Tertiary Education Commission
Te Amorangi Mātauranga Matua

Improving Research Quality

The interim results of the PBRF 2018 Quality Evaluation

Authors

The Tertiary Education Commission

Every effort is made to provide accurate and factual content. The TEC, however, cannot accept responsibility for any inadvertent errors or omissions that may occur.

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Foreword

High-quality research is vital to New Zealand's economic growth and our social wellbeing

The Government is taking bold steps to ensure New Zealand is well positioned to take advantage of emerging technologies. As a country we are at the forefront of research that is changing the way we learn, work, collaborate and live – both now and into the future.

New Zealand researchers are developing amazing technological and digital innovations. They are finding answers to global questions in health care, climate change, social justice and beyond. This Kiwi ingenuity, without a doubt, contributes to New Zealand's economic growth and social wellbeing.

That is why we are committed to growing our research capability and supporting curiosity-driven research. Tertiary education supports innovation by connecting the research, expertise of the sector, and skilled graduates with business and communities.

The Performance-Based Research Fund plays an important role in this. The fund recognises the high-quality work of New Zealand researchers by supporting participating tertiary education organisations.

Over the last six years of the fund, we have seen growth in research fields such as engineering, biomedical science and Māori knowledge.

The recognition of Māori research has been a key component of the PBRF since its foundation. It is exciting to see not only growth in research quality for Māori knowledge and development areas but the cross-pollination of Māori world views and methods of research. This is essential to meeting our commitments under Te Tiriti o Waitangi.

I am particularly pleased to see the 2018 evaluation round was significant in elevating Pacific research. Research plays a vital role in sustaining Pacific cultures and communities.

The interim results of the 2018 Quality Evaluation reflect the successes of our tertiary education. Congratulations to the participating organisations and thank you for your steadfast commitment to research excellence.

I would like to recognise those researchers who had their work assessed. Your research, expertise and knowledge in your chosen subject area is important, not only within your tertiary institution, but also your community and New Zealand. I would also like to acknowledge the panellists who ensured the assessment process was robust and fair.

Research excellence requires ongoing reflection and improvement, and because of this the Ministry of Education will undertake a policy review of the fund in 2019. Our vision is for a sustainable and diverse research workforce that recognises all types of quality research activity. We need to commit to a research system that meets the challenges ahead. I look forward to the findings of the review.

Hon Jenny Salesa
Associate Minister of Education

Preface from the Chief Executive

Research is an important part of an enduring and healthy tertiary education sector. It supports innovation, creating and sharing new ideas; all key components for New Zealand's knowledge economy.

The Performance-Based Research Fund has recognised excellent research in the tertiary education sector since it was established in 2002. The fund is one of the largest the Tertiary Education Commission manages, and it reflects the government's long-standing commitment to high-quality research.

The Quality Evaluation process asks national and international researchers to peer review the quality of New Zealand research. In 2018, we held the fourth Quality Evaluation round. The results in this report mark a continuing rise in the research quality of our tertiary education organisations. In the last 15 years, the number of researchers whose Evidence Portfolios have received a funded Quality Category has increased by 66.2% to 7,408.40 (FTE weighted) in 2018.

After four evaluation rounds, it is encouraging to see trends forming, such as the increase in women researchers taking part in the process. Other trends suggest that New Zealand's tertiary education sector has a healthy mix of breadth and depth in research activity. There has also been an increase in the number of researchers working in the fields of science, technology, engineering and mathematics, contributing to New Zealand's economic development.

The 2018 Quality Evaluation experienced a significant milestone by welcoming the inaugural Pacific Research Panel. The panel recognises the growth of this research area in its own right, moving us beyond the Pacific Expert Advisory Group, formed as part of the 2012 Quality Evaluation.

The Tertiary Education Commission is committed to ongoing improvement and learning. With four Quality Evaluation rounds under our belt it is time to change how we report on the results, lifting our focus to highlight what the results tell us about our research system. In doing so, we aim to make the reporting more accessible and meaningful to a wider audience. We hope you enjoy the end products.

Many people within the tertiary education sector contributed to the 2018 Quality Evaluation. I'd like to recognise: the Sector Reference Group for refining this round, the Principal Moderator and Deputy Moderators, and our panellists of top academics and subject-matter experts from New Zealand and overseas.

Finally, I would like to thank the 36 tertiary education organisations and 8,269 researchers for taking part in the 2018 Quality Evaluation and their continued commitment to research excellence.

Tim Fowler, Chief Executive
Tertiary Education Commission
Te Amorangi Mātauranga Matua

Executive summary

In 2018, 36 tertiary education organisations (TEOs) participated in the fourth Performance-Based Research Fund (PBRF) Quality Evaluation.

The periodic Quality Evaluation is one of the country's biggest research assessment exercises and informs the funding allocation of 55% of the PBRF (just over $1 billion during the six-year funding period).

Based on the results of the 2018 Quality Evaluation, universities will receive the bulk (95.7%) of PBRF Quality Evaluation funding in 2019. Outside of the university subsector, Unitec New Zealand is the only TEO that will receive greater than 1.0% of the total funding available through the PBRF.

However, funding is only part of the story. As in previous rounds, results from the 2018 Quality Evaluation show a further increase in research quality across the tertiary education sector (see Table 1).

In 2018, the Evidence Portfolios (EPs) of 55.9% of PBRF-eligible staff were an A or B[1] Quality Category – compared with 53.3% in 2012. Between 2012 and 2018 the number of EPs awarded an A Quality Category increased by 39.9%, while growth in the number of EPs awarded a B Quality Category increased by 17.5%.

Table 1: Distribution of funded Quality Categories over time

QUALITY CATEGORY	2003		2006		2012		2018	
	% (FTE weighted)	# (FTE weighted)	% (FTE weighted)	# (FTE weighted)	% (FTE weighted)	# (FTE weighted)	% (FTE weighted)	# (FTE weighted)
A	9.5%	424.55	11.0%	599.75	13.2%	835.83	15.8%	1,168.52
B	38.5%	1,716.06	37.9%	2,063.55	40.1%	2,531.92	40.2%	2,974.66
C	52.0%	2,320.90	36.8%	2,003.08	32.0%	2,020.24	29.1%	2,155.52
C(NE)	-	-	14.4%	782.99	14.7%	925.19	15.0%	1,109.70
TOTAL		4,461.51		5,449.37		6,313.18		7,408.40
A + B	48.0%	2,140.61	48.9%	2,663.30	53.3%	3,367.75	55.9%	4,143.18
A (universities only)	9.5%	423.55	11.0%	597.15	13.2%	832.33	15.6%	1,158.62

In the university subsector, the total percentage of EPs awarded an A Quality Category increased from 13.2% in 2012 to 15.6% in 2018. Across the non-university subsector[2] there was an increase in the number EPs awarded funded Quality Categories, indicating growing research activity amongst staff.

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[1] A and B Quality Categories are the two highest Quality Categories awarded. See page 11 for a description of each Quality Category.

[2] The non-university subsector includes institutes of technology and polytechnics (ITPs), private training establishments (PTEs) and wānanga.

The 2018 Quality Evaluation brought several new TEOs into the process. There was a 33.3% increase in participation, from 27 in 2012 to 36 organisations in 2018, highlighting emerging research cultures across several non-university TEOs.

Because this is the fourth Quality Evaluation, in this report we will discuss trends in areas of research and research quality. For example, there has been noticeable growth in certain areas with the Medicine and Public Health Panel and Māori Knowledge and Development Panel[3] recording the largest percentage increases in funded Quality Categories.

The subject areas with the greatest increase in total funded Quality Categories were Biomedical (64.5%), Nursing (40.0%), and Engineering and Technology (33.1%). The increase in the number of EPs awarded funded Quality Categories in STEM (science, technology, engineering and mathematics) subjects over the last six years should help to support wider government priorities in science, research and innovation across the tertiary education system.

The 2018 Quality Evaluation saw the introduction of the Pacific Research Panel. The establishment of this panel recognises the vital role of Pacific-based research methodologies and methods. It also acknowledges the importance of Pacific-centred subject matters in increasing research quality and contributions to the research environment.

For the first time in the 15-year history of the PBRF Quality Evaluation, we will publish information on researcher demographics and look at sector-wide trends. For example, the 2018 Quality Evaluation saw greater gender parity, with women making up 42.9% of researchers whose EPs were awarded funded Quality Categories up from 38.8% in 2012.

We encourage you to read this report to learn more about how participating TEOs performed in the 2018 Quality Evaluation. In general, through the 2018 Quality Evaluation process the data sets indicate that the tertiary education sector remains committed to maintaining and fostering research excellence. In addition, the results suggest that the PBRF continues to serve as an incentive to encourage and reward quality research.

Key information for the 2018 Quality Evaluation

›   Thirty-six TEOs participated in 2018 compared with 27 TEOs in 2012. Participating TEOs in 2018 included 14 institutes of technology and polytechnics (ITPs), 12 private training establishments (PTEs), all eight universities, and two wānanga.

›   Funded Quality Categories were awarded to 7,408.40[4] staff EPs [5].

›   The number of researchers whose EPs were awarded a funded Quality Category increased by 66.2% between 2003 and 2018 from 4,461.51 to 7,408.40.

›   In 2018, the EPs of 55.9% of researchers were awarded an A or a B Quality Category – compared with 53.3% in 2012. Between 2012 and 2018 the percentage of researcher

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[3] Three panels, Education, Māori Knowledge and Development, and Pacific Research, do not have separately defined subject areas. For the purposes of this report we have only discussed observations and trends for these three at the panel level; subject area results exclude them.

