EPSRC
Pioneering research and skills

PROGRAMME GRANT HOLDERS

EPSRC Workshop Report

20th April 2015

Christina Turner

Senior Portfolio Manager

Engineering and Physical Sciences Research Council

Executive Summary

The Programme grant scheme was introduced in 2009. The aim of this workshop was to bring together the holders of these awards to discuss and share their experiences of the running and managing of these awards, and explore how the scheme could evolve to better meet the needs of future research delivery. As the delegates represented a group of researchers holding significant EPSRC investment, the workshop was also used to discuss early stage development of the next Delivery Plan which will feed into the wider EPSRC Delivery Plan engagement

The workshop began with a session on the next Delivery Plan including an overview of the Comprehensive Spending Review process. This was followed by three best practice sessions covering monitoring and management, impact and user engagement, and succession planning and career development. The outputs of each of these sessions have been clustered into a number of themes and will be used by EPSRC to look at future research support in terms of potential evolution of the Programme grant scheme and as input into the development of the Delivery Plan. The workshop ended with five topic sessions that would be of broad interest to those attending, providing an update on EPSRC and/or national strategies and allowing the delegates to discuss these.

Overall, it was thought that the workshop had enabled researchers from across the engineering and physical sciences communities to discuss how the scheme and the researchers themselves could work to get the most out of these investments. The networking opportunities and discussions of area strategies allowed connections to be identified or strengthened between the existing Programme grants, and the links to wider, evolving priorities to be discussed.

The delegates highlighted a number of areas for consideration by EPSRC in the future with some being raised across the sessions by different delegates and disciplines. One such topic was the available options to continue such large activities beyond the lifetime of the current grant. Career development of postdoctoral and early career academic staff employed on Programme grants was also raised in a number of ways and the scheme was seen to have additional opportunities over standard grants. Delegates suggested ways to improve career development further including possibilities of complementary funding. Comments also included the benefits of the environment for PhD students associated with the grants. Another topic of discussion was the strength of the flexibility within Programme grants. Comments on flexibility ranged from the importance of the independent advisory boards in ensuring this is used most effectively; the increased impact and ambition afforded through secondments, feasibility studies and outreach; the realities of managing this flexibility across universities; and the resulting agility that allows the research to adapt to changing challenges.

Contents

Background

Programme grants (PGs) are a flexible mechanism to provide funding to world-leading research groups to address significant major research challenges. They are intended to support world leading researchers, bringing together 'best with best' teams to undertake a variety of activities focusing on one strategic research theme. PGs can be awarded for up to a six year duration. It is expected that most PGs will be interdisciplinary and collaborative but they can address key challenges in a single discipline.

At the time of writing, EPSRC has invested close to £450m through approximately 100 PGs. They are seen by the Research Council as critical mass investments which cover a diverse engineering and physical sciences (EPS) portfolio and benefit UK research through the concentration of high performing talent.

In order to maximise the advantages of the PG scheme EPSRC wishes to encourage researchers to discuss and share their experiences of running and managing these awards, and explore how the scheme could evolve to better align to the future requirements of researchers. Representing a significant proportion of EPSRC's investments, EPSRC also wishes to discuss early stage development of the next Delivery Plan with holders of these awards and will feed this into the wider EPSRC Delivery Plan engagement.

Objectives of the workshop

- To engage with a group of world leading researchers and receivers of significant investment on the next Delivery Plan as part of Council's engagement plan for Jan-Apr 2015.
- To share best practice in the running and management of PGs

Delegate Selection

All Principal Investigators (PIs) of PGs were invited to attend the workshop. Where they were unable to attend they were given the opportunity to send another investigator to represent the grant. Support for Mathematical Sciences PGs is recent, resulting in a lower number of awards in this discipline. In order to provide a balance of representation across the EPS disciplines, the PIs of these grants were asked to nominate a second team member to attend in addition to themselves. All PIs were invited to indicate if they wished additional places for members of their team. These places were given where space was available and were allocated to ensure broad representation of universities, disciplines and individual PGs.

Agenda

The workshop was held on the 19th February 2015 at the Crowne Plaza Birmingham NEC.

0930 **Arrival and registration**

1000 **Welcome**
Christina Turner

1015 **EPSRC Delivery Plan 2015**
Andrew Bourne, Associate Director

1145 **Refreshments break**

1200 **Best practice session 1**

- Impact and user engagement
  Lucy Martin, Sarah Hobbs
- Management and Monitoring
  Helen Niblock, Anke Davis
- Over the Horizon
  Chris White

1315 **Lunch**

1400 **Best practice session 2**

- Impact and user engagement
- Management and Monitoring
- Over the Horizon

1515 **Refreshments break**

1530 **Topic sessions**

- Smart Cities and Urban Living
  Jason Green
- Quantum Technologies – towards a national strategy
  Richard Gunn, Wendy Carr
- Advanced Materials – Leadership Council roadmap
  Lucy Martin, Prof. Neil Alford (Imperial College)
- Healthcare Technologies
  Sarah Hobbs, Annette Bramley
- Mathematical Sciences
  Chris White, Philippa Hemmings

1630 **Summary**
Christina Turner

1700 **Wrap-up and close**

Workshop Outputs

Delivery Plan Session

The aim of this session was to discuss with delegates the Comprehensive Spending Review and EPSRC's role within it.

Objectives

- Raise awareness of the Comprehensive Spending Review process.
- Update delegates on EPSRC's Strategic Plan 2015 and future plans relevant to the Delivery Plan development.
- Gather information on PGs in the context of Delivery Plan development.

Following a presentation by Associate Director Dr Andrew Bourne, delegates were asked to consider the PG scheme over two facilitated sessions. The first asked delegates about the current state of play, the second about adapting or building upon the scheme to improve research delivery.

State of Play

What are the strengths/advantages of this type of investment?

From the outputs of this session the strengths of a PG can be seen as elements of seven key themes:

Quality and ambition
A PG is seen as a scheme that attracts 'best with best' and allows researchers to tackle bigger, more open-ended problems, tackled through a more coherent/holistic approach. The stability in tackling a longer range vision helps motivate teams, provides the freedom required to take risks, and enables longer term planning.

Critical mass
The size of PGs allows for the assembly of the best team and collaborators, all with complementary expertise leading to the development of effective multi/cross-disciplinary working. The scale also provides economies of scale and allows capacity and capability building.

Partnership
The scale of activity is seen to create stronger links between the universities involved and greater visibility at a national and international level. This leads to industry interest beyond the original Project Partners and greater input from the wider community, including industry, resulting in more external on the research direction for the area. The duration and size of PGs allows investment by the team in building effective collaborations.

Creativity
The PG mechanism provides freedom to conduct feasibility studies to scope new opportunities, allows the team to cross-fertilise ideas, and build up new skills sets. This allows the team to develop new themes, and to trade ideas and resources. The stability of

the grant allows Early Career Researchers (ECRs) in the team to express their creativity and pose ideas for investigation. In addition, the grant holder is able to concentrate on the science challenges rather than grant writing.

Impact
PGs are seen to have greater visibility and recognition within the universities involved and the relevant research communities at both a national and international level. This gives the PG team more influence than smaller scale research activities. They are able to attract more visits and engagement with high quality researchers and external stakeholders, leverage other funding, and influence wider strategies. The visibility also enhances the opportunities for outreach and advocacy, promoting UK science.

Career Development
PGs are seen as a good environment for ECRs with longer term career development. The flexibility and longer durations allows the investigators to empower junior team members giving them greater independence through more responsibility and leadership over activities. Postdoctoral staff gain a broader experience due to the breadth of experience and expertise in the team and there are greater opportunities for secondments and mentoring. This makes PGs an attractive employment prospect leading to higher quality recruitment. PhD students are often aligned to PG teams, also benefitting from interacting with a team of broader expertise and activity.

