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Integrated Research Sector: Future Pathways for Emerging Researchers

Authorship statement

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Current career pathways for EMCRs

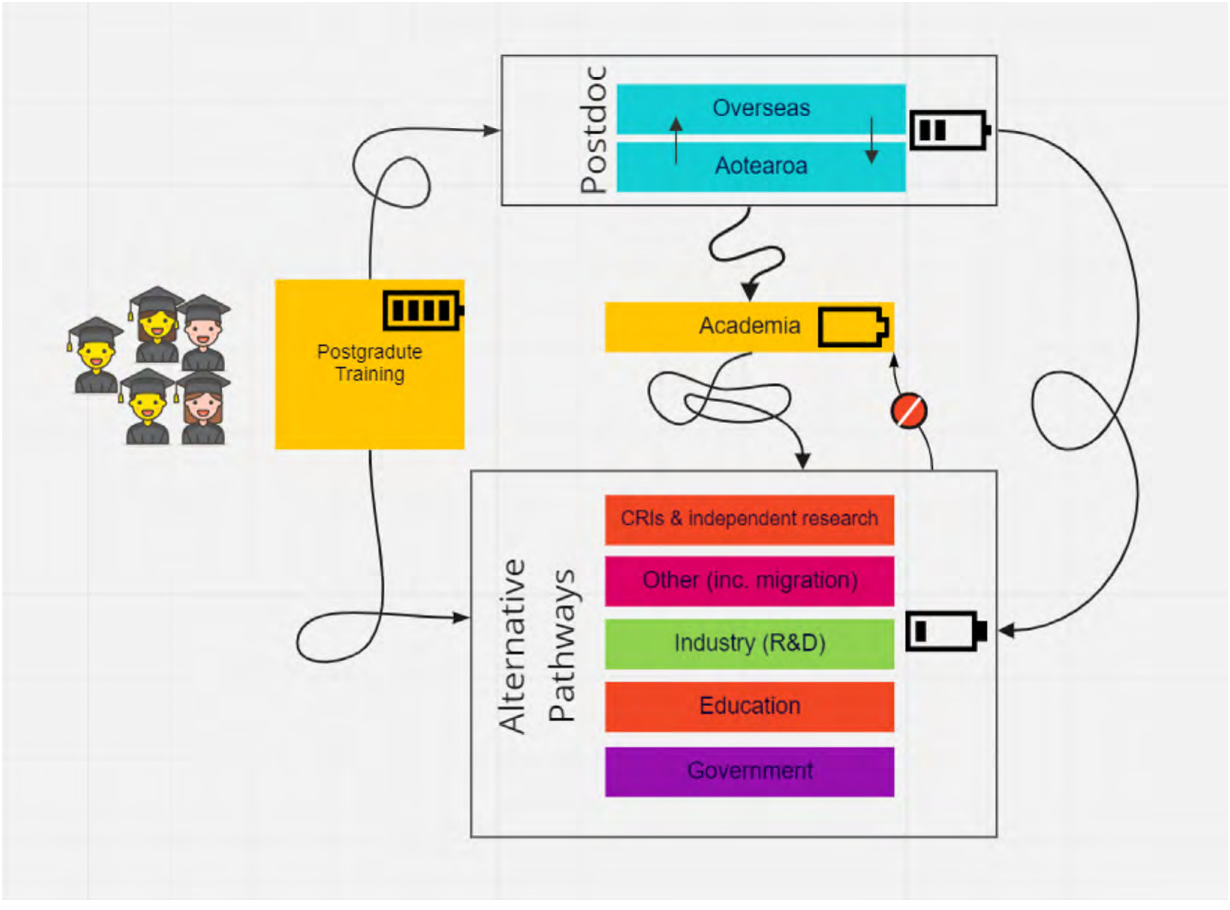

Figure 1 Present State: We use a battery to depict the current levels of availability of research labour. Aotearoa produces many PhDs (full battery). The current pathway for postdocs are limited since there are a limited number of positions available (half battery) and jobs into academia are extremely limited and precarious (empty battery). Alternative pathways from PhD/postdoc exist but are not always obvious. Pathways back into academia are difficult due to prescribed expectations within the academy that don't take into account the diversity and experience gained outside of it (no exit sign). Together, job and funding insecurity and limited awareness of and accessibility of alternative employment decreases ECR wellbeing.