[4] Unless otherwise stated, all staff numbers in this report are full-time equivalent (FTE) weighted.

[5] An EP contains information on a staff member's research and research-related activities produced during the Quality Evaluation assessment period (for the 2018 Quality Evaluation the assessment period was 1 January 2012 to 31 December 2017). EPs are submitted to the TEC and then assessed by peer-review panels.

       EPs awarded an A Quality Category increased by 39.8%, while the percentage of researcher EPs awarded a B Quality Category increased by 17.5%.

› The number of EPs awarded A and B Quality Categories by the Māori Knowledge and Development Panel in 2018 was 85.24. This is an increase of 30.39 A and B Quality Categories from 2012, suggesting an increasing concentration of staff engaged in high-quality research.

› The inaugural Pacific Research Panel awarded funded Quality Categories to 54.61 EPs. Of these, over half (53.7%) were awarded an A or B Quality Category.

› Universities will receive the bulk (96.7%) of total PBRF funding in 2019. By component this includes: 95.7% of Quality Evaluation funding; 97.0% of Research Degree Completion (RDC) funding; and 99.2% of External Research Income (ERI) funding. Outside of the university subsector, Unitec New Zealand is the only non-university TEO to receive greater than 1.0% of the total funding available through the PBRF (as was the case in the 2012 Quality Evaluation).

› The University of Auckland (29.8%) and the University of Otago (19.8%) dominate the overall funding allocations, showing significant levels of achievement in all three components of the PBRF. These two universities will receive 48.4% of Quality Evaluation funding, 47.1% of RDC funding and 56.2% of ERI funding.

› For the 2018 round, we are reporting on two average quality intensity measures[6]: the AQS(S), which shows the intensity of research at each TEO relative to their staffing numbers; and the AQS(E), which looks at the intensity of research relative to postgraduate equivalent full-time student (EFTS) numbers. The average result for the AQS(S) for all participating TEOs was 7.15. This increased to 22.60 when you look at just the universities. The average AQS(E) result for all participating TEOs in 2018 was 0.64. This compares with 0.61 in 2012 and 0.57 in 2006[7]. This indicates an increase in postgraduate study that is informed by research.

Researcher participation

Between the 2012 and 2018 Quality Evaluations there was noticeable growth in participation across certain panels and subject areas. The Medicine and Public Health Panel and Māori Knowledge and Development Panel had the largest percentage increases in EPs that received funded Quality Categories, up 40.8% and 39.0% from 2012, respectively.

The subject areas with the greatest increase in total funded Quality Categories were Biomedical (64.5%), Nursing (40.0%), and Engineering and Technology (33.1%). This is partially the result of the high number of new staff who participated for the first time in 2018.

Of the 8,269 researchers (not FTE weighted) who participated in the 2018 Quality Evaluation, 4,738 also participated in the 2012 Quality Evaluation. Of these, 58.0% had no change in their Quality Category, 33.6% increased their Quality Category, and a small percentage (8.4%) decreased. There were 3,531 researchers (not FTE weighted) who

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[6] For additional information on how AQS(S) and AQS(E) were calculated see Appendix 2 or the *PBRF Guidelines for TEOs participating in the 2018 Quality Evaluation* on the TEC's website: https://moetec.cwp.govt.nz/assets/Forms-templates-and-guides/a7c29b5b70/PBRF-TEO-guidelines-April-2018.pdf

[7] Slight changes were made to the AQS(E) formula in 2018. We have recalculated all previous years based on the 2018 formula and some figures reported in 2012 will have changed.

entered the system for the first time in 2018, and 2,597 researchers who participated in 2012 but did not participate in 2018. The largest percentage of exiting staff were awarded a C Quality Category in 2012 (32.0%) and the smallest percentage were awarded an A Quality Category (9.1%).

Insights in researcher profiles:

› The 2018 Quality Evaluation witnessed greater gender parity, with 3,180.13 (42.9%) women researchers receiving funded Quality Categories, up from 2,449.53 (38.8%) in 2012. Women researchers were awarded slightly more of the C(NE) Quality Category with men more likely to receive an A or B Quality Category.

› There was a modest increase in new and emerging researchers. There were 1,315.41 new and emerging staff who received a funded Quality Category in the 2018 Quality Evaluation, or 17.8% of the total. While most of these researchers received a C(NE) Quality Category, 7.3% were awarded an A or B Quality Category.

› The percentage of researchers who identified as Asian (11%), Māori (4.8%), Middle Eastern/Latin American/African (3.0%), and Pacific (1.4%) in 2018 increased from the 2012 figures of 7.9%, 3.7%, 0.9% and 1.3%, respectively[8].

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[8] In the 2012 and 2018 Quality Evaluations the percentage of researchers who did not state an ethnicity was the second largest percentage behind European; 15.9% in 2012 and 16.6% in 2018.

Key Information infographic

36 TEOs participated in 2018 compared with **27** TEOs in 2012

2 wānanga
8 universities
12 PTEs
14 ITPs

Funded Quality Categories awarded to **7,408.40** staff EPs

↑**66.2%** in researchers awarded a funded Quality Category between 2003 and 2018

→ 4,461.51 to 7,408.40

Pacific Research Panel established with funded Quality Categories awarded to **54.61** EPs, **53.7%** awarded an A or B Quality Category

55.9% of researcher EPs awarded **A** or **B** Quality Categories – compared with **53.3%** in 2012

Māori Knowledge and Development awarded **85.24** EPs with A and B Quality Categories, an increase of **30.39** from 2012

↑**39.8%** in researcher EPs awarded an **A** Quality Category between 2012 and 2018

↑**17.5%** in researcher EPs awarded a **B** Quality Category between 2012 and 2018

96.7% The amount of total PBRF funding received by universities in 2019

Unitec New Zealand is the only non-university TEO to receive **greater than 1.0%** of total funding available through the PBRF

The University of Auckland and the University of Otago together receive **48.4%** of Quality Evaluation funding, **47.1%** of RDC funding and **56.2%** of ERI funding.

7.15 Average result for the **AQS(S)** for all participating TEOs. AQS(S) shows the intensity of research at each TEO relative to their staffing numbers.

Background

The Performance-Based Research Fund (PBRF) is designed to encourage and reward excellent research in New Zealand's degree-granting organisations.

The fund was introduced in 2002 to replace a system that funded research relative to the number of learners.[9] Taking from international examples, the fund combines peer-based assessment with performance indicators. The fund has three components[10]:

› Quality Evaluation (55%) – held periodically (typically every six years), funding is determined by peer evaluation of individual research portfolios (referred to as Evidence Portfolios or EPs).

› Research Degree Completion (RDC) (25%) – measured annually, funding is based on the number of postgraduate degrees completed at a participating TEO.

› External Research Income (ERI) (20%) – measured annually, funding is based on the amount of external funding received for research purposes.

After the inaugural Quality Evaluation round in 2003, there was a partial round in 2006[11] and full rounds in 2012 and 2018.

As set out in the initial funding determination, the PBRF's purpose is to increase the quality of New Zealand research by rewarding and encouraging research excellence. In this context, excellence is defined as delivering on multiple activities:

› the production and creation of leading-edge knowledge

› the application of that knowledge

› the dissemination of that knowledge to students and the wider community

› supporting current and potential colleagues in the creation, application and dissemination of knowledge.

Funding is awarded in bulk to TEOs based on their previous six years' performance. TEOs determine how they will use the funding received through the PBRF and include this information in their Investment Plan, which is monitored by the TEC.

The PBRF is intended to support the growth of research capability across a wide range of subject areas. The introduction of the Pacific Research Panel was a significant milestone for the fund. It moves beyond the Pacific Expert Advisory Group established for the 2012 round and recognises the vital role Pacific-based research methodologies and methods play in New Zealand research.

Funding allocated through the Quality Evaluation component is based on peer assessment of EPs across 13 panels and 43 subject areas. On page 11 we provide a description for each Quality Category. These descriptors are used by the peer-review panels to assess and award a Quality Category to each EP. Two of the Quality Categories, R and R(NE), are not funded. We do not report on unfunded EPs, so the totals discussed do not include these.

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[9] An equivalent full-time student (EFTS)-based top-up system.

[10] For additional information on how each component is calculated, see the *PBRF User Manual* available on the TEC's website: https://moetec.cwp.govt.nz/assets/Forms-templates-and-guides/8844b9fea9/PBRF-user-manual-November-2016-2.pdf

[11] This meant that TEOs were not required to submit EPs for most PBRF-eligible staff, and the Quality Categories awarded in 2003 could, in most cases, be "carried over" to the 2006 Quality Evaluation.

What are the Quality Categories?

Quality Categories are awarded to each PBRF-eligible staff EP. Quality Categories A, B, C and C(NE) are funded Quality Categories and are reported on by the TEC. Quality Categories R and R(NE) are not funded and are not reported on by the TEC.

Quality Category A:
› expected to contain evidence of research outputs of a world-class standard
› research-related activity that shows a high level of peer recognition and esteem within the relevant research subject area
› indicates a significant contribution to the New Zealand and/or international research environments
› may also show evidence of other significant demonstrable impact.

Can be awarded to the EPs of all PBRF-eligible staff members including new and emerging.

Quality Category B:
› expected to contain evidence of research outputs of a high quality
› research-related activity that shows acquired recognition by peers for their research at least at a national level
› indicates a contribution to the research environment beyond their institution, and/or significant contribution within their institution
› may also show evidence of other significant demonstrable impact.

Can be awarded to the EPs of all PBRF-eligible staff members including new and emerging.

