

Helping PIs to Prosper: What Might be Learned from PhD Supervision

Catherine Charlwood and Fiona McBride, Prosper Project, University of Liverpool, UK.

fmcbride@liverpool.ac.uk

An article based upon the presentation at the Researcher Education and Development Scholarship Conference 15th October 2020: *What can PIs learn from supervisors and why might it matter?* Catherine Charlwood and Fiona McBride, University of Liverpool

Acknowledgements: The work undertaken here was for Prosper, a postdoctoral career development initiative funded by Research England's Development fund (the RED fund), led by the University of Liverpool in partnership with the University of Manchester and Lancaster University.



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Structured abstract:

Purpose - We wished to understand the differences and similarities between supervisors of PhD students and Principal Investigators (PI) line-managing postdocs. Our focus is the contrasting monitoring of career development support structures and resources available to supervisors (when there are notable gaps for PIs) and to assert what can be translated across from supervisory practice to that of PIs.

Design/methodology/approach - Our approach involved direct focus groups with PIs, using the findings as a lens through which to view and discuss the literature, and existing career development provision for PIs and supervisors.

Findings -

- There is greater emphasis on, and support available to, supervisors of PhD students than there is for PIs as managers of research staff (postdocs) around career development. This is due to factors including institutional interest, monitoring, value, support and visibility which are unequally weighted towards supervisors and PhD students, over PIs and postdocs.
- A number of academic institutions have begun to address the provision of career development resources to better equip PIs to develop their postdocs. This move has been encouraged by recent publications and is valued by PIs themselves.
- Gaps still remain in career development provision as highlighted by our focus groups and there is no structured way for PIs to share best practice around how they manage and develop their postdocs.
- Practical and easily accessible resources are needed and wanted by PIs, regardless of career stage or discipline, to assist them in the career development of their postdocs (akin to the support that supervisors of PhD students receive).

Originality - Prosper addresses this gap in career development resources for PIs managing postdocs through the co-creation of desired materials, such as how to hold a career conversation. Additionally, a PI network has been established to allow the sharing of best practice. These resources will in time become freely accessible, developed for PIs (or managers of researchers) of all career stages and disciplines.

Keywords: PIs; postdocs; Principal Investigator; career development; beyond academia; supervisor; research; researchers; people management

Article classification: Research paper

Introduction: Identity crisis - when is a supervisor a PI and are they people managers?

Prosper is a new approach to career development that unlocks postdocs' potential to thrive in multiple career pathways, many of which are beyond academia and may as yet be unknown to both postdocs and PIs. Funded by Research England, Prosper is based at the University of Liverpool, with project partners in the University of Manchester and Lancaster University. Prosper's third pillar is recognising the role of PIs: understanding the crucial role they play in postdoctoral career development and supporting them in this.

Most people understand that a PhD student has a supervisor – someone to help guide doctoral studies – but what does a postdoc have? A PI is somewhat of an unknown quantity, especially beyond academia, a shadowy Dick Tracy figure too often mistaken for a private investigator rather than the Principal Investigator of research for which PI stands. But even within the academy, the understanding of what a PI is and does is patchy, confused and perhaps ill-conceived. One answer to our opening question 'what does a postdoc have?' would be the role of 'a manager', since a fundamental difference between PhD students and postdocs is that the latter are professionals, employees with a line manager. Yet the management aspect of the PI remains a source of tension, as we explore below.

As a PhD supervisor, there are milestones to hit from your institution and/or funder – the registration or upgrade process (this is when, usually at the end of the first year of the doctorate, progress is formally assessed and the doctoral candidate given the official go-ahead to continue their research project), annual progress reports, and more. Increasingly, there is expert guidance, such as the UK Council for Graduate Education (UKCGE)'s Good Supervisory Practice Framework. But how is the PI – who is often simultaneously a PhD supervisor – to envisage and carry out their role? This article unpacks the PI-postdoc relationship both through analysing the literature and through the direct evidence Prosper has gathered.

Defining terms: What is a PI? What is a postdoc?

While PIs are at the heart of Prosper, many people inside and outside the academy are confused as to exactly what a PI is, and who gets to be a PI. There is little literature on what a PI is and what their role precisely entails (Kidwell, 2012, p.34). The National Science Foundation (NSF) defines a PI as 'the individual designated by the grantee, and approved by NSF, who will be responsible for the scientific or technical direction of the project' (Point h from https://www.nsf.gov/pubs/policydocs/pappguide/nsf10_1/index.jsp#p). The UK Concordat to Support the Career Development of Researchers broadens this definition, defining the role of the PI as the one who 'takes responsibility for the intellectual leadership of the research project, for the overall management of the research and for the management and development of the researchers' (Vitae, 2008, p.5). For this article, we define a PI as typically being a research grant holder, who is often both a supervisor of students and an employer of research staff (postdocs, but also perhaps a project or lab manager, and related technicians) and perhaps also professional services staff (administrators, grant finance managers, or knowledge

transfer officers), who they both manage and lead. PIs may be tenure-tracked, or employed on a permanent contract. It is worth remembering, though, that a PI is specific to a project funded by a time-limited research grant: this is a job title which is contingent on funding, rather than awarded as a permanent job title from your institution, such as Lecturer, or Professor.