Current challenges

1. Continual expansion of PhD student numbers

- New Zealand universities train thousands of students in postgraduate research-focused degrees annually. In terms of PhD graduates (1,480 in 2019)[1], the number of trainees greatly exceeds available research-centred positions in universities, research institutes and the private sector.
- Although supply has far outstripped demand, New Zealand universities continue to encourage more students to enrol in doctoral programmes. This is driven by well-intentioned government incentives based on the idea that a highly educated population will drive New Zealand's economic growth and prosperity. The government subsidises PhD training via multiple routes including tuition subsidies for both domestic and international students, Performance Based Research Fund (PBRF) incentives, and allowing stipends to be tax-free and exempt from overheads on major grants. There are no such incentives for hiring postdoctoral researchers.

2. Limited jobs for post-PhD (postdocs) in research/academia–jobs are precarious and decrease wellbeing

- While the number of doctoral students has increased, the number of permanent academic and research staff positions has not increased accordingly[2]. In particular, the availability of postdoctoral positions in New Zealand is limited[3]. The now abolished FRST postdoctoral scheme was the main postdoctoral fund. The current remaining RSNZ Rutherford postdoctoral positions are extremely competitive with only 5/6 awarded per year (out of ~ 140 applicants).
- There are large institutional overheads charged on the salaries of postdoctoral researchers. Overheads multiply the cost of including postdoctoral researchers in a grant application by two to five times, such that it is possible to employ many PhD students ($28,000/student)[4] for the cost of one postdoctoral researcher ($78,000/postdoc*overheads)[5]. PhD students are therefore preferred. However concurrently, the number of postdoctoral researchers, who provide much of the hands-on research advice and training to students, has been declining.
- Precarious academic jobs force thousands of talented PhD graduates wanting to contribute to academia/research to leave either the (Universities/CRIs/IRO) sector or the country. For example start-up grants, academic support and salaries can be higher in Australia, with higher pension contributions (up to 17% superannuation in Australia, compared to 3% Kiwisaver in CRIs and up to 6.75% Unisaver in Universities)[6,7]. Losing a key resource for Aotearoa, given their specialised training, impacts on New Zealand's economy, return on government and personal investment[8] and most importantly has the potential to decrease the wellbeing of early and mid-career researchers (EMCR).
- It is not uncommon for appointees to Senior Lecturer positions in research intensive fields such as biomedical sciences to have spent well over 5 years, and sometimes upwards of 10 years on fixed-term contracts covered primarily by soft funding which can place limitations on their creativity and productivity in what should be the most creative time of their career. Research institutes and centres often have very limited core funding for permanent research staff, meaning EMCRs are reliant on soft funding without clear pathways to permanent employment with guaranteed salary cover.

- The 2018 Research, Science and Innovation System Performance report[9] showed that the majority of FTE researchers were employed by CRIs. However, CRI staff numbers over the last decade have not changed significantly.
- Whilst there has been growth in IRO research capacity in the last decade, the 2020 headcount of researchers across IROs was estimated as approximately 1000. Some IRO are medical research and are more likely to employ PhDs whereas others focus on industry development.
- Limited pay transparency laws in NZ mean that it is difficult to gain access to information to compare salaries between jobs, roles and institutions. Organisations tend to hold their information behind closed doors, and while they do provide pay data to some organisations for the purpose of job sizing and market analysis, those organisations charge for the service. It is therefore difficult to comment on potential salary inequities across the system.
- It is difficult for some researchers to move between CRIs because of their specialist nature, while moving into academia is challenging because of the expectation of high publication records and teaching experience, despite other skills and benefits that they will have acquired within their careers.

3. Lack of preparation for diverse career pathways for graduates

- Traditional management of universities, CRIs and other government agencies encourages competition as opposed to collaboration with people who have closely aligned research interests.
- Consequently, PhD training is often monodisciplinary and PhD graduates leave universities potentially without some transdisciplinary skills, advantageous for obtaining jobs beyond academia.
- This includes a lack of training in Te Tiriti o Waitangi, Te Ao Māori and understanding and appreciating mātauranga Māori.
- Without postgraduate training options, many international and other students are not given opportunities to engage with Te Tiriti o Waitangi and Te Ao Māori, making their research less relevant in a New Zealand context.

