotland? If they want to collaborate within Scotland, there is nothing to stop them.

In a research funding environment that has an increased emphasis on Place, pooling has made Scotland 'the place'. The added value from Scotland being 'the place' may be in danger of being overlooked or lost as City and Region Deals and placed-based investments are rolled out.

Section 2: Pooling now and in the future

As the initial pooling investments came to an end, SFC provided limited continuation funding (matched by institutions), to allow successful pools to maintain a central resource, for 5 years.

The research landscape has changed since the inception of pooling and continues to change substantially. This includes changes to funding and funding structures, a greater interdisciplinary and challenge-led research focus, increased prominence of innovation, industry engagement and the economic impact of research, BREXIT and international competition.

The Scottish Government and SFC must continue to support the Research Pools with core funding and ideally more, but I recognise the challenges they both face in balancing resources and expectations.

Scotland is stronger and better placed to address the opportunities and challenges these various elements than it would have been had we not had research pools in place.

Q2a. In the current research landscape, what is the perception of, and role for, the pools?

Has the changing landscape and funding environment affected evolution of the research pools?

The pools have done fantastically well in working with the resources available to them, in being nimble in responding to the changing environment and in leveraging additional resources.

Do institutions remain committed to individual pools and the concept of pooling more widely?

Institutions can speak for themselves but I believe this is the case.

How does pooling fit with the current focus on interdisciplinarity and challenge led research?

The pools fit well with the current focus and their presence has helped foster interdisciplinarity. They readily engaged with challenge-led research.

What is the current role of pools and how has that changed since the initial phase? Is the current model right?

I would not say the initially remit of pools has changed but additional demands have been made of them particularly in relation to industrial interactions.

How do pools interact with other SFC investments such as Innovation Centres?

The extent of the collaborations between pools and ICs and linkages with industry has grown considerably and I am certain each of the pools will be able to evidence this.

Q2b. Should research pools have a continuing role in the Scottish research base?

Will the concept of research pooling remain relevant in the developing research landscape?

Yes.

How can/should the model evolve to fit that landscape?

The pools themselves need to decide how best to respond. Since 2003, the landscape has changed dramatically and the pools have not only survived but have been instrumental in shaping the landscape and in responding to changes driven by others. They have been hugely successfully. Have confidence in them.

The leadership within the pools and the research excellence they support has allowed Scotland to remain competitive. Across the rest of the UK the need for collaboration has been recognized and resulted in a reaction to Scotland's bold initiative with others establishing research collaborations to foster excellence, efficiency, effectiveness and value for research investment.

What happens when the five years continuation funding comes to an end?

I am not sure it was the right question. It would have been better to ask *What more can be done to support the Research Pools?*

The spirit of collaboration will be retained but it is clear that the relatively small investment SFC has made in recent years has allowed the pools some degree of independence from pressures on institutional budgets, though the institutions have continued to commit to pooling and to invest in the pools, and in no small way.

The Scottish Government and SFC must recognise that Research Pooling is one of the 'jewels in the crown'. I am convinced that the overwhelming success of the research pools will provide and evidence base to support this contention. I would encourage SFC to continue to support the pools, at the very minimum at the levels they have supported them over the last five years.

Section 3: Anything else

Any further perspectives on the introduction, implementation and impact of research pooling are welcome.

I have selected a number of examples that came to mind while writing. There are many, many more demonstrating the past successes, the current strengths and future potential of the research pools. If we did not have them we would be busy establishing them now.

The SFC and Scotland's universities took a bold and imaginative leap in supporting Research Pooling. It has paid off. The Scottish Government and SFC deserve credit for sustaining their investments in research pooling they should be encouraged to continue them. Without the focus on disciplines we cannot have world-class inter-disciplinary research.

Finally, it is something of an anomaly that Prof David Gani, and Dr Stuart Fancey have not had the recognition they deserve personally, for launching this ground-breaking initiative.

I am happy to meet with or speak to the review team, if they feel this would be helpful.

Prof Paul Hagan
Vice-Principal (Research), Robert Gordon University