Flexibility
The flexibility PG holders are afforded is seen as a real strength of the scheme. The flexibility enables a more dynamic allocation of resources and a nimble approach to recruitment or the individual projects being undertaken. The independent advisory boards were seen as a crucial element of identifying what projects should be shut down, freeing up resources for other strands. The resulting agility allows the team to undertake aggressive triage if necessary and respond more quickly to new and evolving challenges.

How has your PG enabled you to respond to challenges/opportunities?

The key factors that were seen to allow PG teams to respond were:

Flexibility
As described above, the ability to alter the expertise of the team through recruitment and to redeploy resources were seen as essential to the agility of the team in addressing new challenges or evolving the direction of the research strands.

Leverage
The scale of the activity can give the team greater access to equipment and attract further funding. There were also seen to be benefits of scale in terms of access to appropriate expertise and cost-effectiveness.

Stakeholder/peer input
PGs benefit from input from an independent advisory board and collaborators. The increased visibility of the team increases input from peers and others not directly associated with the grants.

Influence

The longer duration and scale of the activity gives the team greater international visibility. It also allows the team time to build and influence community effort to address challenges often with the PG acting as a hub. The team building element of PGs was seen to improve 'people skills' of team members, increasing their ability and effectiveness in influencing and engaging others.

What new ways of working has your PG enabled and how?

The delegates commented that PGs had enabled:

- Stronger teamwork
    - More collaborative with more active/effective collaborations
    - Inter-PG collaboration
    - Partnerships not competition
- More coherent working
    - True cross-disciplinary working
    - Better connection of theory with experiment
- New partnerships
- Better mobility
    - Between research groups
    - Between institutions
    - Between academia and industry
- Longer term horizon scanning/planning
- Stronger steer on research from long term industry challenges
- Better leadership on research direction due to investigators having more time to concentrate on this rather than grant writing

Building and Adapting

How would you build on the scheme to realise your vision in 2021?

The first main theme of the comments under this question was better integration of schemes, mechanism and strategies within EPSRC, across RCUK and Innovate UK, and other funders. To build on the scheme delegates felt it needs to become easier to transition between different schemes (i.e. there is a perceived gap between the level of funding for a Standard Research proposal vs. a PG proposal) and the remit of different funders in terms of both discipline and technology readiness levels (TRLs). This in part would require consideration of how funding processes join up, but also a matching at a high level of the funders' strategies. Related to this, if EPSRC truly wishes PGs to consist of 'best with best' delegates suggested more support for formal international collaboration and funding. Delegates thought that they would also benefit from clearer mechanisms to link to the Catapults.

The other main theme was on the career development of early stage researchers. Delegates commented that EPSRC should examine the tension between teams of established researchers and the support and development of ECRs either as part of PGs (as Co-Investigators) or through other mechanisms (i.e. the distribution of funding across schemes). Delegates suggested that EPSRC has an opportunity to better consider how Postdoctoral staff can smoothly transition to independent researchers, especially when emerging from a

large team environment. Delegates also suggested the possibility of pump-priming new talent in areas related to PGs through add-on funding part way through the grant. Finally, delegates commented that EPSRC could continue to encourage collaborative working through training ECRs associated with PGs in the associated skills.

What elements would you add or change about the existing scheme?

This section includes weaknesses that were raised by delegates during the discussion of the strengths of PGs in the earlier session.

Delegates expressed concerns about the guidance and mechanisms in place for continuation beyond the lifetime of the PG. While recognising it is important to ensure continuing excellence of the research, it was felt important not to lose the benefits that building up an effective, high performing team has had during the current grant.

As flexibility is seen as a key strength of PGs, delegates encouraged EPSRC to look at inter-institutional financial management and the mismatch between EPSRC and university administration expectations. Delegates also suggested increasing flexibility by removing the rule that disallows movement between Directly Incurred and Directly Allocated costs and removing the strict start date requirement.

Increased guidance, training or help by EPSRC was seen as beneficial in a number of areas:

- When junior academics should be included as Co-Investigators
- Partner contracts and consortia agreements (e.g. standard templates).
- Advocacy
- Outreach
- Advertisement of outputs

Add-on funding was suggested in a number of areas including additional funding for innovation, or a type of stage-gating mechanism allowing successful grants to increase in duration. Linked to this, delegates commented that EPSRC should look again at the exclusion of PG funding in the Platform grant eligibility criteria. Further funding could also be used to enhance connections between existing PGs. These connections could also be encouraged through cross membership of advisory boards.

Finally, delegates commented on EPSRC strategies. Many commented that PGs are excellent training environments for students and while some benefit from CDTs at the institutions which can be aligned, there is an opportunity for further students to be funded and incorporated into the research activity of these teams. Delegates also commented that the pre-peer review stages could be made less onerous and the need to fit to focused areas made less strict.

Best Practice Session – Accelerating Impact and User Engagement in Research

The aim of this session was to raise awareness of the different routes for impact and user engagement and to highlight the resources that the EPSRC provides to facilitate these activities. The session created an opportunity for the PG holders to share exemplars of best practice for accelerating impact and engaging with users. PG holders were encouraged to discuss ways to build on their current approaches to accelerate impact even more effectively and more quickly from their research.

The session began with a presentation on EPSRC's strategic goal to accelerate impact from investments and maximise its potential for exploitation. Several attendees were invited to present to the group on what they had done to accelerate impact from their PG, how the PG scheme had enabled this, and what barriers they faced. The following questions were then posed to the attendees to enable them to share experience and discuss ways in which they could improve their approaches to engaging with beneficiaries of their research.

- What have you done so far in relation to your project/programme to accelerate impact?
- How have you reached out to potential beneficiaries of your research?
- What might you do differently/additionally in the future to reach out to beneficiaries that aren't currently engaged?

Several key themes emerged from the discussions depending on the nature of the impact, what is needed to facilitate this in terms of resource, and how to evaluate or measure impact to determine success. The major areas of impact that emerged were those of:

- Outreach and public engagement – many opportunities and experiences were outlined that demonstrated how researchers can disseminate their outputs widely and also how they can engage with a wide audience. This included utilising social media, science festivals, summer schools, television and radio, apps and open days to engage with many individuals and to showcase their research widely.
- Industry engagement – there were significant discussions about the mechanisms that can be used to engage with industry and to enable the commercialisation of research outputs. Much of the discussions focussed around people mobility and the benefits of secondments and workshops for developing long term relationships. The PG holders also reflected that early engagement with industry can lead to longer-term uptake of outputs.
- Academic impact – wider academic impact such as drawing disciplines together was achieved by the PG holders through conference presentations, organising and hosting workshops, international exchanges for researchers, publications, and visiting oversees research institutions to build relationships and form collaborations.
- Impact through policy – as with industry engagement there was a focus on impact through people mobility through secondments to government departments and influencing policy by partnering with other organisations that work directly with policy makers.

There was also a substantial discussion focussed on the resources required to enable researchers to accelerate impact from their research including accessing funding through EPSRC Pathways to Impact and Impact Acceleration Accounts to access, for example, training provision, pre-industrial development work, technology transfer activities and developing collaborations with industry and the Catapults. There was also a focussed discussion about the need for a responsive budget for higher TRL research to enable outputs to be taken forward, which could be funded through Innovate UK.

The PG holders also discussed ways in which impact can be monitored and measured to assess performance. They reflected that evidence and traceability of impact is essential but can often be difficult to quantify. The full outputs from this session can be found in Appendix C.

Best Practice Session – Management and Monitoring

The aim of the session was to share best practice in management and monitoring of PGs and the delegates were given prompt questions relating to the objectives to help facilitate the discussion; the answers were then shared to the whole room and discussed. The outputs from both the morning and afternoon session can be found in Appendix D but the questions and common answers and key points are detailed below.