Quality Category C:
› expected to contain evidence of quality-assured research outputs
› research-related activity that shows some peer recognition for their research
› indicates contribution to the research environment within their institution or the wider community during the assessment period.

Can be awarded to the EPs of all PBRF-eligible staff members except new and emerging.

Quality Category C(NE):
› expected to contain evidence of quality-assured research outputs produced during the assessment period
› may have limited or no research-related activity in the research contribution component.

Can be awarded to the EPs of new and emerging researchers only.

Quality Category R:
› does not demonstrate the quality standard required for a C Quality Category or higher.

Can be awarded to the EPs of all PBRF-eligible staff members except new and emerging.

Quality Category R(NE):
› does not demonstrate the quality standard required for a C(NE) Quality Category or higher.

Can be awarded to the EPs of new and emerging researchers only.

Policy and operational changes

Over the last 15 years, there have been several reviews of the PBRF policy and operational settings. These reviews were designed to consider the fund's evolution and to make improvements over its lifespan.

After the 2012 Quality Evaluation, the Ministry of Education undertook such a review. This resulted in several changes to the fund. The following is not an exhaustive list (for a more comprehensive list see the *Project Report: PBRF 2018 Quality Evaluation*):

› combining the Contribution to the Research Environment and Peer Esteem components into a single component – Research Contribution

› establishing a new panel for Pacific research

› introducing a weighting of 2 (rather than 1) for new and emerging researchers who receive a C(NE) for funding

› reporting only on intensity measures using two average quality score (AQS) measures – AQS(S), which is based on the total number of teaching staff; and AQS(E), which is based on the number of EFTS that a TEO delivers at postgraduate-degree level or higher.[12]

Reporting the results

With policy changes made for the 2018 Quality Evaluation, including amendments to the fund's aims and AQS measures, and the historical data available from previous rounds, we felt it timely to examine and improve upon reporting. As an initial step, we reviewed how we approached reporting on previous Quality Evaluations. Through this process, we identified two primary drivers for a change in approach:

› changes to reporting on AQS measures, with AQS(E) and AQS(S) being intensity not true quality measures, and the limitation of the AQS(S) not being comparable over time

› previous reports providing limited analysis of what results meant to the overarching aims of the fund.

It was decided that a new approach was necessary; one that focused more on the growth of quality research in New Zealand, as evidenced by funded Quality Categories, and less on the AQS measures as determinants of quality.

The objectives of the TEC's reporting of the 2018 results are:

› to give meaning to the outcomes

› to provide value to the sector

› to make the results accessible to a wide audience.

To achieve these objectives, this report is enhanced by additional outputs. All reporting outputs and their audiences are described in Table 2.

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[12] The formulae for calculating the two average quality scores have changed from 2012. The use of a three-year average for the AQS(S) makes comparisons between years impossible, as we did not collect that data prior to the 2018 round. Only minor changes have been made to the AQS(E) denominator, making it possible to recalculate this measurement for previous Quality Evaluation rounds.

Table 2: Reporting publications for the 2018 Quality Evaluation

OUTPUT	DESCRIPTION	TEOs ONLY	TEOs AND PUBLIC
Improving Research Quality: The interim results of the PBRF 2018 Quality Evaluation	**Presents the interim results of the PBRF 2018 Quality Evaluation and provides analysis and background**		√
Report of the Moderation Panel and the Peer-Review Panels	Overview of the process each panel undertook, and some analysis of the results within a panel context		√
Project Report: PBRF 2018 Quality Evaluation	Outlines the process the TEC undertook to implement the 2018 Quality Evaluation		√
KPMG Performance-Based Research Fund Audit Report	Independent assurance that the Guidelines have been consistently and correctly applied		√
Quality Evaluation results and demographics applications available via Ngā Kete	Allows TEOs to analyse their results through the TEC's Ngā Kete platform. There are two: 1. Quality Evaluation (PBRF) – Final Results 2. Quality Evaluation (PBRF) – Researcher Demographics	√	
Quality Evaluation results interactive charts	Allows the public to view high-level results of individual TEOs, subsectors and the whole sector		√
Infographics	Overview of the results by subsector and across the four Quality Evaluation rounds (2003, 2006, 2012 and 2018)		√
Data visualisations	Traces knowledge pathways by looking at researcher collaboration and the reach of research outputs		√

Assessing research quality

One of the aims of the PBRF is to increase the quality of basic and applied research at New Zealand's degree-granting organisations.

To better understand how the outcomes of the Quality Evaluation deliver on this, we asked ourselves: *What do the 2018 Quality Evaluation results tell us about the quality of research produced in New Zealand over the last six years?*

We know that the EPs submitted by TEOs on behalf of their eligible staff typically only represent the best of a researcher's outputs within a set period (for the 2018 Quality Evaluation this was the previous six-year period from 1 January 2012 to 31 December 2017), and thus, do not represent a complete picture of research activity across New Zealand. However, the results offer an important window into the variety of knowledge created, applied, and disseminated within the New Zealand research ecosystem.

Overall, the 2018 results show an increase in average research quality compared to the 2012 round. The total number of funded Quality Categories awarded increased from 6,313.18[13] in 2012 to 7,408.40 in 2018. There was also a 23.0% increase in the number of A and B Quality Categories awarded between 2012 (3,367.75 EPs) and 2018 (4,143.18 EPs). In 2018, the EPs of 55.9% of PBRF-eligible staff were awarded an A or B Quality Category compared with 53.3% in 2012.

The number of researcher EPs awarded a C(NE) Quality Category increased from 14.7% in 2012 to 15.0% in 2018. In general, the total number of new and emerging researchers[14] increased only marginally, signalling that the increased funding weighting of 2 may not have had a significant impact on TEOs taking on early career researchers, or submitting EPs for these researchers. We will expand on this in more detail in the next section where we discuss the research workforce.

Results by subsector

The results suggest that TEOs continue to focus on investing in and driving high-quality research outputs and contributions to maintain and, in some instances, to grow their existing PBRF funding. The 2018 Quality Evaluation brought additional TEOs into the process. There was a 33.3% increase in participation, from 27 in 2012 to 36 in 2018, highlighting emerging research cultures developing across several non-university organisations.

The University of Auckland and the University of Otago had the largest number of funded Quality Categories awarded of all participating TEOs. Applying a non-university lens, Unitec New Zealand (ITP), Whitecliffe College of Arts and Design (PTE) and Te Whare Wānanga o Awanuiārangi (wānanga) had the largest number of funded Quality Categories in their respective subsectors.

Universities

Universities continue to produce the largest percentage of EPs awarded an A Quality Category. The total percentage of researcher EPs awarded an A Quality Category increased from 13.2% in 2012 to 15.6% in 2018. These results are expected given the role of universities within the

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[13] Unless otherwise stated, the funded Quality Category numbers are FTE weighted and represented to two decimal places.

[14] In 2006, a new assessment pathway was introduced for new and emerging researchers, which made provision for such researchers to be assessed against specific criteria. These criteria recognised that new and emerging researchers were unlikely to have had an opportunity to develop extensive evidence of research contributions.

system: to meet international standards of research and teaching, be repositories of knowledge and expertise, and act as a critic and conscience of society.

While the University of Auckland and the University of Otago submitted and received funding for the largest number of EPs awarded funded Quality Categories, several other universities also increased their number of EPs awarded funded Quality Categories. Auckland University of Technology increased their total number of funded EPs by 60.5%, from 429.47 in 2012 to 689.23 in 2018. Compared with the number of funded EPs from Auckland University of Technology in 2003 (135.87), that is a 408.7% increase over 15 years. This is the largest percentage growth in the number of EPs awarded funded Quality Categories across the university subsector.

Victoria University of Wellington also increased its number of funded EPs by 34.8% from 641.54 in 2012 to 864.57 in 2018.

The results of the 2018 Quality Evaluation suggest that universities remained focused on maintaining or increasing the number of researchers whose EPs received A or B Quality Categories. Intuitively this makes sense, given the higher funding weighting attached to these EPs. However, the lower percentage of EPs awarded C and C(NE) Quality Categories, 26.7% and 14.3% respectively, relative to other subsectors could indicate a future workforce issue as the researchers who received A or B Quality Categories begin to retire.

University researcher EPs that received an **A** Quality Category increased from **13.2%** in 2012 to **15.6%** in 2018

The University of Auckland and the University of Otago had the largest number of funded Quality Categories awarded of all participating TEOs

↑**60.5%** Auckland University of Technology increased total number of funded EPs between 2012 and 2018 → 429.47 to 689.23

The table below shows the distribution of funded Quality Categories by university in alphabetical order.

Table 3: Distribution of funded Quality Categories by university

TEO NAME	A (FTE)	B (FTE)	C (FTE)	C(NE) (FTE)	TOTAL
Auckland University of Technology	47.50	251.63	265.29	124.81	**689.23**
Lincoln University	22.00	74.70	57.25	22.58	**176.53**
Massey University	131.07	419.61	375.14	88.77	**1,014.59**
University of Auckland	390.64	733.63	343.30	276.60	**1,744.17**
University of Canterbury	105.56	256.38	124.12	110.40	**596.46**
University of Otago	228.67	555.69	347.66	225.63	**1,357.65**
University of Waikato	60.26	203.05	116.05	49.11	**428.47**
Victoria University of Wellington	172.92	399.51	204.46	87.68	**864.57**
TOTAL	**1,158.62**	**2,894.02**	**1,833.27**	**985.58**	**6,871.67**

Institutes of technology and polytechnics

The number of ITPs that participated in 2018 increased compared with 2012, from 10 in 2012 to 14 in 2018.