So if that is a PI, what exactly is a postdoc? Similar to 'PI', the term 'postdoc' is ill-defined and often misused (Albrecht, 2013, p. 5 and Burke, 2019, p. 331 and p.337). As others have observed, 'it is difficult to capture postdoctoral experience using a simple definition, and any single definition may be inadequate to describe the diverse duties and conditions of postdoctoral work. Postdocs are not students, though training is the manifest function of the postdoctorate. They are not faculty members (postdocs do not necessarily teach or do service), but they are expected to direct academic research projects' (Cantwell, 2010, p.491). For our purposes we define a postdoc as an individual with a PhD, who is employed primarily to work on research and is usually on a short, fixed-term contract. They are a member of staff but occupy a slightly strange space, being no longer a student working towards a qualification, nor a permanent member of University staff.

The difficulty of determining the nature of the postdoc role is a common theme within the literature on postdocs. While this is beyond the scope of this article, it is worth pointing out how often when postdocs are surveyed this sense of homelessness within the university comes up. This lack of a sense of fit or belonging within the university is neatly summarised by a paper co-written by 7 postdocs 'It seems that postdoctoral scholars are viewed as trainees in an ill-defined space between graduate student and full academic. [...] many postdoctoral scholars in our faculty experienced the confining nature of these positions, related to structures outside of their control' (Burke et al., 2019, p.337). In a 2011 survey conducted among postdocs which gathered comments such as 'I am constantly reminded I am not real staff', led the authors to consider that 'many postdocs are not sufficiently linked into the system to take full advantage of professional development and other offerings' (Scaffidi and Berman, 2011, p. 697). Fundamental aspects of postdoc status within the academy are likely contributing to the specific issue of career development support.

Background: What does career development currently look like for postdocs? What can be learned from PhD students' career development?

Unclear or non-obvious would be the straightforward answer to the first question. As members of staff (albeit temporary) postdoc career development doesn't neatly align with tenure-track academics career development, aimed at making them better in their current role, and preparing them for promotion. Postdocs (since they are members of staff), are also usually ineligible to access the institutional career guidance centres available to undergraduate and postgraduate students. As provision for postdoc development neither fits nicely with that for tenured academics nor PGRs where can this fit within an institution?

Postdoc status, and support, has long been debated. In America, this reached an important milestone with the publication of *Enhancing the Postdoctoral Experience for Scientists and Engineers* in 2000 (since updated in *The Postdoctoral Experience Revisited* (2014)). This report notes the benefits of establishing a postdoctoral office so that postdocs have an obvious point of contact on campus and within the broader institution.

Writing about setting up an Office of Postdoctoral Education (OPE) at the University of Alabama at Birmingham (UAB), the authors reveal that it was unclear 'where such a structure should be housed' (Lorden and Matalon, 2002, p. 48). Explaining their decision to house the OPE within UAB's Graduate School, they note that 'many of the problems faced by postdocs are similar to those that graduate students face, although the specifics may differ. For instance, both groups need opportunities for career development and enhancement of professional skills' (Lorden and Matalon, 2002, p. 49). Importantly, they also foreground graduate students' being 'the next generation of postdocs, so we need to give them good advice about their career choices and set the kind of standards they should come to expect' (Lorden and Matalon, 2002, p. 49). This vignette exemplifies how PhD students and postdocs can be usefully co-considered when seeking to improve the lot of postdocs, particularly when it comes to career development. Lorden and Matalon's idea of setting 'standards' at PhD level hints that structures are more firmly in place pre-postdoc, but also that this grounding of expectations has an important effect on the postdoctoral recruitment and experience.

In the UK context, the Concordat to Support the Career Development of Researchers (commonly known as the Researcher Development Concordat) has sought to provide a framework specifically for the support of research staff, as opposed to research students. This living document, last revised in 2019, sets out the standards required for the support of postdocs. Importantly, one of the Concordat's four stakeholder groups with defined responsibilities under the Concordat's Principles is 'managers of researchers'. This is in part to suggest the broader possibilities of who might manage research staff beyond a PI (a Co-investigator, another senior researcher or head of unit), but crucially it privileges the 'direct line management responsibility for researchers' in its definition (Vitae, 2019a, p. 8), reminding PIs of their status as managers through this nomenclature. Each principle set out in the Concordat has a numbered list of responsibilities for each of the four stakeholder groups. However, the Concordat's introduction notes that 'These responsibilities are cast as obligations, given the pressing need to improve standards and to ensure a consistency of experience for our researchers across the UK' (Vitae, 2019a, p. 1). The Concordat, then, seeks to provide part of the answer to the question of what precisely a PI is supposed to do.