Objectives

- To discuss best practice in managing a PG flexibly.
- To discuss best practice in using the advisory board to their best potential.
- To discuss best practice in monitoring progress in a PG.

<u>Flexibility</u>

- *How have you managed cross-institutional projects?*

  Cross-institutional grants can be challenging, especially the allocation of funds, but this can be managed effectively with clear leadership, communication and a collaboration agreement between the investigators. Secondments of PDRAs between universities work well to build the team and to manage resources.

- *How have you managed changes in research direction?*

  The advisory board are useful in steering the direction of research, and the flexibility of resources and short-term PDRA contracts allows this.

- *What would you do differently/advise to new PG holders?*

  Resource management between universities can be difficult. Not all resources should be allocated at the beginning of the grant to increase flexibility for changes in staff/research direction.

<u>Advisory Board</u>

- *What is the composition of your advisory board (AB)?*

  ABs vary in composition and number according to the nature of the project, but most have UK, international and industry representatives. The AB may change in composition

as the research changes direction. There should be enough people to cover the breadth of research and not everyone will be able to attend all meetings.

- *How do you make the most of your AB?*

  Have a workshop with talks/posters from investigators and PDRAs before the annual AB meeting so they can meet and speak to everyone involved in the project. The board should be comfortable in challenging the investigators and their advice should be valued.

- *What would you do differently/advise to new PG holders?*

  Terms of reference are helpful in enabling everyone to understand the role and responsibility. Think carefully about the composition of the board to give the best overview for the project. Having an AB member who is/was a PG holder is useful in terms of management and best practice.

Monitoring

- *What methods do you use to monitor the PG?*

  Regular meetings whether formal or informal, presentations and reports written at regular intervals. Pictorial representations of the project, Gantt charts with milestones/decision points, project management software and an internal website/wiki are useful tools.

- *How did you/how would you prepare for a mid-term review?*

  Not all PGs will have a mid-term review, however some useful advice includes: an annual census of papers and conference proceedings/ attendance, match work done with proposed work plan, explain deviations, more details should be provided compared to the annual AB report. It is a good time for the team to reflect on current progress and the AB should be used while preparing for the mid-term review.

- *What would you do differently/advise new PG holders?*

  Continuously gather evidence and spend should be monitored carefully. Technology can be useful (e.g. Skype and monitoring software).

Best Practice Session – Over the Horizon

The objectives of this session were to firstly understand what current PG holders considered as next steps beyond their existing grant to fully realise their original vision. Secondly we were keen to understand how PG holders planned for future capability in their research area including their thoughts on succession planning and active career management for ECRs.

The first question was asked and groups discussed this at their tables capturing relevant points as they went along. The relevant points raised across all the tables have been clustered and the following major themes emerged:

- **Critical Mass & Leverage –** the PG can be used to influence more broadly, grow and act as a leader for the area.

- **Other Funding Sources –** growing the capability through further PG applications and EU funding, but also thinking about downstream funders such as Innovate UK and when to engage these groups (including Catapults).
- **Evolution –** there is a need to evolve the team and research ideas during and after the PG. The 5/6 year timescale of PGs means that Research Council and political drivers change over their course so staying relevant requires evolution.
- **People** – the gender diversity amongst the PG holder cohort (especially PIs) is heavily skewed so needs consideration, concern about postdoc vs. industry wages and maintaining a healthy & talented people pipeline now that £9k fees are a reality.
- **Barriers** – the best people to do the science are not necessarily the right people to deliver the impact, needs to be a continuity of mechanism beyond applying for another PG, industrial engagement at low TRLs is a struggle, and there is a gap between the Standard Research funding amount and PG amount.

Before the second question was introduced, a thought provoking output from an EPSRC ECRs retreat was read out, which was:

- There are additional and competing demands on ECRs in terms of their development and training. Researchers have a breadth of demands placed upon them: research, student education, leadership training, administration, management, leadership, outreach, impact. These demands are growing. It is clear that the majority of ECRs are struggling with these demands as tensions arise between focusing on publications as a mark of success to get their first academic appointment versus developing breadth, leadership and management skills and academic agility to respond to changing problems and challenges.

As before, considering the above statement, the tables were asked to discuss and capture points related to their approach to managing ECRs, thoughts about succession planning and characteristics they are looking for in research staff that they manage.

It is apparent that there is a large degree of variance in expectations for ECRs across the different disciplines and research cultures. The breadth of operational roles that ECRs are expected to carry out adds weight to the statement read out from the ECRs retreat. These included teaching, supervision, impact lead, budget ownership, delivering strong outputs and public engagement. One topic that was pervasive was the importance of mentoring both across and within disciplines.

The characteristics that were most widely sought included phrases such as ‘self-starter’, ‘multi-tasker’ and someone who can ‘take ownership of tasks’. Alongside this was the emphasis that both networking and independent autonomy are considered important.

More systemic factors reported that clarity of thought at the recruitment stage is key to bringing the right set of skills into the team and that trust and time are important in career development. Counter to this were comments that encouraged competition amongst ECRs and required external scrutiny of their roles and research.

Finally, there was some discussion of management styles which included comments about the importance of dialogue and understanding how the ECR sees their role and

responsibilities. Additionally, performance management and encouraging ECRs to be critical of prevailing wisdom was raised.

Overall the breadth of comments to the ECR question reflect the diversity of research disciplines, highlighting the differences between them and the different approaches that are required. However it may also reflect a lack of continuity relating to best practice and management of ECRs, inhibiting effective delivery of the people pipeline and creation of future research leaders. The full outputs from this session can be found in Appendix E.

Topic Sessions

Smart Cities and Urban Living

This aims of this session were to provide information about the Smart Cities agenda and discuss with the delegates how EPS researchers can contribute to a future vision of urban living.

Quantum Technologies – towards a national strategy

The objectives of this session were to provide delegates with information on the UK National Quantum Technologies Programme and the development of a national strategy, EPSRC's role in the Programme, and highlight relevant upcoming EPSRC activities.

Advanced Materials – Leadership Council roadmap

This session provided delegates with an overview and update on progress by the Advanced Materials Leadership Council and an opportunity for delegates to discuss the future of this broad area from both a national and EPSRC perspective.

Healthcare Technologies

The objectives of this session were to provide an update of the Healthcare Technologies Theme strategy to a wider audience, raise awareness of the opportunities within healthcare that the community can engage in, and gain input from the community on future interventions in the healthcare space. Outputs from this session can be found in Appendix F.

Mathematical Sciences

The aim of this session was to understand how the PG scheme was working for researchers in the Mathematical Sciences disciplines.

Conclusions

The workshop aimed to engage senior researchers involved in Programme grants from across the whole engineering and physical sciences portfolio to explore the realities of running and managing these grants, consider how the scheme could be improved to reflect the evolving needs of UK research, and provide input on the Delivery Plan development. Specifically, delegates were asked to identify areas where EPSRC could adapt the current funding environment, areas of best practice for researchers to run such grants more effectively, and consider what activities EPSRC and the community could undertake to deliver these.

The information gathered from the workshop shows that the characteristics of the Programme grant scheme which differ from Standard Research are appreciated and seen as the key strengths of this mechanism. Many of the recommendations look to utilise these strengths more effectively either through changes to the scheme or broader policies within EPSRC, or through the grant management within universities. Programme grants are seen to have significant impact and influence over the wider community and further recommendations were made for how this could be better exploited.

The outputs of this workshop will inform EPSRC on actions it should consider in addressing the future needs of research being conducted at this scale. These include better integration across different mechanisms and smoother migration across remits and technology readiness levels. The outputs will be included in EPSRC Council's Delivery Plan engagement and we encourage researchers to also consider the workshop outputs and what actions they are able to take forward.