Recommendations

Reimagining EMCRs career pathways through the lens of future global challenges

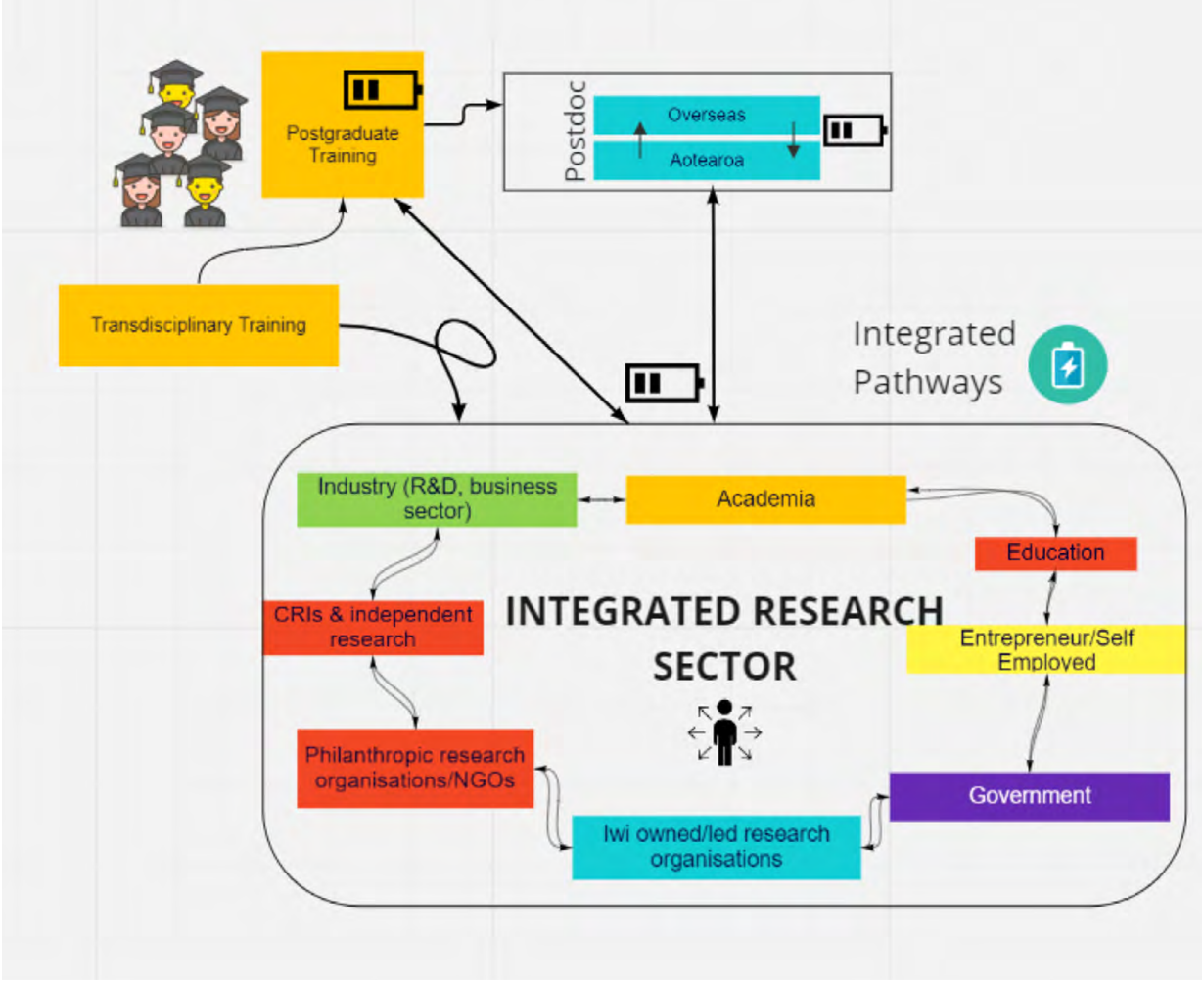

Figure 2 Reimagining EMCR career pathways: Transdisciplinary training is part of postgraduate programmes allowing other skills to be acquired beyond research. There are also fewer PhD students straight from University, as careers within the integrated research sector are attainable following a reimagined research science and innovation (RSI) sector. Those within the sector are able to move more freely within other organisations, sharing and acquiring skillsets that make them more transdisciplinary (reusable battery). The RSI sector is also able to financially support part time postgraduate studies that are targeted towards the organisation's needs rather than academic needs. Wellbeing across the sector increases.