The number of EPs awarded funded Quality Categories has increased over each Quality Evaluation for this subsector. There was a 26.5% increase in EPs awarded a B Quality Category and a 28.9% increase in EPs awarded a C Quality Category between 2012 and 2018. The number of researcher EPs awarded a C(NE) Quality Category went from 58.09 in 2012 to 94.79 in 2018, a 63.2% increase.

The distribution of B and C Quality Categories suggests a focus on supporting a research culture and the subsector's contribution to regional and local communities.

↑**26.5%** in EPs awarded a **B** Quality Category between 2012 and 2018

↑**63.2%** in the number of researcher EPs awarded a C(NE) Quality Category between 2012 and 2018 → 58.09 to 94.79

↑**28.9%** in EPs awarded a **C** Quality Category between 2012 and 2018

The table below shows the distribution of funded Quality Categories by ITP in alphabetical order.

Table 4: Distribution of funded Quality Categories by ITP

TEO NAME	A (FTE)	B (FTE)	C (FTE)	C(NE) (FTE)	TOTAL
Ara Institute of Canterbury	0.64	3.00	26.36	10.31	**40.31**
Eastern Institute of Technology	1.96	6.63	21.88	3.33	**33.80**
Manukau Institute of Technology	1.30	4.42	12.35	4.87	**22.94**
Nelson Marlborough Institute of Technology	-	1.99	6.93	3.00	**11.92**
NorthTec	-	-	4.30	-	**4.30**
Open Polytechnic	-	-	8.23	5.00	**13.23**
Otago Polytechnic	-	9.07	39.32	11.97	**60.36**
Toi Ohomai Institute of Technology	-	4.00	16.63	6.00	**26.63**
Unitec New Zealand	5.00	23.77	70.44	16.40	**115.61**
Universal College of Learning	-	0.80	5.20	5.50	**11.50**
Waikato Institute of Technology	-	3.00	27.30	17.40	**47.70**
Wellington Institute of Technology	-	1.00	7.57	6.00	**14.57**
Western Institute of Technology at Taranaki	-	0.58	1.00	0.96	**2.54**
Whitireia Community Polytechnic	-	5.60	16.46	4.05	**26.11**
TOTAL	**8.9**	**63.86**	**263.97**	**94.79**	**431.52**

Private training establishments

The number of PTEs that participated in 2018 increased compared with 2012, from eight in 2012 to 12 in 2018[15], a 50.0% increase.

↑**320.0%** in EPs awarded a **B** Quality Category between 2012 and 2018

↑**37.4%** in the **C** Quality Category between 2012 and 2018

↑**115.6%** in EPs awarded a **C(NE)** Quality Category between 2012 and 2018

The number of EPs awarded funded Quality Categories has increased over each Quality Evaluation. Most of the growth has been in EPs awarded B or C(NE) Quality Categories between 2012 and 2018, a 320.0% and a 115.6% increase, respectively. The distribution of B and C(NE) Quality Categories suggests an existing cohort of researchers balanced with new and emerging researchers.

There was also a more modest increase in the C Quality Category, up 37.4%. In the 2018 Quality Evaluation one PTE researcher achieved an A Quality Category; a first for the subsector and an indicator that the subsector continues to build a research culture.

The table below shows the distribution of funded Quality Categories by PTE in alphabetical order.

Table 5: Distribution of funded Quality Categories by PTE

TEO NAME	A (FTE)	B (FTE)	C (FTE)	C(NE) (FTE)	TOTAL
Auckland Institute of Studies	-	1.00	5.00	2.00	**8.00**
Bethlehem Tertiary Institute	-	1.00	3.00	1.00	**5.00**
Carey Baptist College	1.00	-	4.80	1.00	**6.80**
Good Shepherd College – Te Hepara Pai	-	-	4.00	1.00	**5.00**
ICL Business School	-	-	1.20	1.00	**2.20**
IPU New Zealand	-	-	2.31	2.00	**4.31**
Laidlaw College Incorporated	-	2.00	4.65	1.53	**8.18**
Media Design School	-	1.00	1.00	6.00	**8.00**
New Zealand College of Chiropractic	-	3.00	0.85	2.80	**6.65**
New Zealand Tertiary College	-	-	1.00	-	**1.00**
Whitecliffe College of Arts and Design	-	4.60	9.14	-	**13.74**
TOTAL	**1.00**	**12.6**	**36.95**	**18.33**	**68.88**

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[15] One PTE that participated did not receive any funded Quality Categories.

Wānanga

Two wānanga participated in 2018 compared with one in 2012.

Overall, the total number of EPs awarded funded Quality Categories increased between 2012 and 2018. Most of the growth was in the C(NE) Quality Category, up from 1.00 in 2012 to 11.00 in 2018. The number of EPs awarded B and C Quality Categories also increased, up 33.3% and 204.7%, respectively.

While these increases reflect a relatively small number of EPs awarded funded Quality Categories, it is an important indicator of a growing research culture.

↑**33.3%** in EPs awarded a **B** Quality Category between 2012 and 2018

2 wānanga participated in 2018 compared with one in 2012

↑**204.7%** in EPs awarded a **C** Quality Category between 2012 and 2018

The table below shows the distribution of funded Quality Categories by wānanga in alphabetical order.

Table 6: Distribution of funded Quality Categories by wānanga

TEO NAME	A (FTE)	B (FTE)	C (FTE)	C(NE) (FTE)	TOTAL
Te Wānanga o Aotearoa	-	1.00	6.00	11.00	**18.00**
Te Whare Wānanga o Awanuiārangi	-	3.00	15.33	-	**18.33**
TOTAL	**-**	**4.00**	**21.33**	**11.00**	**36.33**

Results by panels and subject areas

In all but two panels, there has been a growth in funded Quality Categories between 2012 and 2018. The panels with the largest percentage growth were Medicine and Public Health, up 40.8%, and Māori Knowledge and Development, up 39.0%. In Māori Knowledge and Development there was a marked increase in the percentage of A and B Quality Categories, up 55.4% from 2012 to 2018. While Medicine and Public Health saw growth in all funded Quality Categories, the most pronounced were C and C(NE) Quality Categories, with 62.9% and 49.1% increases, respectively.

Panels with largest percentage growth

↑**40.8%** Medicine and Public Health

↑**39.0%** Māori Knowledge and Development

↑**55.4%** increase in the percentage of **A** and **B** Quality Categories in **Māori Knowledge and Development**

Government priorities for tertiary provision and research funding, like the National Science Challenges, have focused on growing certain sectors, specifically those with high skills demand

like STEM (science, technology, engineering and mathematics) and primary industries. The PBRF helps to support these priorities by enhancing research capability. Looking at panels that assess research in these fields – Biological Sciences; Engineering, Technology and Architecture; Mathematics, Information Sciences and Technology; and Physical Sciences – these saw increases of funded Quality Categories of 3.6%, 28.3%, 14.0%, and 20.4%, respectively.

These panels also tend to be the ones that assess the greatest proportion of applied research.[16] The Quality Evaluation does not distinguish between pure and applied research for the purposes of assessment, which makes drawing conclusions about the quality of applied research difficult. Based on a review of the field of research within the EPs submitted, research that could have an application outside of academia continues to come out of the areas assessed by the Engineering, Technology and Architecture Panel and the Biological Sciences Panel. The Mathematics, Information Sciences and Technology Panel and Physical Sciences Panel also had EPs that included applied research, particularly in the Statistics subject area.

It is important to note the milestone of establishing the first Pacific Research Panel. The panel is an acknowledgement of the vital role research plays in sustaining Pacific cultures and communities while developing Pacific research capability. This focus aligns with the TEC's effort to lift achievement for Pacific learners, growing the knowledge produced by and for Pacific communities. The panel's overall distribution of funded Quality Categories reflects the quality that exists within the field: 10.3% of researcher EPs were awarded an A Quality Category, 43.4% of researcher EPs were awarded a B Quality Category, 28.9% of researcher EPs were awarded a C Quality Category, and 17.4% of researcher EPs were awarded a C(NE) Quality Category.

At the subject-area level, the largest number of EPs awarded funded Quality Categories were in Engineering and Technology (582.94); Biomedical (471.78); and Computer Science, Information Technology, Information Sciences (332.99). All experienced overall growth in funded Quality Categories: Engineering and Technology was up 33.1%; Biomedical was up 64.5%; and Computer Science, Information Technology, Information Sciences was up 22.4%. The growth in Biomedical was also a factor in the overall increase in funded Quality Categories in the Medicine and Public Health Panel.

Largest number of EPs awarded at subject-area level

↑33.1%
Engineering and Technology (582.94)

↑64.5%
Biomedical (471.78)

↑22.4%
Computer Science, Information Technology, Information Sciences (332.99)

The subject areas with the greatest concentration of EPs awarded an A Quality Category were Philosophy (28.7%); Psychology (28.2%); and Pure and Applied Mathematics (28.1%). The *Report of the Moderation and Peer-Review Panels* provides additional detail on why these subject areas are high performers, but all these subject areas increased their overall percentage of researcher EPs awarded an A Quality Category compared with 2012. Philosophy; Psychology; and Pure and Applied Mathematics were already in the top five high-performing

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[16] The definition of applied research has been limited to research that seemed to have a direct application to industry in the STEM subjects. We acknowledge this is a limited application of the term and there are likely to be subject areas that would be of an applied nature.

subject areas in 2012. While Sport and Exercise Science; Music, Literary Arts and Other Arts; and Earth Sciences were not in the top three of subject areas with the greatest concentration of researcher EPs awarded an A Quality Category, it is worth noting their marked growth in the percentage of EPs awarded an A Quality Category between 2012 and 2018, with a 250.0%, 173.5%, and 171.1% increase, respectively.