Appendix A – Delegate List

First Name	Last Name	Holding Organisation Name
Neil	Alford	Imperial College London
Ray	Allen	University of Sheffield
Mike	Ashfold	University of Bristol
Phil	Bartlett	University of Southampton
Jeremy	Baumberg	University of Cambridge
Polina	Bayvel	University College London
Jon	Binner	University of Birmingham
Ann	Blandford	University College London
Marco	Borghesi	Queen's University Belfast
Andrew	Bourne	EPSRC
Annette	Bramley	EPSRC
Michael	Butler	University of Southampton
Wendy	Carr	EPSRC
Mike	Cates	University of Edinburgh
Colm	Caulfield	University of Cambridge
John	Clark	University of York
Sandy	Cochran	University of Dundee
Alan	Cocks	University of Oxford
Richard	Craster	Imperial College London
John	Cremona	University of Warwick
Lee	Cronin	University of Glasgow
David	Cumming	University of Glasgow
Stuart	Dalziel	University of Cambridge
Anke	Davis	EPSRC
Martin	Dawson	University of Strathclyde

First Name	Last Name	Holding Organisation Name
Kishan	Dholakia	University of St Andrews
Fionn	Dunne	Imperial College London
Jaafar	Elmirghani	University of Leeds
João	Fonseca	The University of Manchester
Steve	Furber	The University of Manchester
James	Gates	University of Southampton
Simon	Gay	University of Glasgow
Jason	Green	EPSRC
Geoffrey	Grimmett	University of Cambridge
Richard	Gunn	EPSRC
Philip	Hall	Imperial College London
John	Hand	EPSRC
Yang	Hao	Queen Mary, University of London
John	Harding	University of Sheffield
Mark	Harman	University College London
Philippa	Hemmings	EPSRC
Adrian	Hilton	University of Surrey
Sarah	Hobbs	EPSRC
Colin	Humphreys	University of Cambridge
Ian	Hutchings	University of Cambridge
Roy	Johnston	University of Birmingham
Steve	Kolthammer	University of Oxford
Graham	Leggett	University of Sheffield
David	Leigh	The University of Manchester
Jon	Marangos	Imperial College London

First Name	Last Name	Holding Organisation Name
Lucy	Martin	EPSRC
Omar	Matar	Imperial College London
Jonathan	Matthews	University of Bristol
Phil	Mawby	University of Warwick
Alexander	Movchan	University of Liverpool
Karen	Muncey	EPSRC
Ben	Murdin	University of Surrey
Alan	Murray	University of Edinburgh
Helen	Niblock	EPSRC
Robert	Nicholls	University of Southampton
James	Norris	University of Cambridge
Jeremy	O'Brien	University of Bristol
Rachel	Oliver	University of Cambridge
Miles	Padgett	University of Glasgow
David	Payne	University of Southampton
William	Powrie	University of Southampton
Philip	Prangnell	The University of Manchester
David	Pym	University College London
Paul	Raithby	University of Bath
Graham	Reed	University of Southampton
Jason	Reese	University of Edinburgh
Steve	Renals	University of Edinburgh
David	Ritchie	University of Cambridge
Steve	Roberts	University of Oxford (Robotics)
Steve	Roberts	University of Oxford (Materials)

First Name	Last Name	Holding Organisation Name
Gareth	Roberts	University of Warwick
Chris	Rogers	University of Birmingham
Matthew	Rosseinsky	University of Liverpool
Mark	Sandler	Queen Mary, University of London
John	Seddon	Imperial College London
Alwyn	Seeds	University College London
Peter	Sewell	University of Cambridge
Dimitra	Simeonidou	University of Bristol
Les	Sims	EPSRC
Henning	Sirringhaus	University of Cambridge
Maurice	Skolnick	University of Sheffield
Mike	Smith	The University of Manchester
Iain	Thayne	University of Glasgow
Peter	Topping	University of Warwick
Christina	Turner	EPSRC
Sanju	Velani	University of York
Richard	Vinter	Imperial College London
David	Wagg	University of Sheffield
Peter	Wahl	University of St Andrews
David	Wales	University of Cambridge
Chris	White	EPSRC
Guang-Zhong	Yang	Imperial College London
Xin	Yao	University of Birmingham
Anatoly	Zayats	King's College London
Nikolay	Zheludev	University of Southampton

Appendix B – Outputs from Delivery Plan Session

State of Play

What are the strengths/advantages of this type of investment?

- Excellent environment for ECRs
- If done well, gives quality researchers a supportive environment to more fully develop. Excel → stability
- Scale of resource enables difficult challenges to be tackled
- Ideas & resources can be traded
- Combining different skill sets creatively
- Undertake multidisciplinary feasibility studies – which may lead to new opportunities
- Ability to move quickly
- Stability gives ECRs the opportunity to express creativity → empowerment and to take leadership
- Attract best people
- Major "build" achievement?
- Takes heat off grant writing
- Can "afford" secondment
- Attracting visits & engagement
- Skills can be developed and exploited to the full because the grant is an ecosystem
- Provide resources to wider community through economy of scale
- Long term ; flexibility; Continuity - HIGH QUALITY & IMPACT
- Critical mass
    - Research
    - Influence
- Strong leadership
- Cross-disciplinary!
- Agility
- Mentoring (career development)
- Advocacy & outreach
- Empowerment (local and beyond)
- Freedom
- BRANDING (website logo & recognition)
- Bringing together large range of areas/forum i.e. whole universities, etc.
- Breaking borders → resource, building new teams
- Flexibility – resource allocation
- Supportive teams
- Long range vision helps to motivate the team
- Tackled a problem that was larger than a single PI may be able to approach
- Bigger teams, working in much larger groups. Resources to tackle problems, i.e. flexibility
- Money and time to solve harder more significant problems
- 5 year funding – stability
- Critical Mass

- Collaboration
- Complementary expertise
- Between key players in different institutions
- Breadth of experience by post-docs
- Gives PDRAs more independence and more responsibility
- Long-term planning
- Flexibility:
    - Underwriting
    - Nimbleness
    - Leverage
- Attractive employment
- Long term career development
- High quality recruitment
- Critical mass $\rightarrow$ opportunities
- Direct benefit to environment
- Raises profile of subject
- Benefit to PhD: mini CDT?
- Time to develop working methods from a diverse set of researchers and disciplines
- Opportunity to bring in (international) others
- Time and an ability to assemble an excellent team
- An opportunity to work with stakeholders to help define the (best) research direction
- Ability to address open-ended questions
- Trust to investigators to take big ideas forward
- The ability to develop capacity
- Greater visibility and freedom within institutions
- The key is duration and flexibility
- Engage with external stakeholders
- Strong partnerships with other universities
- Industry is interested (beyond original partners)
- PGs allow young academics (Co-Is) to get involved with large research programmes
- Flexibility
    - Have
        - Internationally
        - industrially driven advisory board, helps shut things done
    - Can create more additionality
    - Can move resources around; respond to new challenges
    - Can create new themes; cross-fertilisation possible
- Scale – can do things holistically; eliminates vagaries, of chance of getting required multiple grants simultaneously
- Can build up real credibility
    - Can generate influence
    - Get lots of overseas invites, promotes UK influence
- Can achieve more outreach
- Long Vision
- Long Duration
- Flexible

- More efficient
    - Time saved in fewer grants
    - Outputs
    - Impact
- Aggressive triage
- Encourages risks & ambition
- Opens opportunities
    - People
    - Collaborations
- Reasonable oversight: not onerous – keep to task
- Allows investment in collaborations
- Team building: enhances young career
- Duration/flexibility – but difficult with multi-institution partnerships
- Multi-disciplinary (can be)
- Coherent programme of research: deliver on a vision
    - address big challenges
- Visibility/critical mass
- Flexible recruitment
- Grant environment facilitates 'self-training' of RAs, etc., PhD students

Counter-points

- Major build not possible
- 'ineligible' for platform
- Cliff edge lack of continuity – how to follow on
- Envy – regular grants have higher reject rate
- Inflexibility of funding when multiple units involved
- Lack of project studentships is a real problem
- Variability over ability to include junior academics as Co-Is (some Prog Grants allowed, others not)
- For Prog Grants that started a while ago some rules changed after grant started
- Need to plan for continuation after Prog Grant finishes (but also an opportunity)
- What do you do once the PG funding is gone?
- Long term benefit to UK goes down as funding non-UK PDRAs

How has your PG enabled you to respond to challenges/opportunities?