Of the Concordat's three principles, the third - 'Professional and Career Development' - is most pertinent to Prosper's aims. The revised Concordat is clear that 'Researchers must be equipped and supported to be adaptable and flexible in an increasingly diverse global research environment and employment market' and that 'researchers pursue a wide range of careers' - not just academic careers (Vitae, 2019a, p. 6). Thus, the emphasis of this principle is around preparation for a breadth of career opportunities, not a single-track pathway of postdoc-to-PI conversion. Indeed, the second responsibility of managers of researchers under this principle is to 'Support researchers in exploring and preparing for a diversity of careers, for example, through the use of mentors and careers professionals, training, and secondments' (Vitae, 2019a, p. 8).

For the first time, the Concordat specifies a time commitment PIs must build in for postdocs' career development: responsibility 4 reads 'Allocate a minimum of 10 days pro rata, per year, for their researchers to engage with professional development, supporting researchers to balance the delivery of their research and their own professional development' (Vitae, 2019a, p. 7). This minimum of 10 days (and it is a minimum, with responsibility 4 noting that managers of researchers must 'Identify opportunities, and allow time (in addition to the 10 days professional development allowance), for their researchers to develop their research identity and broader leadership skills') is being actively promoted to research staff on the ground via individual universities' Researcher Development Teams, Research Staff Associations and postdoc fora. For instance, all University of Liverpool Research Staff Association emails include 'Remember all research staff are entitled to a minimum of 10 days (pro rata) professional and career development per year, as stated in the Statement of Expectations for PIs and Research Staff' in the email signature. Like many institutions, Liverpool has its own 'Statement of Expectations' which dovetails with, and reinforces, their institutional commitments as a signatory of the Concordat (available at https://www.liverpool.ac.uk/intranet/media/livacuk/researcher/documents/Statement_of_Expectations_October_2019.pdf).

From principles to practice - how are PIs practically supporting postdoc career development?

Whilst it is heartening that the expectations of research staff and the managers of research staff are explicitly set out in the Concordat, how this support for development manifests itself for individuals at ground level is unclear. In order to understand exactly how PIs at the University of Liverpool interpret their responsibilities with respect to supporting the career development of their researchers we sought to ask them directly. With co-creation at the heart of Prosper, we held a series of focus groups in January 2020 at the University of Liverpool, with PIs and postdocs respectively. We wanted to hear directly from PIs how they currently support their postdocs' career development and the kinds of resources or support that would help enable them to do this.

These focus groups were advertised by email to all PIs across the University of Liverpool and were non-compulsory [1]. With ten slots available per focus group, and the theme of the sessions being postdoc career development, we thought that we would be inundated by keen postdocs, and have to work hard to encourage PI attendance. We were wrong. While it was hard to fill up the postdoc focus groups and convert registrations to attendance, a total of 28 PIs attended one of the three 60-minute long, face-to-face focus groups. For PIs of the 30 slots available we had 31 PIs register and only 3 failed to attend (93% attendance), whereas for postdocs of the 30 available places 28 registered but 12 failed to attend (53% attendance) .

The PIs who attended came from a range of career stages (from early career new PIs to established Professors) and from each of the three faculties at the University of Liverpool. The breakdown of PI attendees was 10 women, 18 men, and from a faculty perspective was 7 from Humanities and Social Sciences, 11 from Health and Life Sciences and 10 from the Faculty of Science and Engineering. The PIs who volunteered to participate in these focus groups were keenly aware of the plight of postdocs and were deeply invested in wanting to do their best by their researchers. We are indebted to the PIs who attended these focus groups, for their insights and frank and honest discussions of the realities they face in developing their researchers.

A number of themes common across all PIs, regardless of discipline or career stage, arose from these focus groups. PIs told us of the difficulties they have found in being a PI as opposed to being a PhD supervisor (when they hold, or have held, both roles). It became clear that there is guidance for what 'good' PhD progress looks like, but that this is lacking for postdocs, as mentioned in the introduction, through the lack of milestones. PIs also highlighted that annual mandatory performance and development review (PDR) discussions could be used better, to not just review performance in the current role but to discuss career aspirations and development more broadly:

what usually works very well but isn't done often enough, is to use the PDR process. Not in the normal, annual way, but through regular recorded discussions. Where career development is a standing item and where both the supervisor and the postdoc really, together, discuss career pathways from the start, and look into gaps in their training. At a higher level, of course, that's done with PhD students, but for postdocs it's something which is not really done often enough.

Additionally, PDR is arguably a more charged discussion between PI-postdoc than an annual review between supervisor and PhD student, since the postdoc, as an employee, may not feel they are able to openly discuss their desire to leave a contract early as example, for fears it may impact future contracts or references. These issues have been reported elsewhere, exemplified by a postdoc stating 'with my PI, there is this penalty for thinking about going into industry...like, you are dead to me' (Hayter, 2019, p. 563). A lack of career support was highlighted with postdocs being expected to 'figure things out' on their own, as that was the experience the PI had been through (pp. 563-564) and lastly, 'PIs can (...) largely choose not to

prioritize the career goals of postdocs' (p.564). Whilst finding literature focusing directly on the quality of PI-postdoc PDR discussions has proved fruitless, the Postdoctoral Experience Revisited (National Academy of Sciences et al., 2014, p. 3) found that 'there is little evidence that universities and mentors are providing adequate information about and preparation for other types of careers' and also 'postdoctoral researchers need to recognize that a great research investigator is not necessarily equivalent to a great mentor and that many if not more principal investigators or senior research faculty have not received any formal training in mentoring' (National Academy of Sciences et al., 2014, p.7). All of this serves to support our assertion (and that of the PIs in our focus group) that PDR discussions could be used in a better way to assist the career development of postdocs.