Looking at subject areas with a large growth in percentage of researcher EPs awarded the C(NE) Quality Category, Nursing experienced a 177.1% increase, up from 5.55 in 2012 to 15.38 in 2018. This was followed by Biomedical; Computer Science, Information Technology, Information Sciences; and Communications, Journalism and Media Studies with increases of 99.1%, 78.8%, and 75.0%, respectively.

Results by demographics

Previous reports on the Quality Evaluation have not included the distribution of funded Quality Categories by demographics, specifically gender, ethnicity and age. Changes to our reporting framework provided an opportunity for us to review older data sets and ensure these were robust and accurate. As part of this work, we were interested in better understanding typical researcher profiles.

Our analysis shows the typical New Zealand researcher who participated in the 2018 Quality Evaluation was European (60.9%), male (56.6%), not new and emerging (82.2%), and between 40 and 49 years of age (28.5%) followed closely by those between 50 and 59 years of age (27.7%).

The demographics change slightly when we break this down by funded Quality Category. Looking at researchers who received an A Quality Category, in general, these were men (68.3%). Limiting ethnicity to those stated, the majority were European (69.2%) followed by Asian (6.0%). The average age shifted slightly for these researchers to the 50 to 59 range (37.9%).

Researchers whose EPs received B or C Quality Categories in 2018 had a similar profile to the researchers who received an A Quality Category: the majority were European men. For the C Quality Category, the gender distribution evened out with 51.6% men and 48.8% women. There was also an inverse relationship with age: the largest percentage of researchers who received a B Quality Category were younger (aged 40 to 49) relative to researchers who received a C Quality Category (aged 50 to 59).

For new and emerging researchers, the primary changes were in relation to gender and age. For the C(NE) Quality Category, women (53.7%) overtook men (44.6%) and the age range shifted to those aged 30 to 39 (59.1%). This aligns with the intention of the new and emerging category: to recognise staff who are just out of doctoral or postdoctoral study, or moving from industry, and producing quality research but may not yet have the depth of contributions to the research environment.

Research contributions

The assessment of research quality is about more than just the production of outputs. It speaks to a more holistic understanding of the role of research and its impact on academia and society. The Research Contribution component of an EP acknowledges this and describes the contribution and recognition of a researcher or their research-related activities inside and outside of academia.

As noted in the *Background* section, the Research Contribution component replaced and expanded upon the Peer Esteem and Contribution to the Research Environment components

of EPs in previous Quality Evaluation rounds. The following section explores this component and makes observations about how this is linked to the awarding of funded Quality Categories.

It also seeks to explore the two new research contribution types introduced for the 2018 Quality Evaluation:

› outreach and engagement

› uptake and impact.

The outreach and engagement contribution type reflects the contribution researchers make to the wider community in New Zealand and internationally through their research-based expertise. The uptake and impact contribution type provides an indication of the contribution the research made outside of academia.

Impact has increasingly become a focus of performance-based research systems. The most well-known example is the Research Excellence Framework (REF) in the United Kingdom. They introduced the assessment of impact case studies in the 2014 REF, which accounted for 20% of the overall results and was designed to assess the reach and significance of the impact. More recently, the Australian Research Council introduced an Engagement and Impact assessment, which was run concurrently with their 2018 Excellence in Research Australia round. While the 2018 Quality Evaluation did not go this far in its introduction of uptake and impact, we were interested in gaining insights into the frequency of uptake and impact by panel and subject area.

Contribution types

Across the EPs submitted, 98,190 research contributions were assessed. The three most frequent research contribution types[17] were: reviewing, refereeing, judging evaluating and examining (14.9%); contribution to research discipline and environment (13.2%); and facilitation, networking and collaboration (11.7%). Conversely, EPs were less likely to include the following contribution types: other evidence of research contribution (2.5%); researcher development (3.7%); and uptake and impact (4.1%). An examination of the uptake and impact examples submitted suggests that researchers and TEOs interpreted the meaning of this type in different ways. This is perhaps unsurprising given the newness of the type and also because the meaning of impact can vary across disciplines.

Across the two new contribution types, EPs included 7,784 outreach and engagement and 3,997 uptake and impact research contributions. The following table is broken down by the two new contribution types and the percentage of these within each panel's EPs.

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[17] For more information on what each research contribution type entails, see page 82 of the *Guidelines for tertiary education organisations participating in the 2018 Quality Evaluation*.

Table 7: Outreach and engagement (%) and uptake and impact (%) by panel

PANEL	OUTREACH AND ENGAGEMENT (%)	UPTAKE AND IMPACT (%)
Biological Sciences	8.3%	3.9%
Business and Economics	7.8%	4.2%
Creative and Performing Arts	9.8%	2.9%
Education	6.3%	4.1%
Engineering, Technology and Architecture	6.1%	5.6%
Health	7.4%	4.4%
Humanities and Law	8.9%	4.1%
Māori Knowledge and Development	10.1%	3.8%
Mathematical and Information Sciences and Technology	4.9%	2.7%
Medicine and Public Health	8.3%	4.1%
Pacific Research	11.1%	3.4%
Physical Sciences	7.8%	4.1%
Social Sciences and Other Cultural/Social Studies	9.5%	4.1%

As outlined above, the Māori Knowledge and Development Panel and Pacific Research Panel had the largest percentages of the outreach and engagement contribution type across the panels. The key activities associated with this contribution type include community engagement, contribution to public understanding, being the critic and conscience of society, and helping to foster debate.

Much of the outreach and engagement included public speaking engagements on radio and television and online dissemination channels, such as blog posts. While public outlets were frequently cited, researchers also cited being expert witnesses or subject-matter experts for government agencies and helping to inform new policy initiatives or programmes. Often the descriptions note that as researchers they were being asked to translate their research into digestible and relatable chunks of information to ensure accessibility to end users and the public.

The panels with the largest percentage of the uptake and impact contribution type were Engineering, Technology and Architecture; Health; and Business and Economics. This would seem to align with the outputs of these panels, with a focus on the uptake of research by industry, commercialisation, technology and knowledge transfer and the improvement of existing practices, policies, businesses processes or products.

Using the Business and Economics Panel as an example, a general theme across the panel's uptake and impact was a focus on influencing policy and its implementation, particularly within the field of marketing. Most frequently this was done through commissioned reports, briefings or research that were acted upon by the government. This work also included reports or consultancy practices on process improvements for businesses.

Profile of funded Quality Categories

To be awarded an A or B Quality Category, researchers need to show more than just high-quality research outputs. Outputs need to be complemented by strong evidence of research contribution, with peer esteem and contribution to the research environment expected to inform these descriptions. This is affirmed by the expectations outlined in the *Guidelines for*

the 2018 Quality Evaluation assessment process, which note that, to obtain a high score, strong and consistent evidence of both peer esteem and contributions to the research environment would normally be expected. Strong and consistent examples of community or end-user impact also contribute to a high score, although it was not expected that all researchers will have, or include, such examples.

Given the newness of the outreach and engagement contribution type and the uptake and impact contribution type, it was not required that each EP would include one or both types. All contributions were considered on their merit, with no one research contribution (out of a maximum of 15) determining the component score or overall Quality Category. However, we thought it would be interesting to examine these new types in more detail.

In the following section we make a few observations on researcher EPs awarded funded Quality Categories that included community or end-user impact.

Community and end-user impact
Research is often seen as inaccessible or mysterious; knowledge that is produced by academics, for academics. Yet when we turn on our televisions or read the news, we are quite likely to see an academic commenting on an area relating to their research expertise. In doing so, they are being asked to take complex information and distil it into language those of us without advanced degrees in these subject areas can understand. Increasingly, these same academics are being assessed not just on what they produce, be it journal articles or conference papers, but on how they disseminate their knowledge and how their research is helping to transform our everyday environments, communities or businesses.

The profile of an EP awarded an A Quality Category that included one or both impact types ranged across panels. Limiting the discussion to panels that had the greatest percentage of community or end-user impact types – Māori Knowledge and Development; Pacific Research; Creative and Performing Arts; Engineering, Technology and Architecture; Health; and Business and Economics – the following themes emerged:

› commenting on issues of cultural, political, creative, medical or environmental significance, both domestically and internationally

› influencing public discourse or changing common practices

› increasing public awareness about a topic of significance or emerging importance, including working directly with public, community or international groups

› engaging with industry, businesses or government to improve standards, guidelines or policies

› commercialising research outputs to enable technological innovation and human advancement, and generating IP and revenue

› working to improve people's quality of life in terms of government laws, products, and medical innovations.

Frequently, the descriptions provided had an international reach, engaging with or influencing people, processes or organisations outside of New Zealand. Focus on national topics often affected indigenous or Pacific peoples and sought to improve rights, policies, recognition and wellbeing. The contributions were often high profile, exhibiting the researcher's level of expertise and typically the high esteem in which they are held by their colleagues or wider communities.

Similar themes emerged from EPs that were awarded B and C Quality Categories; however, these contributions were often on a national or local level. By no means less important, the

difference was often about the size and scale of the outreach and impact. A small number of these EPs also confused the impact of research for end users with impact factors, or the number of times a research article had been cited. While citation rates are important in relation to the reach and dissemination of research, it does not give a complete picture as to how the research has impact beyond academia.

A much smaller number of EPs awarded a C(NE) Quality Category included community and end-user impact. This is not surprising given new and emerging researchers are not expected to provide any evidence of research contributions to receive this funded Quality Category.