- Flexibility & size → re divert
- Targeted multicore
- Big equipment investment sometimes new to address challenge
- News ways of working (but old ways can work too)
- Engage with 'big' bodies – regulators, government, standards
- Building the national community with PE as hub
- advise of how helps
- Agility
- Flexibility (resource allocation)
- Peer/stakeholder input
- Co-ordination & professional project management

- Longer term opportunities
- International visibility
- Innovation
- Influence
- Flexibility to re-focus at mid-point to respond to discoveries and to external changes
- Easy access to wide range of expertise and instrumentation for PDRAs and PhDs
- Rapid taking up new research directions
- Collaborations are much more easy to start
- Benefits of scale/multidisciplinary
- Challenges can evolve during grant
- Broadening perspective & better 'people skills'
- Referencing of external advisory panel (& support)

What new ways of working has your PG enabled and how?

- Student cohort creation
- New partners? within existing funds }
- Secondments (innovation funds) } ADDED VALUE → EXTRA STUDENTS
- Inter-PG collaboration }
- Theme development
- Visibility (PR/advocacy)
- IMPACT!!
- PARTNERSHIP (EPSRC & ACADEMIC & INDUSTRY)
- Other funding (EU, Industry)
- Cross-disciplinarity
- More active collaboration between institutions
- Coherent way of working
- More collaborative
- Maintaining critical mass
- Much stronger teamwork across group
- Switching postdocs from EPSRC to industry funds and back again
- Switch resource into new directions
- Longer term planning horizon
- Hiring better people
- Residential workshops
- Creativity@home
- Lab exchange/mobility
- Helps PI focus on challenges/science
- Industrial referencing
- New models for collaboration (incl. 'virtual')
- Helps steer collaborating academics - enhances UK ambition
- Higher visibility from outside UK - becomes hub for outside UK connections
- Real connection theory – expts

Building and Adapting

How would you build on the scheme to realise your vision in 2021?

- Better connection to TSB/Innovate UK
    - Follow-on scheme for technology translation/impact acceleration (connections currently are personal rather than orchestrated/managed)
- Collaborations formally with other nations e.g. States?
    - Make world leading teams
    - Avoid double jeopardy in multiple nations RCs
    - Best of/with the Best
- Studentships?
    - Build the next generation for critical mass
- Growing a grant portfolio
- Less political interference
- More regional funding
- Look at length
- How do you continue post-PG?
- Migration of discipline?
    - e.g. into MRC/NERC territory
    - mechanisms/processes
- Examine the tension between:
    - Team of established researchers
    - Development of Early-Career Co-Investigators
- Find an easier way to bring in new partners
    - Standard Contract Models or Consortium Agreements?
- Funding beyond the PG??
    - Higher TRL funding - ensure Impact!
- Eco-system is under pressure
- Allow international students??? (Maybe home rates??)
- Translate between directly allocated & directly incurred funding
- Or full studentship for European students!
- Europe + the world?
- Programme of PGs
- Cross-membership of Advisory Boards
- Does EPSRC talk with RS, Leverhulme, Brit Council, RAEng etc.
- Log-rolling (working together) no-one wants to fall off (funder or investigator) working together and continuity
- Matching to higher TRL & Innovate UK relationship building
    - E.g. at higher level e.g. Digital Economy or any other Grand Challenge
- Innovation + impact might need longer time horizon
- Possibility to renew, extend, refocus
- Maintain momentum
- Avoid wind-down/wind-up
- Gender gap at this meeting →extra resources
- Innovation add-on to PGs
- Continuity

    - take reviews seriously! If it is world leading find mechanism to continue
    - keep successful teams together
- Demonstration of continuing excellence
- Possibility to get outside of box (not just focus areas)
- Studentships (Programmes are an excellent training environment)
    - Mini-CDT or equivalent
    - Project students: to benefit from critical mass
- Discretionary fellowship funds – to be managed? A fellowship for outstanding PG PDRAs
- Formal international Co-Is/partners/exchanges
- More outreach - leverages outside interest
- Link catapults
    - to PGs
    - more brokering/funding?
    - to Innovate
- Adding studentships (scheme to recruit as RAs)
- Maintain standard/responsive mode funding level & enable smoother transition from those (e.g. 0.5M) to larger grants (e.g. 5M PG – fill in the gap) (esp. for CI – PI staff development)
- Have more explicit mechanisms for continuation/evolution of PGs (allowing also scaling up with more engineering effort towards industry impact)
    - simpler link to 'Innovate UK' funding
    - Research & this next step innovation must be blurred
- Part-fund international collaborations, e.g. bid for partial funding for staff. Form links but ensure no handcuffs/unhelpful constraints
    - + adopt more adventurous/risk appreciative measures (balanced profile of risk)
- Collaborative training for ECR, across prog grants (critical mass)
    - Part network grant. Part of funding must be spent outside the initial partners (Ethical, sincere behaviours expected) → ask about experience within Dig Ec Hubs
- + more flexible ?? funding, e.g. for IP protection
- + allow accretive research to be part funded
- PhD – opportunity for low risk (cost/adventure)
    - + allow part of grants for PhD studentships. CDTs are one critical mass. PGs may be a mid-range opportunity for critical mass. So, e.g. adopt a threshold of funding to allow PhD students to be funded as part of the grant

What elements would you add or change about the existing scheme?

- Make flexible inter-institution financial management more real (avoid mismatch between EPSRC view & university admin view)
- Specific funding for PhDs on Programme
- 3 – 5 Co-Is optimal scale
- Strict start date is not helpful → is 6 months extension enough? 12 month preferred
- Include PhD student funding
- Good research environment for students
- Different funding and complementary to CDTs

- Good for team building
- Ask people who didn't get PGs!?
- Balance of
    - funding to junior staff? – reward
- End of grant – team built – how to maintain?
- How to decide (by EPSRC) which PG to run on?
- Continuation, mechanism for extension
- Help with advocacy, advertisement of outputs
- Improved strategy for cross-Council funding, specifically with STFC
- Re-introduce funding for PhD students linked to the project
- Clusters (Networks?) of Programmes?
    - How to construct
    - How to "use" them
- Flexible start time
- Satisfying EPSRC politics at pre-peer review stages is tricky
- Some concern (not unanimous!) over the influence of the interview
- PGs leading to new "buds" that should be nurtured (avoiding double-dipping complaints)
- Follow-ups/connections with Innovate UK
- Specific funding for PhDs
    - Excellent training environment
- Variable length 5-10 years?
- Freedom to apply for funding in all categories: students, RAs, equipment, etc.
- Continuity planning?
    - What point could PG2 be sought within the timeframe of an existing PG?
- Distinguish between 'rolling the people' & ' rolling the science'
- Associate PhD students with PGs?
    - introduce formula that "credit earned" via PG is earmarked to PG holder by the host university)
    - use/extend the flexibility to trust PIs to recruit PhD/PDRA as appropriate
- Clear & consistent guidelines about who is eligible as a Co-I. 'Best of the best' vs bringing on junior members as Co-I
- Cross-fertilisation between PGs?
  Cross-fertilisation between PGs & CDTs?
  (Light touch review & information)
- Allow Project Students
- Increase flexibility start date
- Increase researcher-research collaborations
- Renewal mechanisms:
    - Rolling scheme
    - Longer programmes (with tougher review) 9 yrs, 12 yrs
    - Weight dice (direct to full application)
- Flexibility to refresh team (new Co-Is, new institutions)
- Harvest on-going 1 page slides from each PG; graphical success
- Provide extra pot of £ @ year 3 for PG to fund new/young academic in related area (pump-primes new talent)