Our focus group participants also highlighted that metrics are collected by institutions on PhD success rates but nothing similarly rigorous or coordinated exists for postdocs:

The one main thing, when you've finished your PhD you have the alumni thing that tracks your career after your PhD and everything. When you finish your postdoc, you disappear. That's the main thing. So the uni[versity] can give "76% of our PhDs find a job within six months". It's great, but what about the postdocs? Do they find something, or do they die in a ditch?

While the above is humorous (and raised a laugh), there is a stark truth here that postdocs are not tracked, their progression data is not captured and they are allowed to become invisible. However, these PIs had not only noticed this, but wanted to bring it to our attention. This sentiment is echoed in Cantwell and Lee's paper 'due to their temporary status and varying responsibilities and rights, postdocs tend to be less visible and less studied than students, staff and faculty' (Cantwell, 2010, p. 492). With little tracking data available even now, we continue to be in the position an American article noted in 1999, where 'Few universities can provide a truly accurate count of the number of postdoc fellows on campus' (Nerud and Cerny, 1999, p. 1535).

To summarise, the institutional, embedded support and resources available to PhD students and supervisors, but which do not exist for postdocs and PIs, heightens the need for good PI support to enable postdocs to access and engage with career development opportunities. The fundamental lack of definition around the postdoctoral role continues to be a problem (albeit in very different ways) for postdocs and PIs alike.

The value issue: Who cares if a PI does a good job?

This section title is deliberately provocative. Obviously, there are many people who do care about how PIs conduct themselves, most keenly the postdocs under their line management. First, this section builds on the evidence already presented to indicate how crucially the PI is placed to make a difference in the postdoc experience, then it looks in detail at PIs as managers (and the systematic flaws in PI training within this regard), before turning to the data from a national UK survey to

show that while the career development of postdocs matters to individual PIs, we must do more to embed the value of this at a pan-institutional level. This is in contrast to the PhD student-supervisor relationship, where there is often additional oversight, (such as institutionally-fixed attainment milestones, or secondary supervisors) to address poor practice and act as a safety net. Such checks and balances do not exist for postdocs.

The precarious nature of the postdoc role (fixed-term contracts, a saturated academic job market) makes the importance of the PI perhaps even greater to a postdoc's career outcome than a supervisor's for the PhD student. This is neatly outlined by Hayter and Parker: 'Faculty PIs play a critical role in the postdoc experience. PIs generally recruit and hire postdocs, manage their day-to-day research activities, and have significant influence over their careers' (2019, p. 563).

Hayter and Parker note 'PI factors' as an important influence on postdocs' transitions beyond academia. One postdoc revealed "My PI reluctantly let me attend [a university career development event] but told me that the workload in the lab would not change...I just had to work later at night and on the weekends" (2019, p. 563). This quotation was a few below another postdoc being told in no uncertain terms to stop attending careers events. This gate-keeping of time (which is not necessarily a purposeful block on career development activities) is a common factor cited by postdocs and PIs alike when it comes to balancing the demands of the current project and a projected future. This is why the UK Concordat's 10 days of development training will, we hope, prove to be a powerful mechanism. Recent research may also help to address a persistently reported barrier to both PhD student and postdoc engagement with career development opportunities around the supposed negative effect time away from research may have on output - Brandt et al. (2021) shows data directly refuting this (at least for biomedical PhD students). We hope in time to see similar studies across other disciplinary areas and extended to postdocs. Scaffidi and Berman, though, have already demonstrated through their survey that 'supervisor-postdoc relations have a substantial effect on the experiences and productivity of postdoctoral researchers' (2011, p. 695). Confusingly, they use 'supervisor' to mean 'PI', though this provides an apt demonstration of the terminological difficulties which surround postdocs. The UK Researcher Development Concordat dovetails with many of the recommendations from the League of European Research Universities (LERU)'s position paper on careers of researchers inside and outside academia. Throughout the paper they refer to 'supervisors and principal investigators', acknowledging the similarities between these two positions. However, while there are shared aspects between these senior roles, LERU also keenly assert the disparities between PhD students and postdocs:

Supervisors and principal investigators should support their supervisees in exploring a variety of career pathways [...] Particular attention is needed for the support of postdoctoral researchers, whose numbers are growing in many universities. Their needs are both specific and different from those of doctoral researchers [...] the issues of postdoctoral researchers have not been

addressed as strategically or structurally as those of doctoral researchers.
(LERU, 2018, p. 18)

Arguably, that last sentence is true as a comparison between PIs and supervisors, as we endeavour to evidence. Who is to serve these specific needs, now that they are gaining increased notice?