It is interesting to note that EPs submitted to the Engineering, Technology and Architecture Panel and the Health Panel were more likely to include these two contribution types than the other four panels discussed in this section. Almost one-third of the EPs with these contributions submitted to four panels – Engineering, Technology and Architecture; Health; Māori Knowledge and Development; and Pacific Research. This could indicate a degree of integration or indication of importance of these contribution types to teaching and learning covered by the panels.

Growing the research workforce

The sustainability and enhancement of research quality is dependent upon having an emergent research workforce. As older researchers move through the system and retire, it is important that younger researchers are entering the system to begin and establish their academic careers.

Recent research undertaken by Buckle and Creedy (2018) on the evolution of quality as measured by the PBRF[18], argues that the growth in quality through the Quality Evaluation is unsustainable. Their findings are based on a detailed analysis of the 2003, 2006 and 2012 results, using anonymised data from the TEC, and echo the findings of the 2012 PBRF review[19].

Buckle and Creedy draw on multiple factors to inform their finding. Mainly, the research workforce is ageing, influenced by an increase in the average age of entrants and fewer exiting from the older age groups. The authors noted that these factors, combined with often-preferential recruitment of researchers who have previously had an EP awarded an A or B Quality Category by the larger universities and a low exit rate for these researchers means there may not be enough younger researchers entering and moving up through the system to see increases in quality in future rounds.

Researcher participation in the Quality Evaluation between 2012 and 2018 would appear to support this trend. The number of researchers who participated in both rounds was 4,738. The total number of researchers who participated in 2012 but did not participate in 2018 was 2,597. The largest percentage of exiting staff were awarded a C Quality Category in 2012 (32.0%) and the smallest percentage were those awarded an A Quality Category (9.1%). Of the 4,738 returning researchers, 11.1% of researchers awarded an A Quality Category remained in that Quality Category, 11.3% of researchers increased to an A Quality Category, and none decreased. For researchers awarded a B Quality Category, the profile showed a larger percentage of those who had no change or increased, 25.3% and 18.8%, respectively. In total, approximately two-thirds of returning researchers received an A or B Quality Category in 2018, which was either the same Quality Category or an increase from 2012.

This report will not attempt to further corroborate or refute these findings. However, we have drawn attention to this because we have seen only a small increase in new and emerging entrants between 2012 and 2018. This would suggest that participating TEOs place more tactical emphasis on achieving a high number of researchers who receive A or B Quality Categories to maintain or increase their funding. This practice could be supplanting efforts to grow their research workforce. The Ministry of Education's upcoming review of the PBRF will examine this in more detail.

Researchers by panel and subject area

As noted in the *Results by demographics* section, the largest percentage of researchers awarded an A Quality Category were in the 50 to 59 age range. When you look across all the age ranges, however, 65.7% were aged 50 or older, with 27.8% aged 60 or over. Looking at the

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[18] See Robert A. Buckle & John Creedy (2018) The evolution of research quality in New Zealand universities as measured by the performance-based research fund process, New Zealand Economic Papers, DOI: 10.1080/00779954.2018.1429486

[19] Reference to workforce issues was noted in the Cabinet changes made after the 2012 PBRF review. See the Ministry of Education's website for more: http://www.education.govt.nz/assets/Documents/Further-education/Policies-and-strategies/Performance-based-research-fund/PBRFCabinetPaper.pdf

distribution of researcher EPs awarded an A Quality Category by age at the subject-area level, the top three with a high percentage of those aged 60 and over were:

› Clinical Medicine – 53.0%

› Accounting and Finance – 50.0%

› Public Health – 47.5%.

Limiting this analysis to the three subject areas with the highest percentage of researchers awarded an A Quality Category, 26.2% of staff in Psychology were 60 and over, 24.9% in Philosophy, and 23.5% in Pure and Applied Mathematics. While the retirement age is flexible, and academics often continue to produce research beyond 65, potentially a quarter of the researchers awarded an A Quality Category in these three subject areas could be retired for any subsequent round.

Turning our attention to the age of staff who achieved a B Quality Category, as noted above the largest age range was 40 to 49, a slightly younger cohort compared to the researchers whose EPs were awarded an A Quality Category. In 2018, only 18.9% of the researchers whose EPs were awarded a B Quality Category were 60 years or older. Nursing (41.9%) and Foreign Languages and Linguistics (32.4%) had an older cohort of researchers (60+) relative to other subject areas[20].

Like the researchers awarded an A Quality Category, those awarded a C Quality Category were a slightly older cohort, with the largest percentage in the 50 to 59 age range (31.5%). However, unlike the researchers awarded an A Quality Category, only 54.6% were aged 50 or older, with a greater percentage of researchers aged 30 to 39 (15.8%). Looking at the distribution of the EPs awarded a C Quality Category by age at the subject level, three subject areas had no researchers under the age of 40: Pharmacy; Philosophy; and Religious Studies and Theology. On the other hand, eight subject areas included those aged 20 to 29: Accounting and Finance; Chemistry; Ecology, Evolution and Behaviour; Engineering and Technology; Management, Human Resources, Industrial Relations, International Business and Other Business; Marketing and Tourism; Music, Literary Arts and Other Arts; and Physics. It is assumed that the younger cohort already had previous research experience and thus they did not meet the definition for the new and emerging category.

While the researcher profile for 2018 does highlight an ageing population, particularly for those whose EPs were awarded the A Quality Category, there were also panels and subject areas that buck the trend. Returning to the inaugural Pacific Research Panel, researchers who submitted to this panel had a younger profile: 35.7% awarded an A Quality Category, 33.8% awarded a B Quality Category and 25.3% awarded a C Quality Category were between the ages of 40 and 49. For researchers awarded a C(NE) Quality Category, 52.6% were between 30 and 39 years of age.

In terms of gender, the Pacific Research Panel had a much higher proportion of women than men – 71.1%. This holds across all funded Quality Categories for that panel. Unsurprisingly, most researchers who submitted to the panel identified as Pacific (71.8%), followed by not stated (11.7%) and European (9.2%). This profile was mirrored across the Māori Knowledge and Development Panel, which had a larger percentage of women (58.0%) than men (42.0%), and most of the researchers identified as Māori (88.6%). These trends are important in terms of increasing parity and creating a more diverse research environment.

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[20] At a panel level, Education had a large percentage of researchers awarded a B Quality Category who were 60 and over, 36.2%.

Researcher profiles

While the above analysis examined demographics by panel or subject area, we will now take a closer look at how specific demographics are represented in the Quality Evaluation.

Māori researchers

While the commentary above looked at researchers who submitted to panels, noting those who focus on Māori and Pacific research methodologies and paradigms, we will now look at the distribution of Māori researchers across subject areas. Overall, Māori researchers in the 2018 Quality Evaluation made up 4.8% of researchers whose EPs were awarded a funded Quality Category, an increase from 3.7% in 2012. Of these, 15.0% were new and emerging researchers, 55.2% were women, and 39.3% were aged between 40 and 49.

Māori new and emerging researchers were mainly awarded a C(NE) Quality Category with 14.4% awarded a B Quality Category. Of the 15.0% of new and emerging researchers, they tended to submit in the following subject areas:

› Other Health Studies (including Rehabilitation Therapies)

› Accounting and Finance

› Molecular, Cellular and Whole Organism Biology

› Biomedical.

Looking at the distribution of funded Quality Categories across subject areas (excluding Māori Knowledge and Development), overall, Māori researchers received the largest percentage of funded Quality Categories in Visual Arts and Crafts (12.4%); Public Health (8.8%); and Music, Literary Arts and Other Arts (6.9%). Comparatively, this mirrors the 2012 result where: Visual Arts and Crafts (10.5%) and Public Health (7.1%) had the largest percentages.

The largest percentage of researchers awarded an A Quality Category who identified as Māori were in the following subject areas: Visual Arts and Crafts (32.9%); Architecture, Design, Planning, Surveying (10.9%); and Pharmacy and Music, Literary Arts and Other Arts (both 8.8%).

The distribution of Māori researchers by subject area shifts when you look at the B Quality Category. Visual Arts and Crafts (13.5%) remains high, but Public Health (13.2%) and Human Geography (10.2%) also have relatively high proportions.

Pacific researchers

Pacific researchers made up 1.4% of researchers whose EPs were awarded a funded Quality Category, up from 1.3% in 2012. Of these, 21.3% were new and emerging researchers, 60.1% were women, and 33.8% were aged between 40 and 49.

Pacific new and emerging researchers were mainly awarded a C(NE) Quality Category with 16.7% awarded a B Quality Category. Of the 21.3% of new and emerging researchers, they tended to submit across the following subject areas:

› Communications, Journalism and Media Studies

› Chemistry

› Clinical Medicine

› Law

› Marketing and Tourism.

Looking at the distribution of funded Quality Categories across subject areas (excluding Pacific Research), overall, Pacific researchers received the largest percentage of funded Quality Categories in Public Health (3.9%); Pure and Applied Mathematics (2.5%); and Sociology, Social Policy, Social Work, Criminology and Gender Studies (2.4%). Comparatively, this mirrors the 2012 result where Public Health (6.9%) and Sociology, Social Policy, Social Work, Criminology and Gender Studies (3.8%) had the largest percentages.
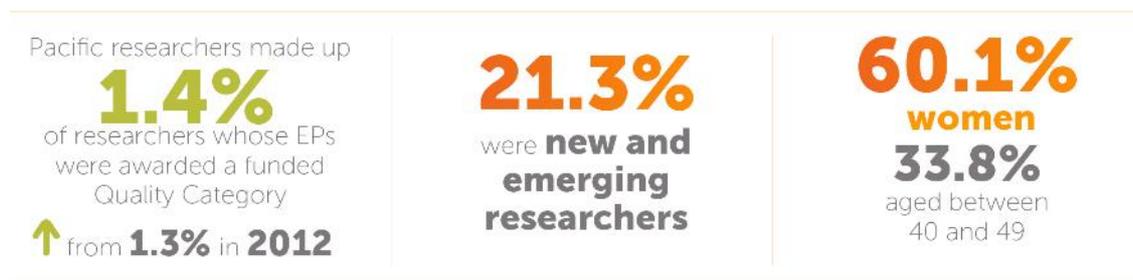
The subject areas with the largest percentage of Pacific researchers whose EPs were awarded an A Quality Category were Agriculture and Other Applied Biological Sciences (5.1%); History, History of Art, Classics and Curatorial Studies (3.3%); and Pure and Applied Mathematics (2.9%).