1. Focus on quality of training rather than quantity of students

- Promote transdisciplinary training: train students in transdisciplinary skills, providing them with a unique but wider set of transferable skills that can be applied in a range of job settings.
- Create more collaborative relationships between university staff and those from other sectors including increased institutional connectivity[10]. Examples include:
    1. Joint Graduate School (Partnerships between Universities, CRIs, Independent Research Organisations, Government),
    2. Public sector-wide internship programmes (building on the examples of programmes run by MfE and many CRIs),
    3. Partnership with business/industry/philanthropic organisations/NGOs.[11]
- Reward system from the government (PBRF and other government funding) to incentivise transdisciplinary postgraduate training including PhD and postdoc training
- The integrated research sector also supports PhD and postdoc training by offering financial support and training time to upskill existing staff, creating a more bespoke learning experience that centres on those sector specific needs. This would include supporting CRI and IRO staff with PhDs to supervise PhD students more easily, including through cost recovery for institutes that host students.

2. Reform funding system

- Government funded research programmes should be required to include EMCR roles (i.e. investment in EMCRs becomes an assessment criteria for programme funding).[12] The EMCRs must be integrated in the research in meaningful ways, including plans to support their leadership and development throughout the project and funding to support costs, conferences etc. This must include a balance of PhD and postdocs. Funding pools should be adjusted to ensure appropriate coverage of salaries.
- Government funded research programmes should stipulate that Equity, Diversity and Inclusion (EDI) are key components of successful research, ensure training opportunities are distributed equitably and inclusively, and will inform team members of all relevant training opportunities and funding participation where appropriate.
- Government-funded opportunities targeting EMCRs should enable inclusion of sufficient salary to cover the time of the PI to undertake the project, and all government-funded opportunities should allow salary recovery for key personnel.
- Criteria set by funders needs to recognise the broad value that researchers provide beyond academic peer reviewed articles e.g., community and industry engagement, education, public service, client reports, industry magazine articles etc

Desired/anticipated outcomes and benefits for New Zealand

- Creation of an integrated, highly skilled workforce that prepares for a changeable future.
- A reduction in EMCRs from for example, reduced PhD numbers and/or alternative pathways options relieve competition for a limited number of available jobs.
- Enabling open collaboration, with greater connectivity between the public and private sector.
- More career pathways that lead to a breakdown of traditional PhD career pathways
- Development of more research-led private sector businesses.
- Advantages in productivity and increased return on investment.
- Development of skills to create future leaders.
- Increased holistic wellbeing for EMCRs.

We believe that the design of this "new integrated research sector" (Figure 2) requires input from all organisations as well as EMCRs from across the current sector, including those currently undergoing training, to ensure the identification of the transferrable skills that are required throughout the New Zealand RSI sector. This will need to be adaptable to suit a rapidly changing research environment.

References

1 https://www.educationcounts.govt.nz/statistics/research

2 For example, there is a major disconnect between academic jobs available and PhD students trained in Aotearoa, with 1450 PhDs completed in 2018 alone and no increase in full-time equivalent academic staff employed at universities between 2002 and 2016 (5,700±200 total), see https://www.royalsociety.org.nz/assets/Aotearoa-ECRs-Post-COVID-August-2020.pdf

3 https://www.royalsociety.org.nz/what-we-do/funds-and-opportunities/rutherford-foundation/funding-opportunities/new-zealand-postdoctoral-fellowships/

4 https://www.otago.ac.nz/study/scholarships/database/otago014687.html

5 https://www.otago.ac.nz/humanresources/otago654432.pdf

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8 https://www.educationcounts.govt.nz/publications/80898/do-people-with-doctoral-degrees-get-jobs-in-nz-post-study

9 https://www.mbie.govt.nz/dmsdocument/1499-research-science-and-innovation-system-performance-report-2018

10 https://www.royalsociety.org.nz/assets/Te-Ara-Paerangi-Future-Pathways-Green-Paper-Submission.pdf

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