One recent important step in refashioning the postdoctoral experience was the Broadening Experiences in Scientific Training or BEST program. Between 2013 and 2019 the US National Institutes of Health (NIH) funded 17 different sites running individual, experimental development programs to aid the career development of biomedical trainees. The main point of commonality was that 'institutions were expected to address the dissonance between trainees performing research under the mentorship of their faculty advisor while simultaneously trying to develop the independent competencies needed for entry into a wide range of science careers' (Meyers et al, 2016, p. 509).

Many of the BEST initiatives sought carefully to involve PIs since early on in the process, 'Anecdotal information shared among the consortium membership indicate[d] that faculty concerns (including trainee time away from the laboratory) can lead to resistance' (Meyers et al, 2016, p. 509). Like Prosper's model of co-creation, working with PIs is key to finding an outcome which works for all involved.

What Hayter and Parker term 'information asymmetries' in part accounts for the perceived lack of support for career development beyond academia - how can PIs be expected to know about something they may never have experienced? For the postdoc, though, this can look like a lack of interest in anything other than academia, leading to feelings of failure if they don't 'make it' in academia (Hayter and Parker, 2019, p.566). As LERU's vision on multiple pathways for the careers of researchers' makes clear, 'Supervisors and principal investigators contribute to take away cultural ambivalence about taking up training that appears to take time "away from the lab" and/or is focused on career pathways after academia' (LERU, 2018, p. 23).

The preferential treatment of academic positions, though, stems from a research culture which places a higher value on securing an academic role over anything else. As Hayter and Parker found, 'most postdocs reported that PIs are usually willing to support their candidacy for a tenure track position by writing recommendation letters or making phone calls. This support stems from pride in placing postdocs in academic positions, which also carries high value in the academic world' (2019, p. 564). While PIs may not know how to support candidacy for other roles in the same way, these positions also don't have the same cachet which in turn could lead to a lack of engagement from PIs. Perhaps the least well-known fact is that a postdoc moving to a role beyond academic can in fact be of benefit to the PI:

Ironically, one PI with a record of placing PhD students and postdocs in non-academic positions reported that her relationships with former PhDs and postdocs now working in industry had become an important source of research funding and improved her overall academic performance' (Hayter and Parker, 2019, p. 564)

Prosper has heard similar stories, with one former postdoc case study noting ‘when I left for IBM the funder of my Institute, the BBSRC, saw it really positively because now the Institute had an industrial collaborator’ (Dr Laura-Jayne Gardiner, Prosper prototype portal). These positive stories about the PI benefits which can come from postdoc career development deserve to be more widely-known. Only by changing the value relationship between academia and roles beyond academia can managing postdoctoral career development become a natural and habitual part of a PI’s role.

But often PIs don’t think of themselves – and aren’t institutionally led to think of themselves – as managers. Institutions often offer optional management training to PIs, which adds to the impression that people management is not of primary importance to their role, despite data to the contrary (Van Noorden, 2018, p.296). The slightly nebulous nature of the role leaves both gaps open and missed opportunities to appreciate good work. Indeed, as a young PI quoted in an article about mental health in academia confesses, ‘No one has ever taught me to be a manager. I even went on courses that I thought would teach me, but they didn’t. You have to strike the balance between getting someone to achieve their potential and not stressing them out (Loissel, 2019). Line management skills are not a given, they are taught or acquired by experience. The academic pathway teaches people many things, but management skills is an often-identified gap.

Drawing on the data from a 2018 [Nature survey of 3,200 scientists \(Van Noorden, 2018\)](#), a team of developers note that ‘lab members wanted more principal investigators (PIs) to take training courses in mentoring and management. Interestingly, PIs responded in the same way and wanted more support for mentoring and management’ (Baas et al., 2020, p. 87). This makes sense, continue the authors, because ‘leadership quality is a strong predictor of group productivity and turnover’. This clear evidence of both a need and a desire for increased training led the University of Rochester’s BEST program (URBEST) to develop a specific Leadership and Management for Scientists Course as a mandatory part of their program.

Interestingly, the UK Concordat’s fifth responsibility for managers of research is that they ‘Engage in leadership and management training to enhance their personal effectiveness, and to promote a positive attitude to professional development’ (Vitae, 2019a, p. 8). Obviously, any leadership and management training would have broader benefits than just supporting development, but it is telling that this is how Vitae chose to frame it.

As PIs in Prosper focus groups made clear, there is virtually no training associated with this role. You win your hard-earned grant funding and suddenly you are landed with a variety of new functions – line management, budget responsibilities, administrative workload – the list goes on (Kwok, 2018). In all likelihood, with grant funding so scarce, a PI has probably had to focus far more on refining the research programme and outputs than any of these more functional aspects. When it comes to developing postdocs, as one PI told us honestly, ‘You probably start by doing what happened to you when you were a postdoc in someone else’s group. You know, you

become parents and you treat your kids like you were [treated], which is not necessarily a good thing.'