Appendix C – Outputs from Impact and User Engagement

Outreach and public engagement

- BBC science reporters are ok
- Art and design student project degree show prize
- “Bright club” comedy shows on science
- Engagement in science festivals at local and national level
- Using twitter and citizen science with related workshops and focus groups to discuss the impact of design on human performance.
- Engaging with school children and teachers through magic shows to communicate CS and HCI and safety issues
- YouTube videos led to Royal Society Science Exhibition
- Disseminate this information
- Taken part in EPSRC
- Exhibit at Big Bank Fair in London (ExCel) – twice
- Exhibit at the Times Cheltenham Science Festival twice
- Summer schools
- Schools outreach and science week events
- A nominated outreach person – science festivals etc.
- Organise open days
- Social media
- Free downloadable apps (educational) for phones/laptops
- Public engagement helps clear thinking about big picture for research. Also leads to research project with ready-made impact
- Resident artists
- Apps for wide engagement/publicity

Industry engagement

- Keep up conversation with industry partners
- Co-organising workshop with MHRA (UK regulator) on regulating technology design
- Consider impact to policy makers – i.e. secondments to government departments
- Site visits to industrial partners – secondments of RAs in companies
- Secondments on industry projects
- Good to hold open ‘industry day’ at say 18 months to link into user community
- Reach out to industry
- Outreach to industry – licensing discussions – patent filing
- Pre-competitive industry discussions – raise awareness of staff skills – employment
- Early engagement with companies can enable longer-term uptake
- Impact and engagement routes differ for large and small companies
- Unexpected ‘blue’ sky discovery can sometimes find unexpected application
- Secondments from industry (1 week – 3 months) – act as a broker, don’t worry about IP
- Joining projects – selling outcomes to industry
- Spun out 2 companies.

Academic impact

- International workshop on research methods – 2 books published

- Impact through intellectual capital
- Postdoc worked as intern at FDA (US regulator) to get them thinking about user interface design.
- Technical workshops secondments between academia and industry
- Conference presentations
- Review publications
- Organising workshops
- Workshops on targeted applications
- Drawing disciplines together
- International exchanges

Policy

- Contact MP – send email. They do reply.
- Outreach to policy makers, to Joe public, to others, lobbying interface
- Political engagement (MPs, Ministers) frame questions back
- Influencing policy by partnering with organisations that influence policy, e.g. GeSi(Global e-sustainability initiative)

Resources needed

- Allocate enough budget to support impact activities – impact administration
- Delegate to students and researchers as part of skills development
- Media training – improve media engagement
- Use web and social media
- PhDs must be part of the impact (fund on grants)
- Training people
- Training and enabling career development
- Training students and PDRAs – emerging careers
- Follow-on funding for linked research and impact-orientated (but pre-industrial) development work is needed
- Contact media outfits
- Individual researcher-led impact activities
- In-group technology transfer team (pump-priming then self-financing)
- Need Innovate UK responsive mode pot of money
- Feasibility study to demonstrate technology
- Enough engineering effort to build 'beyond proof of concept' models and systems has been essential
- Leverage alumni networks
- Responding to Innovate UK initiatives
- Find bridge partners: help influence further – outfacing brand – they come to you
- Length of PG allows the identification of industrial use
- Fellowships vs industrial funding
- Catapults
- Links with KTN

Measuring impact

- Evidencing impact data creation of impact
- Engagement - Impact – Evidence (traceability)

- By the way Research Fish is very awkward to use and search so will not be being effective.
- EPSRC policy feed into REF, e.g. for less linear impact
- Seek alignments of impact desires
- Impact as auditable impact

Additional things to consider

- Clarity r.e. potential roadblocks for technology development even at early stage
- Open source data/models to avoid IP barriers
- Open source software (with documentation)
- IP needs appropriate protection to reflect true value
- Impact via open source software and freely distributed models has been essential to get rela dialogue and impact
- Embrace wider aspects of impact
- It is diverse – issues of confidentiality raise issues – very different to ITRC
- Explore diversity for impact routes
- Roadmap to define what it would take to bring technology to market – honesty
- Should we do everything or focus? Public, government, industry
- Diverse – projects vary widely

Appendix D – Outputs from Management and Monitoring

Flexibility

- How have you managed cross-institutional projects?
  - Cross-institutional is difficult i.e. costs
  - Use advisory board for advice
  - Max 2 years funding for other institutions
  - Need decision of management group first
  - Management group different view of flexibility, i.e. didn't like 2 year allocation
  - 7 institutions taken over 6 months to sort finances
  - Visit all teams individually
  - Innovation Fund to bring new groups in
  - Return of money to another partner more difficult
  - Release points for funding – less difficult
  - Secondment of staff instead of moving money
  - Technical flexibility (easier) vs resource flexibility (more difficult)
    - Hard to change directions because universities need to return
  - 2 year contracts, then AB advice and possible change of direction
    - Too short for location/ moving
  - Trust in partners to have a fair allocation
  - Conflict resolution procedure has helped.
  - Events to encourage PDRA interaction
  - Be assertive – active management + events to bring researchers together
  - Secondments
  - Pick your partners carefully
  - Buck stops with the PI
  - Develop trust and way of working together
  - Nip any problems in the bud before they reach critical point
  - Need a good Memorandum of Understanding
  - Managing DTP allocations can be an issue
    - Some universities will return some to collaborating universities
    - Others it just goes to PI universities
  - 3 sites, 3 investigators. All investigators highly experienced and manage their own site research
  - 4 universities PG – monthly RF meetings (with PI and Project Manager) …helps geographical spread.
  - Regular cross-partner meetings of researchers
  - Clear collaboration agreement up-front
  - Monthly meetings of the (senior) investigators – virtually – helps greatly
  - Build on previously built partnerships
  - Funds transfer to another RO
    - Might lead to dismay if RO has to give away money
  - Centrally advertise for positions
  - PDRAs feel like they are only consulting on other projects
  - Involve PDRAs in non-PG projects to increase training
    - PDRAs visiting other labs: exchange

- How have you managed changes in research directions?
  - PI makes decision on direction to take with consensus of CoI
  - Evolutionary changes rather than major
  - PDRAs on several projects gives flexibility to re-shuffle
  - Advisory board input very valuable, would point to new directions
  - 1st 2 years GANTT, 2nd 2 years aspirational goals then refinement
  - Input from end users
  - Flexible workshop funding
  - Long term support for staff – continuity
  - Tension between flexibility of trying out new things so they can be 'spun out' into new projects, without them taking PG off course.
  - May need to refresh membership of advisory board if research direction is changing
  - Don't appoint all PDRAs on long term contracts at the outset to retain flexibility to change direction
  - A good advisory board can really help with this.
  - Flexibility in University facility funding – need EPSRC to back up
  - Hiring RA until extra/ new skills so this is changing on direction (a bit). We welcomed this
  - Workshop at start of grant to take forward ideas and new staff
  - Magnet for high quality people. Able to easily move people around when they move on to fellowship e.g.
  - Research Fish: impact factor for Maths will be quite low in comparison to other areas
    - Decision making on basis of this
  - Monthly board (Co-Is) meetings and 6 monthly research reviews. Enable opportunities to be quickly identified
  - Board has agreed to close activities and deploy resources into more vibrant areas. Researchers on-board
  - Mid-programme sandpit defined Phase 2…led to flexibility in RF employment
  - Advisory board to steer direction of projects
  - PDRAs spread across different projects
  - Increased engagement with PDRAs to explain web of projects/ change of projects