The distribution of Pacific researchers by subject area shifts when you look at the B Quality Category. Economics (3.4%) was followed by Visual Arts and Crafts (3.3%) and Political Science, International Relations and Public Policy (3.1%).

Gender

As noted above, the gap has closed between the percentage of men and women participating in the Quality Evaluation – 42.9% women, 56.6% men and 0.5% other[21]. This compares with 38.8% of women and 61.0% of men in 2012. Overall, women were awarded fewer A, B and C Quality Categories than men. However, in 2018, women represented more C(NE) researchers (53.7%) than men (44.6%). These figures align with research conducted by Ann Brower, et. al. on gender and the PBRF. The research, which is currently under review for publication, shows that across the previous three Quality Evaluation rounds, women were more likely to be Lecturers and Senior Lecturers and more likely to be awarded C and C(NE) Quality Categories than their male counterparts. The inverse also appears to be true, Professors were more likely to be awarded an A Quality Category and more likely to be male. The authors argue that this appears to largely be the result of recruitment, promotion and retention practices across TEOs,

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[21] The 2018 Quality Evaluation is the first time we have offered "Other" as a category for gender.

and will continue unless something is done to address women's underrepresentation in academia and some fields of research.

Participation in the 2018 Quality Evaluation

42.9% women ↑ from **38.8%** in **2012**

56.6% men ↓ from **61.0%** in **2012**

0.5% other

Examining the gender distribution of new and emerging researchers across subject areas a number of trends can be observed. New and emerging women researchers dominated in Veterinary Studies and Large Animal Science (100%); Nursing (87.8%); and Dentistry (75.4%). While there was a larger percentage of new and emerging men in Physics (79.3%); Engineering and Technology (78.2%); and Pure and Applied Mathematics (76.9%).

Looking at the distribution of funded Quality Categories across subject areas, EPs of men researchers were more likely to be awarded a funded Quality Category in Engineering and Technology (86.3%); Physics (84.7%); and Pure and Applied Mathematics (82.9%). EPs of women researchers[22] were more likely to be awarded a funded Quality Category in Nursing (83.4%); Other Health Studies (including Rehabilitation Therapies) (68.8%); and Public Health (64.6%).

The subject areas with the largest percentage of men researcher EPs awarded an A Quality Category were Religious Studies and Theology (100%); Economics (94.9%); and Accounting and Finance (92.9%). Women researcher EPs awarded an A Quality Category dominated in Foreign Languages and Linguistics (60.3%); Anthropology and Archaeology (57.4%); and Visual Arts and Crafts (56.1%).

The distribution of gender by subject area shifts when you look at the researchers whose EPs were awarded a B Quality Category. Pacific Research (79.7%); Nursing (73.8%); and Other Health Studies (including Rehabilitation Therapies) (68.0%) were greatest for women, while Engineering and Technology (89.8%); Physics (89.6%); and Pure and Applied Mathematics (86.0%) were greatest for men. The dominance of men in the STEM[23] subjects persists. However, the results of 2018 show an increase from 2012 in women achieving funded Quality Categories in these subjects – a 26.1% increase between 2012 and 2018, and a 157.1% increase since 2003.

New and emerging researchers

As noted in the previous section, the number of new and emerging researchers increased between 2012 and 2018, up from 1,122.05 to 1,315.41. However, the overall percentage of new and emerging remained at 17.8% overall.

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[22] At the panel level, Pacific Research and Education also had a high percentage of women researchers, 71.1% and 69.4%, respectively.

[23] For the purpose of this report, STEM subjects were defined as Architecture, Design, Planning, Surveying; Agriculture and Other Applied Biological Sciences; Chemistry; Computer Science, Information Technology, Information Sciences; Earth Sciences; Ecology, Evolution and Behaviour; Engineering and Technology; Molecular, Cellular and Whole Organism Biology; Physics; Pure and Applied Mathematics; and Statistics.

In general, these researchers were primarily women (51.6%), European (45.2%) and aged 30 to 39 (62.2%). There has been an increase across non-European ethnicities between 2012 and 2018: researchers who identified as Asian increased from 13.7% to 18.5%; Middle Eastern/Latin American/African from 2.0% to 5.3%; Māori from 3.0% to 4.1%; and Pacific from 1.4% to 1.7%.

Examining the distribution of new and emerging researchers across subject areas, the largest percentages were in Molecular, Cellular and Whole Organism Biology (28.3%); Biomedical (28.1%); Chemistry (24.9%); and Engineering and Technology (24.4%).

1,315.41
new and emerging researchers
↑ from **1,122.05** in **2012**

51.6% women
62.2% aged 30 to 39
45.2% European

In subject areas
28.3% Molecular, Cellular and Whole Organism Biology
28.1% Biomedical
24.9% Chemistry
24.4% Engineering and Technology

The distribution of funded Quality Categories is less salient for new and emerging. Most of these researchers were awarded a C(NE) Quality Category, with no significant change between 2012 (14.7%) and 2018 (15.0%). However, in a small number of exceptional cases, new and emerging researchers were awarded A and B Quality Categories. In 2018, 0.7% of new and emerging researcher EPs received an A Quality Category and 6.6% a B Quality Category.

EPs awarded the B Quality Category were more equally distributed across all subject areas with the exception of Veterinary Studies and Large Animal Science; Religious Studies and Theology; and Pharmacy, where none were recorded. Those with the largest percentage of new and emerging staff awarded a B Quality Category were Human Geography (15.6%); Psychology (15.0%); and Ecology, Evolution and Behaviour (12.6%).

Employment status

Most researchers who participated in the Quality Evaluation were considered full-time[24] – 88.4% in 2018. In general, this trend has remained relatively static for each round, with 2018 having slightly more part-time researchers than full-time; 11.6% and 88.4% compared with 9.9% and 90.1% in 2012. The distribution of funded Quality Categories by employment status highlighted that researchers awarded an A Quality Category are more likely to be full-time (93.0%) compared with researchers awarded a C Quality Category (83.1%).

88.4%
Full-time researchers

93.0%
Researchers awarded an **A** Quality Category are more likely to be full-time compared with researchers awarded a **C** Quality Category **83.1%**

Largest percentage of part-time researchers
34.9% Clinical Medicine
33.7% Public Health
23.9% Nursing

[24] For the purposes of reporting, we have defined full-time as any researcher with an employment contract of 1.0 FTE or greater. Part-time is anyone with an employment contract less than 1.0 FTE. A researcher's FTE is used to determine their eligibility to participate in the PBRF and only measures employment for the year preceding the Quality Evaluation round.

In 2018, the subject areas with the largest percentage of part-time researchers were in the health fields: 34.9% for Clinical Medicine; 33.7% for Public Health; and 23.9% for Nursing. This is not surprising given the number of health professionals who continue their clinical practice while being employed by the TEO to teach and conduct research. The next largest group of part-time staff were in the creative arts: Visual Arts and Crafts (23.8%) and Theatre and Dance, Film and Television and Multimedia (16.9%). Like health professionals, it is likely that those involved in the creative space spend only a portion of their time contracted to undertake teaching and research.

Broken down by gender, women tended to be employed on a part-time basis more often than men. Of the women researchers, 16.4% were part-time and 83.6% full-time. This compares with their male counterparts, where only 8.0% of men were part-time and 92.0% full-time. Examining the subject area with the greatest percentage of part-time employees, in Clinical Medicine, almost half (46.8%) of all women researchers were part-time compared with 27.5% of all men researchers.

Average quality scores

For the 2018 Quality Evaluation, we have changed the average quality score (AQS) measures we report on. The decision was made after the last Ministry of Education policy review to simplify reporting and only report on two of the four AQS measures reported on in 2012: the AQS(S) and AQS(E). Both measures reflect research intensity as opposed to measuring research quality. The AQS(S) compares the number of funded Quality Categories to the total number of staff at degree level or higher at each TEO, while the AQS(E) looks at the number of funded Quality Categories in relation to postgraduate learners at each TEO.

The following breaks down each AQS by TEO. For the AQS(E), we have provided a comparison between the four rounds (2003, 2006, 2012 and 2018). This was not possible with the AQS(S) given the changes we made to the denominator used for the 2018 Quality Evaluation.

AQS(S)

The 2018 AQS(S) uses a multi-year average of FTE totals at each participating TEO relative to the number of funded Quality Categories. This measure provides an indication of the extent to which staff whose EPs have been awarded a funded Quality Category are representative of all teaching and research staff at each TEO. The average results across all participating TEOs is 7.15. This increases to 22.60 when you look at just the universities. Like 2012, the higher university average reflects the proportion of funded EPs in the sector and the likelihood that non-university TEOs have a smaller number of academic or research staff compared with those engaged in teaching.

Table 10 shows that universities have the highest proportion of research-active staff. This is to be expected, given the role of universities to meet international standards of research and teaching.