Academic institutions offering PI-specific training are steadily becoming the norm: examples include Newcastle University's [Principal Investigator Development Programme](#) and the University of Manchester's [Managing at Manchester](#) programme. Developing an attractive management and leadership offering for PIs is not without complexity. Institutions have to strike a careful balance between presenting PIs with the opportunity to develop their management skills, without burdening them with compulsory management or leadership training on top of their already significant workload. The same rule as PhD supervisor training applies: it must appear as an opportunity, rather than as onerous.

The quality of supervisors' oversight and support of PhD students is more closely regulated at research institutions than that of PIs. For example, funders explicitly include career development into their monitoring frameworks for centres for doctoral training, such as EPSRC (point 3.5 on p.6 of <https://epsrc.ukri.org/files/skills/epsrc-monitoring-and-evaluation-framework-for-the-portfolio-of-centres-for-doctoral-training/>). Typically, there are built-in processes and checkpoints in place for PhDs such as the upgrade process, and because doctoral students are still students, there's an institutional interest in keeping a careful eye on the drop-out rate. But where is the metric, the stick or indeed the carrot by which PI behaviour towards their postdocs is measured, curtailed or rewarded?

Of the measures we do have available to study the PI-postdoc relationship, an established metric is the Principal Investigators & Research Leaders Survey (PIRLS), co-ordinated by Vitae. While the PIRLS survey has since been replaced with Culture, Employment and Development in Academic Research Survey (CEDARS), if we look back at the 2019 data from the PIRLS survey (which we presented in PI focus groups to stimulate further discussion) there are some telling statistics [2]. Like a trick of the light, the difference in wording between two questions reveals a lot about the value issue for PIs. When asked to rate their agreement of the statement 'I think that providing career development advice to others on careers outside higher education is very important in being a successful PI/research leader' PIs come out strongly in favour. 25.2% strongly agree with this statement (up from 22.4% in 2017), 47.4% agreeing, and a decrease in the percentage disagreeing (compared with 2017), with scores improved from 2017 (Vitae, 2019b, p.4).

However, when the statement becomes 'My institution recognises and values the contribution I make to providing career development advice to others on careers outside higher education' the picture switches in the wrong direction. A mere 5.5% of respondents 'strongly agree' here, with the highest percentage 35.1 for 'disagree', a 'strongly disagree' up a point to 8.9% from 2017 (Vitae, 2019b, p.3).

We can compare these findings from PIRLS 2019 against Postgraduate Research Experience Survey (PRES) 2019 data around training and development opportunities. Of those postgraduate research students surveyed, 45% received training to develop their transferable skills and 31% received advice on career options. However, perhaps tellingly, 76% received training to develop their *research*

skills. This data suggests that training and development opportunities are offered to and taken seriously by postgraduate research students, yet the difference between training directly related to research and that to transferrable and career options is a concern. Since postdocs fall into neither group surveyed by PIRLS or PRES we must look to Careers in Research Online Survey (CROS) 2019 for comparison. Only 24% of the respondents agreed strongly that they were encouraged to engage in personal and career development, with 12.5% reporting that they spent no days on training or continuing professional development in the previous 12 months. These findings suggest that there is certainly room for improvement regarding encouraging both postgraduate students and postdoctoral staff to engage in development activities.

Prosper wishes to challenge the existing norm that sees a disjoin between personal belief and institutional recognition of the importance of providing career development advice on careers beyond academia. If all the evidence suggests that offering PIs line management training, and valuing and recognising the vital contribution PIs make to postdoctoral career development would benefit postdocs, PIs and institutions alike, then it is high time we started to put these structures in place for all.

A solution: How PIs can Prosper

Becoming a PI takes years of dedication, focus and research excellence. PIs typically have to demonstrate their expertise in their chosen field of study through talks and publications and show their ability to teach. What is often overlooked are the implied skills that come along with that research excellence: being able to lead people, team work, project manage, give and receive feedback constructively, the list goes on. We limit our focus here to how PIs manage their researchers and what support they get to do so.

PIs face time pressures which are unadvertised by the grant proposal process:

“You have this idea that once you are the boss, you can do what you want and whenever you want,” Avasthi recalls thinking when she was a trainee. But once she started her new role as a PI, she quickly found that was not quite the case. Between her current teaching responsibilities, meetings, and other commitments, “this is the least amount of control over my schedule that I’ve ever had,” (Pain, 2018 b).

Placing an expectation on supervisors or PIs to pause and reflect on their supervisory practice is an extra and unrealistic pressure to put them under if it is not well structured and supported. Additionally, as highlighted above, if the quality of the career management of postdocs by PIs is not rewarded or recognised, why would a busy PI find time to prioritise it amongst the myriad of other calls on their time?

Fortunately for those supervising PhD students there are a range of both formal and informal resources available. Informal resources exist for PhD supervisors via social media and blogs, such as Dr Kay Guccione’s Supervising PhDs blog <https://supervisingphds.wordpress.com/>, where, for example, interested supervisors write guest blogs tackling a specific aspect or issue around being a supervisor. To

the best of our knowledge, there is no comparable equivalent for PIs managing postdoctoral researchers.