- What would you do differently/ advise to new PG holders?
  - Minimise number of institutions/ partners
  - Line up the story before making decisions to cut project Fixed start date
    - Factor extra 6 months in to allow for later start of PDRAs
  - More resources: more impact money and more T&S money
  - Separate technical and management discussions
  - Senior team need to monitor landscape in real time – not on 6 month intervals
  - Make life easy for your steering group – clear decision points
  - Difficult to reallocate resources between partner universities
  - Familiarity with EPSRC rules on financial flexibility – could there be clearer advice?
  - Difficulty in getting team in place within 3 months if funded
  - Find a way to cut off unpromising directions at the right time
  - Difficulties in recruiting staff at start date

- Don't appoint all PDRAs for full duration of the grant – appoint for shorter term with option to extend
- Keep some resources back
- Inconsistent advice from EPSRC re no. of Co-Is and their seniority (one PI advised max 5 + all senior). Disadvantages – people not getting kudos for being on grant, hard to bring on ECRs. Better/ consistent guidance/thinking on this would be desirable.
- Provide a serious discussion forum for all researchers – career development/ launch new ideas.
- Inflexible start date
- Apply at different time of year: writing over the summer
- More money for advisory board, workshops and visiting researchers
- Greater level of PI time + management (administrator) (at least 50% PI time at least 50% administrator)
- Greater pressure on ROs to use overheads to appoint replacement staff

<u>Advisory Board</u>

- What is the composition of your Advisory Board?
  - Meetings every 8 months alongside every second interim team meeting
  - UK academic, International academic, Industry partners, Government researchers.
    - ∑4; 8 ; 12 ; 6 ; 3
  - Mixture of backgrounds UK ↔ international. End user, policy
  - 4 academics + industry
    - 1 UK, 1 EU and 2 US
  - 6 they don't all come or 8
  - Refresh of AB after 2 years
  - Chair must understand whole landscape
  - Needs to cover breadth of research
  - International chair to secure attendance
  - International members to facilitate collaboration
  - May need to actively change over lifetime of grant
  - CEOs Start-ups: Similar to running a PG – management + reporting challenges
  - Having someone who is also a PG holder
  - Split.
    - Academic: Industry
    - UK:Non-UK
  - International representation (but can only expect them to attend once annually)
  - 'user' representation
  - Another PG holder/ someone that understands the context/ purpose of the scheme
  - Research leaders
  - Balance depends on nature of research
  - 2 chair academics, 2 industry not project partner, EPSRC, MEP, International. 50:50 international:UK

- PPs invited to meeting but not on AB
- MEP no longer MEP – can he still be used
- Partners bring advice
- Could bring on more policy relevant people to be able to maximise impact
- 2 advisory boards
  - Audit group
  - Impact group
- 1 industry (UK Based), 2 scientific/ academic (international), (two panels) Not management advisory
- Ind AB
  - 4 academic (3 UK)
  - 6 Ind (4 UK)
- Have somebody on the Board who leads another PG

- How do you make the most of your AB?
  - Industrialist: manage expectations of what they will get & how quickly
  - Web meeting 1 x year + 1 day before/ after a major conference
  - Lobbying for IP with companies
  - Point to things from an external perspective
  - Presentations, telephone conferences
  - Advice from AB on preparing 2nd PG application
  - Person-to-person meeting not required, but can be done via TC
  - Person-to person: meet the students, meet PDRAs, see the demonstrators
  - Want people who will challenge you
  - Ask board to give presentations
  - One meeting a year. AB might not come more
  - Ask AB the questions you want answered
  - Point out opportunities
  - 2 day meeting, 1 day presentations then AB meeting, then management meeting
  - Chair has terms of reference
  - Chair should communicate with EPSRC + take responsibility of what will happen after PG
  - Involve in research projects to give them a state
  - Technical presentations every 6 months
  - Technical reports in addition to outputs
  - Invite to participate in workshops
  - "Branding" from high profile – useful for recruitment
  - Advertising to high level scientists
  - Use the whole team (students and PDRAs) to maintain contact
  - Find out who to talk to/ which events to attend
  - Don't reinvent the wheel
  - Flexibility to have in person meetings and skyping in
  - People exchange PDRAs coming in got training
  - Value their advice
  - Annual meetings
  - Balance between meetings and getting advice from busy people

- Can be hard to get continuity of attendance, particularly for international members even if you give lots of notice.
- Terms of reference are helpful in enabling everyone to understand the role and responsibility.
- Feedback to the whole team including PDRAs
- Start 'team' can add people to it if necessary without it being cumbersome
- Consider 'virtual' attendance for some meetings if they are more than one per year.
- AB can act as advocates for the project
- AB not changed through progress of PG, continuity good
- Take AB member for dinner if they can't make meetings
- Chair defined board and engagement
- Go through the chair. 1 meeting at Uni and skype
- Encourage them to interact direct with all researchers (PhD, post Docs as well as PIs)
- Biannual Summits with project partners (24 initially; now ~70) – all allocated as Expert panellists to 5 research challenges and Audit group (every 6 months) and Impact group (every year) then meet at the end of these days
- Advice, cofounding. Access to field sites. Funding related projects. Contributions in ind (materials etc)

- What would you do differently/ advise to new PG holders?
  - Think carefully about AB composition: availability to attend meetings etc. rather than impressing referees.
  - Best version of AB not for status, but the ones that have time to comment with oversight of the area.
  - Hands on experience of the area required
  - Avoid death by PowerPoint – don't over report to AB
  - Need to get level of individuals right i.e. if they are high up might not be available for meetings
  - Choose chair carefully
  - Establish that the AB are working for you
  - Qualitative vs quantitative analysis of activity
  - Different expectations internationally (NSF)
  - PI is in charge! Have a protocol
  - Balance steering role with freedom to operate
  - Manage expectations of AB members
  - Understand the agenda of your advisory board + be careful about the balance of its composition.
  - Non-Disclosure Agreements can be tricky
  - Attend meetings in person or via skype if possible
  - Let AB members know what the expectations are
  - Known collaborators easier to get involved but should be critical enough
  - World leading experts in our field
  - UK representation required – application guidelines should explain need for this
  - 1 member from each industrial partner
  - 3 academia – 2 were existing collaborators, 1 not

- Should be advisory board not steering
- Poster session at AB meeting so AB can talk to staff
- 5 people – international. KT for Scotland EPSRC
- Opportunity panel – steering and direction separate past or management
- Make sure a couple of UK members (+PG holders) to best share ideas
- Guideline for advisory board up-front

Monitoring

- What methods do you use to monitor your PG?
  - Regular report writing (6 monthly) (progress + future challenges)
  - Meet with each student + PDRA
  - Frequent discussions on progress of projects – informal/formal
  - PDRAs report to each other
  - Progress charts
    - What/How decisions were made
  - Project management software
    - Liked by industry AB members
  - Need a plan in place
    - Make 6 month plan to AB meeting with performance metrics materials provides is gate keeper
  - Regular verbal updates at meetings
    - Minuted meeting
  - Get papers out in a timely manor
  - Keep internal website updated
  - Identifying which areas are of relatively higher/ lower priority
  - Regular team meetings
    - Follow through on actions
    - Cycle through work streams
  - Physical meetings, more important at the start – then can move to virtual
  - Social meetings/ events to build relationships
  - Agile > Gantt charts
  - Advisory Board input – 6 vs 12
  - Pictorial representation of progress
  - Channelling PDRA ideas into the PG direction
  - Weekly group meetings, fortnightly with other dept.- presentations
  - Progress in projects through PI: PDRA meetings
  - Publications, Invited speaker
  - Working papers 3-4 page sketches circulated around the group every couple of months for every WP
    - Allows others to contribute to the work at an earlier stage
  - Benchmarking (initially) exercise every 8 months, summarise/ scouting initial development vs own advances
  - PRDAs and PhD students (reps or working on ICASE) at group meetings
  - Circulation of papers around the group that one has found
  - Informal internal monitoring PDRA: plenary sessions then PIs over coffee. Different to proposal, but more effective
  - Secondment to industry partners

- Quarterly project meetings with a written review by PDRAs
- Wiki site. A dedicated website with publications on.
- Update schematics of the project
- Regular email contact with researchers
- Set goals for the team e.g. paper writing
- Do people use a risk register?
- Local weekly meeting update. Meetings of each Lead CI. Monthly Management Board of Co-Investigators.
- Quarterly report of all activities
- 2 weekly (internal to an institution) RF/RS meetings
- Monthly RF meetings with PI and Prog Manager
- 6 monthly Full team meetings
- Weekly research meetings
- Monthly board meetings
- 6 monthly review meetings
- Monthly management meetings (PIs, Co-Is and senior PDRAs)
- 6 monthly Industry steering group
- Annual workshops.
- Mid-term international reviews

- How did you/ how would you prepare for a mid-term review?
  - Significant amount of paperwork to demonstrate criteria
  - Template – mismatch between EPSRC + reviewer needs?
  - Mid-term review will pull strands together and highlight gaps
  - People flow, money wants to be known by panel
  - Annual census of papers and conference proceedings/ attendance (Pas helpful if they have booked travel!)
  - Harder to demonstrate less tangible criteria
  - PG managers – publish best practice
  - Clarity of expectations wrt Flexibility – “pooled funding”
  - Variations by theme lead to differ focus – scientific vs monitoring
  - Don’t get to EC reporting levels
  - Time –consuming distracting from research
  - Match work done with proposed work plan, explain deviations
  - Detailed template: not easy to write a flowing document
  - Similar to prep AB, but more extensive details required
  - Feels like writing the proposal again
    - Helps to firm up ideas
  - Communal effort of producing the report
  - Painful but worth going through
  - Programme manager can help prepare
  - Use AB for preparation for mid-term review
  - Good for the team to work through the mid-term review
  - No dress rehearsal but 6 monthly meetings, so we were well prepared
  - Discussion of an M-T review prompts a full team (internal) team meeting. Annexes from each theme…then PI drafts 2+8 pages
  - Cross-project focus on challenges to demonstrate RES. Advance
  - Reports (written) on each work area to international review panel.

- Review meeting inc. site visit (S)
- A full team, 2 day sandpit to co-create Phase 2 helped focus the ideas for the M-T review.

- What would you do differently / advise to new PG holders?
  - Monitor spend carefully
  - For panel/ board.
    - Show links/ summarise between slides
  - Use computerised systems ASAP, gets more complicated with more people.
  - Choose highlights for presentations
  - Beneficial for whole team to understand the aims and deliverables
  - Mid-term reviewers need to understand scheme and any constraints.
  - Technology – get everyone a good webcam and mic
  - Keep slots in diaries – just in case
  - Continuous evidence gathering vs. 4 months effort
  - Be there for the staff – be available for them visibility – walk about management
  - Ask for more PI time for monitoring and management

Appendix E – Outputs from Over the Horizon

These have been clustered into points raised by tables.

Question 1: Next steps beyond the existing grant

Critical Mass & Leverage

- There is a need to continue to develop critical mass beyond PG
- Use critical mass of PG to engage external stakeholders
- Grow a PG to a Centre
- Linkage of other activities (Fellowships, project studentships, capital) to PG – how could this be incentivised by EPSRC
- Embed fellows within PG – recognise leadership behaviour

Other Funding Sources

- Get money from the EU/ERC
- Generate a portfolio of funding
- Innovate money should be facilitated alongside PG
- There should be more interaction with Catapults
- When should the team think about follow on funding

Evolution

- There is a need to refresh & evolve team
- Priorities change in a timescale <5 years, political and research council cycle
- How do PG holders doing a good job at managing the grant get rewarded
- Outcomes of PG will lead to exploitation potential & new research avenues

People Issues

- Where are all the women PIs in the PG cohort?
- Teams are more than just talented in
- Salaries of research staff very low compared to industry wages
- Impact of student fees on maintaining a strong people pipeline into research

Barriers

- There needs to be some continuity of the mechanism
- Finite time; old science impact vs new science delivery
- Discovers not always the best people to be developers of the research
- No clear mechanism for follow up funding
- Industrial engagement at low TRL is a struggle
- Gap between responsive mode funding (£0.5M) and PG funding (£5M) a big one
- Funding treadmill

Question 2: Future capability, succession planning, early career researchers

<table>
<tr>
<td rowspan="3">OPERATIONAL

• Effective mentoring
• Skills/Training
• Apply for own funding
• Lead mini projects based on own ideas
• Teaching
• Supervising PhD Students
• Represent the grant at conferences
• Work package leadership
• Impact lead
• Engage with industry
• Budget ownership
• Public engagement
• Secondments between industry & between university partners
• Team working
• Strong outputs</td>
<td>CHARACTERISTICS
Can do attitude/self-starters

• Team worker
• Multi-tasker
• Independent/Autonomy
• Multidisciplinary
• Flexibility
• Ownership of tasks
• Networking</td>
</tr>
<tr>
<td>SYSTEM FACTORS

• Churn of staff is healthy – don’t keep good PDRAs for too long
• Recruitment is key – starting point
• Competition amongst ECRs is healthy
• ECR should be externally scrutinised
• ECR should be given time
• ECR should be given trust
• Recognise that different people have different career trajectories</td>
</tr>
<tr>
<td>INTERPERSONAL MANAGEMENT

• Honest dialogue & management of expectations
• How do <u>they</u> see their responsibilities
• Performance management
• Encourage them to be critical of prior art & prevailing wisdom</td>
</tr>
</table>

Appendix F – Outputs from Healthcare Technologies

1. **What are the characteristics of a good network?**
    - It takes time to go from working non-interdisciplinary to multi-disciplinary
    - Need to establish a common language and understand each other
    - Working in parallel on problems can be difficult
    - Perception of risk can be different across disciplines
    - Good if network can enable work e.g. pilot studies rather than just workshops
    - Include patients in networks
    - Links to next stage funders for translation
    - Focus on small tasks/objectives
    - People can end up networking with the community they already know
        - Encourage working across communities in the call
    - Good to put people in close proximity to enable cross-working
        - Get people in one place for an extended period of time; 2/3 days and not just talks

2. **How do we ensure that networks are interdisciplinary?**
    - Don't put people off; look at things from the other perspective
    - Need to get people to solve a problem together rather than looking at specific benefits
    - Personalities are key
    - Shared interests – the problem needs to be challenging for everyone
    - Build up; smaller to larger projects
    - Look for prior collaborations
    - Staggered funding; look for evidence
    - Provide topical questions
        - Brings together similar interests
    - Bring a friend
    - Need all bases covered; consultant, clinicians and underpinning science
        - Need the people that understand the protocols
    - Clinical researchers are key, takes a lot of funding to span this area
    - How do you co-author with clinicians?
        - Different style, different narrative
    - Accept from start; need to learn how to work together
    - Show intent; providing equipment/ data
        - Pump priming – could be valuable outputs from relatively small amount of funding
    - Takes a lot of time and work to get into regulatory bodies (MHRA for example).
        - Can EPSRC mediate this relationship? To build a new connection you often need a mutual link
    - Interdisciplinary PhD students
    - Need resources for things other than travel
    - Added value; a network needs it!