Examples of formal support for PhD supervisors includes Vitae's Researcher Development Framework (RDF) which has been developed to support researchers throughout their research careers, and is usually first encountered and used at the PhD stage [3]. The British Academy has recently published a report entitled 'Good Practice in Providing Careers Guidance for Postgraduate Research Students' (The British Academy, 2020), which, as with the RDF, has been primarily created for PhD students but can be used with postdocs. As with the informal support we struggled to find an example of formal support resources created specifically for PIs managing postdocs. This is echoed in articles, such as Elizabeth Pain's 2018 'PIs need to help postdocs develop their careers' (Pain, 2018a), which speak of a distinct lack of career support for postdocs from their PIs.

This lack of structured formal guidance or resources for PIs has several knock-on effects. Firstly, PIs who strive to be excellent managers of their research staff are hampered in their efforts: if they cannot easily find quality, practical and achievable guidance around management, competing demands on their time will swiftly relegate this to the bottom of the pile (Perkel, 2015). Additionally, those PIs who have not thought to prioritise their management of their postdocs are not prompted to consider it. Ultimately, the lack of guidance for how PIs manage their postdocs leaves the abiding impression that being a good manager of postdocs is either somehow innate or 'nice to have' rather than being an important factor in conducting research.

The lack of formal or even informal resources for PIs to access regarding how to manage their postdocs results in patchy career support for postdocs. This variable career support can only differ from PI to PI as they mostly suffer from a lack of coherent, consistent support in doing so, rather than a lack of interest. Pain's article may be better retitled as 'PIs need help to help postdocs develop their careers' (Pain, 2018 a): this is the approach Prosper is taking. To this end we have created a suite of initial resources to assist PIs, hosted on our online portal, which includes practical suggestions on how to have a career conversation with their postdoc and also includes PI case studies to foster the sharing of practice and learning from each other. These resources have been created in response to and using advice collected directly from PIs. All of these resources will be tested by both PIs and researcher developers (who work directly with supervisors and PIs) to allow the resources to be refined and improved. The ultimate aim is to have resources which are fit for purpose that have been created with the end users (PIs) from the very start.

A final quote from a PI focus group demonstrates the value of making time for this often-forgotten group of career development stakeholders: 'I know...in academia we tend not to get trained for anything...[it's] literally learning on the job, it's sink or swim, so I think just chatting to other people about the experiences of how you've handled this, or not handled this, potentially could be quite helpful' (January 2020, University of Liverpool). It became clear that there is no established forum or mechanism for PIs across an institution, let alone across several institutions, to share their experiences and best practice of how to be a good PI.

Therefore, in addition to the online resources, Prosper has established a PI network which serves as both a network and an informal community of practice. The meeting format, duration and occurrence of the PI network are all under continuous revision to ensure we are not inadvertently introducing barriers to PI participation. The format of the initial meetings had a theme and invited speaker(s) with time allotted for discussion amongst participants to share their experiences and best practice. Whilst the discussions are not strictly steered, Prosper team facilitators and prompt questions are provided to aid discussion and maintain the focus on the PI support of postdocs. Each meeting of the PI network is captured (the discussions summarised and the talks recorded) and uploaded to the Prosper PI portal pages so that they can be accessed or revisited on-demand. PIs are invited to give feedback after each session which Prosper can then act on to adapt the sessions.

The PI network is in its infancy, with aspirations to become self-sustaining, driven by a group of engaged PIs and open across multiple institutions. To this end, a steering group of PIs has been established and is composed of a small number of PIs from Prosper's partner institutions (University of Liverpool, University of Manchester and Lancaster University). The steering group has been, and will continue to be, consulted for in-depth feedback and input on the topics of the PI network sessions, the occurrence and frequency of the sessions and the format of the meetings. To date, the PI network meetings have not exceeded 60 minutes duration, and happen no more often than monthly. However, we may move to trial a mixture of session lengths, occurring less frequently but with some longer sessions allowing more time for in-depth discussions. The sessions will be monitored and feedback incorporated to ultimately create a PI network working model that serves their audience, and is of use for PIs irrespective of discipline, institutional affiliation or career stage.

Summary: What might PIs learn from supervisors, and why might it matter?

There is significant overlap between being a supervisor and a PI, such that some of the resources created for and used with PhD students can be used effectively with postdocs. PIs may find that clearly setting out defined points and progress markers with their postdocs, akin to the structured approach supervisors take with PhD students, beneficial. Using the compulsory annual PDR more effectively and encouraging career development discussions in addition could also be of use to both PI and postdocs, and is strongly recommended by both national (UK Concordat) and international (LERU's recommendations) policies. Even if PIs recognise they either don't have the time or requisite knowledge to assist a particular researcher's career development aspirations (be it PhD student or postdoc) they could signpost them to someone in their wider network who can.

Not all of the responsibility can lie with the PI, though. PhD supervisors benefit from structures and frameworks to guide their practice, and institutions and organisations should consider how to implement similar, though adapted, mechanisms for PIs. With the global research community increasingly committed to culture change, now is a good time to investigate what might be put in place to support PIs and, as an immediate consequence of this, to help postdocs themselves.

However, there are also significant differences between being a PI overseeing postdocs and a supervisor of PhD students. PIs need to be mindful from supervisors of the differences between PhD students and postdocs - that the former has a much greater degree of structured career management (sometimes even explicitly built into their PhD by their institution or institute) and that their outcomes are monitored. The lack of this structured support for postdocs doesn't mean that career management is now unimportant. Conversely, it is of paramount importance, precisely because it isn't administered, monitored, tracked or explicitly rewarded. PIs should not, however, feel that their postdocs' career development is all on them: their postdoc should be proactive, with the PI providing a supportive coach and signposting function, rather than having all of the answers.

The visibility of postdocs, and as a consequence PIs, needs remembering within universities, but also broader society. In mid-July 2021, the UK Government published its R&D People and Culture Strategy. Aligned with many of Prosper's aims, it states the government's intention to 'provide support for flexible, cross-sector training programmes to encourage more movement & collaboration between academia, industry and the third sector' (2021, p. 6). However, for a document about how to attract, train and retrain people who will perform R&D roles in the UK in both the short- and long-term, it is disturbing that the word 'post-doc' features only twice. By contrast, a 2014 article about postdocs ends 'PDRs' output, employment conditions, and job prospects need to be closely monitored—all the more so given the importance of PDRs' work in research and development for the UK economy' (Felisberti and Sear, 2014, p. 6).

Noticeably, the R&D strategy foregrounds the inclusion of PhD students, promising 'a New Deal for postgraduate research students to attract and retain talented people within the sector and support the flow of people and ideas across the R&D system' (2021, p. 9). While there are welcome changes - such as driving the 'adoption of the 'Résumé for Researchers' narrative CV which broadens the range of experiences and accomplishments that are recognised' (p. 7) - which will indirectly improve the situation for postdocs, they remain indirect. Postdocs, and the PIs who seek to support them, need to move up our collective agenda, so that we can create lasting change for all.

Findings and Next steps

- We held 3 focus groups with a broad cross-section of PIs around how they facilitate the career development of their postdocs.
- The findings from the focus groups were namely: guidance for 'good' progress for PhD students exists but there is no such framework for postdocs; PDR discussions could be better used with postdocs to cover career aspirations and development more broadly; metrics are collected on PhD success rates but there is no equivalent for postdocs (adding to their lack of visibility within institutions); there is little or patchy training for PIs with respect to people management and development; there is no forum for PIs to share best practice with each other on management and leadership.

- These findings were discussed and compared with the literature, with a specific focus on where postdoc career development needs overlap with those of PGRs.
- The anecdotal evidence collected at our focus groups was reflected by the existing literature, supporting our assertion that these challenges around career development are common across PIs, regardless of career stage and discipline.
- There is more emphasis and support available to supervisors of postgraduate research students than there is for PIs as managers of research staff (postdocs) around career development. This is due to factors including institutional interest, monitoring, value, support and visibility which are unequally weighted towards supervisors and PhD students, over PIs and postdocs.
- A number of academic institutions have begun to address the provision of career development resources to better equip PIs to develop their postdocs. This move has been encouraged by recent publications and is valued by PIs themselves.
- This work demonstrated that practical, easy to find and use resources are needed and wanted by PIs, to assist them in the career development of their researchers.

Next steps: Prosper seeks to better understand the gaps and specific needs PIs have in developing, managing and leading their postdocs. We are working directly with PIs and researcher developers to develop, test and revise practical resources that will be fit for purpose for the end users. The established PI network will continue to be monitored, iterated and eventually broadened out to become a fully-functioning forum for the sharing of best practice open to all managers of researchers. Although not Prosper's stated aim, much like Vitae's RDF resources, we hope that these resources will be of broader use and that supervisors may also find them helpful.

[1] Determining exactly who is a PI within a research institution at a given point in time is out of scope for this paper, but this too is another dataset which is difficult to derive. With universities using different HR systems (and thus different codes for staff statuses) and a PI position one determined by grant funding rather than institutional employment (generally), we needed to cross-reference between lists of grant awardees held by the Research, Partnerships and Innovation Directorate (RPI) and HR data. This difficulty in determining who is a PI is also likely impacting training and support being offered to the relevant people within the majority of universities.

[2] CEDARS is the Culture, Employment and Development in Academic Research Survey. CEDARS was developed in 2019 and replaces the long-running Careers in Research Online Survey (CROS) and Principal Investigators & Research Leaders Survey (PIRLS).

[3] Whilst the RDF has been created to support researchers throughout their careers in the CROS 2019 survey 53% of respondents had never heard of the Vitae Researcher Development Framework (RDF), with only 2.2% strongly agreeing that they use the RDF to support their continuing professional development.

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