See Appendix 2 for the AQS(S) formula and box and whisker diagram.

Table 8: 2018 Quality Evaluation – AQS(S) by TEO

TEO NAME	AQS(S)
Ara Institute of Canterbury	1.47
Auckland Institute of Studies	1.83
Auckland University of Technology	15.78
Bethlehem Tertiary Institute	2.47
Carey Baptist College	10.11
Eastern Institute of Technology	2.35
Good Shepherd College – Te Hepara Pai	5.45
ICL Business School	1.50
IPU New Zealand	1.22
Laidlaw College Incorporated	3.05
Lincoln University	17.64
Manukau Institute of Technology	1.34
Massey University	19.50
Media Design School	2.73

TEO NAME	AQS(S)
Nelson Marlborough Institute of Technology	1.43
New Zealand College of Chiropractic	5.09
New Zealand Tertiary College	0.23
NorthTec	0.23
Open Polytechnic	1.63
Otago Polytechnic	3.80
Te Wānanga o Aotearoa	0.54
Te Whare Wānanga o Awanuiārangi	2.66
Toi Ohomai Institute of Technology	1.02
Unitec New Zealand	5.24
Universal College of Learning	0.96
University of Auckland	24.94
University of Canterbury	25.92
University of Otago	26.09
University of Waikato	21.76
Victoria University of Wellington	29.19
Waikato Institute of Technology	2.25
Wellington Institute of Technology	1.08
Western Institute of Technology at Taranaki	0.61
Whitecliffe College of Arts and Design	7.40
Whitireia Community Polytechnic	1.82

AQS(E)

The AQS(E) is calculated by using the number of EFTS at degree level or higher enrolled in qualifications at level seven and above at each participating TEO relative to the number of funded Quality Categories. This measure indicates the extent to which degree level and above teaching and learning is underpinned by research. Higher numbers indicate a greater intensity of degree-level provision that is informed by research.

The average result across all participating TEOs in 2018 was 0.64. This compares with 0.61 in 2012 and 0.57 in 2006, signalling that teaching and learning is increasingly strengthened by research. Again, all eight universities scored above 1.00, alongside two PTEs – Carey Baptist College and Good Shepherd College – Te Hepara Pai. Lincoln University continues to be the top performer, alongside the University of Otago and Good Shepherd College – Te Hepara Pai. Like the AQS(S), it is expected that, overall, universities would have higher figures given their focus on research.

See Appendix 2 for the AQS(E) formula and box and whisker diagram.

Table 9: Four Quality Evaluations – AQS(E) by TEO

TEO NAME	AQS(E)			
	2003	**2006**	**2012**	**2018**
Ara Institute of Canterbury	-	0.27	0.22	0.21
Auckland Institute of Studies	0.03	0.09	0.10	0.19
Auckland University of Technology	0.30	0.46	0.56	0.85
Bethlehem Tertiary Institute	-	0.29	0.16	0.33
Carey Baptist College	0.57	0.64	1.29	1.22
Eastern Institute of Technology	-	0.16	0.35	0.39
Good Shepherd College – Te Hepara Pai	-	1.56	0.57	2.00
ICL Business School	-	-	-	0.36
IPU New Zealand	-	-	-	0.32
Laidlaw College Incorporated	0.38	0.15	0.31	0.58
Lincoln University	1.00	1.19	1.78	2.14
Manukau Institute of Technology	-	0.38	0.20	0.20
Massey University	0.63	0.93	1.19	1.42
Media Design School	-	-	-	0.22
Nelson Marlborough Institute of Technology	-	0.34	-	0.22
New Zealand College of Chiropractic	-	-	0.12	0.60
New Zealand Tertiary College	-	-	0.06	0.01
NorthTec	-	0.13	0.23	0.07
Open Polytechnic	-	0.20	0.17	0.13
Otago Polytechnic	-	0.34	0.55	0.33
Te Wānanga o Aotearoa	0.38	0.27	-	0.32
Te Whare Wānanga o Awanuiārangi	-	0.93	0.15	0.28
Toi Ohomai Institute of Technology	-	-	-	0.28
Unitec New Zealand	0.29	0.51	0.38	0.43
Universal College of Learning	-	-	-	0.18
University of Auckland	1.07	1.12	1.36	1.57
University of Canterbury	0.98	1.16	1.25	1.32
University of Otago	1.19	1.52	1.65	2.06
University of Waikato	0.82	1.03	1.10	1.22
Victoria University of Wellington	0.74	0.98	1.12	1.46
Waikato Institute of Technology	0.10	0.20	0.10	0.29
Wellington Institute of Technology	-	-	0.14	0.22
Western Institute of Technology at Taranaki	-	-	-	0.22
Whitecliffe College of Arts and Design	0..35	0.27	1.11	0.60
Whitireia Community Polytechnic	-	0.12	0.11	0.25

Conclusion

Two key contributors to long-term economic growth and social progress are new knowledge production and innovation. A strong and sustainable research ecosystem is a necessary mechanism for building a highly skilled workforce and advancing the wellbeing of our society.

The Ministry of Business, Innovation and Employment's 2018 report on New Zealand's research, science and innovation systems[25] shows that we have a relatively small but highly productive system. Compared with OECD averages, New Zealand outperforms in publications of researchers per year; publications per higher education and government expenditure; and publications in the top 1% of most-cited journals worldwide. Among the Small Advanced Economies, we rank high.

A key part of this landscape is the PBRF, which continues to drive and reward the highest-quality research. The 2018 Quality Evaluation results reflect continued growth, not just in the number of EPs awarded funded Quality Categories but in the increased research capability of a wider range of TEOs.

Distribution of funding and evidence of quality

The outcome of the 2018 Quality Evaluation provides a similar distribution of funding as previous rounds. Unsurprisingly, the university subsector continues to receive most of the funding. Yet many other TEOs participated in 2018, with several increasing their number of EPs awarded funded Quality Categories within an existing culture of research. For other non-university TEOs, we have seen the growth of nascent research cultures and increasing research capability.

There was noticeable growth across certain panels and subject areas. The Medicine and Public Health Panel and the Māori Knowledge and Development Panel saw the largest percentage increases in funded EPs, up 40.8% and 39.0% from 2012, respectively.

The subject areas with the greatest increase in EPs awarded funded Quality Categories were Biomedical (64.5%), Nursing (40.0%), and Engineering and Technology (33.1%). This increase should help to support the government's prioritisation of STEM-related investment in research in these fields.

Looking to the future

As the results show, to date there is much to celebrate in terms of the New Zealand research landscape.

The sustainability of growth in the A and B Quality Categories; however, is a key question. A healthy research ecosystem needs a mix of researchers including those who are producing ground-breaking research along with those who are just beginning their research careers and may not have reached their peak yet.

We also know that equity for all New Zealanders will drive economic prosperity and wellbeing. As part of our changing world of work, a priority must be to ensure that Māori and Pacific peoples are encouraged into research-based careers and that our tertiary education system

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[25] Retrieved on 8 February 2019 from: https://www.mbie.govt.nz/assets/7693f53535/research-science-and-innovation-system-performance-report-2018.pdf

reflects the changing diversity of New Zealand. See the *Report of the Moderation and Peer-Review Panels* for their recommendations in addressing this issue.

For the TEC, this means driving parity for Māori and Pacific learners and researchers. The Quality Evaluation results show a lag in the number of Māori and Pacific researchers participating in the PBRF. We will work with the Ministry of Education to try and address this for any future rounds.

A knowledge-based economy requires a good supply of highly skilled people. The PBRF contributes to nurturing the research productivity that New Zealand needs to advance economic growth and social wellbeing.

The periodic review of the PBRF is scheduled to begin mid-2019. It will examine the ways that the government can continue to support research excellence by improving the effectiveness and efficiency of PBRF settings and ensuring that it delivers solid outcomes for learners, businesses, communities and New Zealand as a nation.

Appendix 1: Distribution of funded Quality Categories by panel and subject area

Table 10: Distribution of funded Quality Categories by peer-review panel

PEER-REVIEW PANEL NAME	A (FTE)	B (FTE)	C (FTE)	C(NE) (FTE)	TOTAL
Biological Sciences	141.09	274.79	158.61	130.33	**704.82**
Business and Economics	62.90	342.11	251.71	123.60	**780.32**
Creative and Performing Arts	83.83	204.55	150.00	23.88	**462.26**
Education	51.53	143.80	238.50	54.13	**487.96**
Engineering, Technology and Architecture	121.48	297.89	182.88	129.79	**732.04**
Health	52.72	168.17	196.23	78.94	**496.06**
Humanities and Law	118.89	332.16	127.13	55.11	**633.29**
Māori Knowledge and Development	26.12	59.12	64.57	25.06	**174.87**
Mathematical and Information Sciences and Technology	86.90	220.05	143.42	76.52	**526.89**
Medicine and Public Health	151.62	361.51	296.62	207.13	**1,016.88**
Pacific Research	5.61	23.70	15.80	9.50	**54.61**
Physical Sciences	110.93	212.99	83.20	105.95	**513.07**
Social Sciences and Other Cultural/Social Studies	154.90	333.82	246.85	89.76	**825.33**

Table 11: Distribution of funded Quality Categories by subject area

SUBJECT AREA	A (FTE)	B (FTE)	C (FTE)	C(NE) (FTE)	TOTAL
Accounting and Finance	14.00	80.71	73.29	44.00	**212.00**
Agriculture and Other Applied Biological Sciences	38.96	78.44	55.96	23.46	**196.82**
Anthropology and Archaeology	15.68	30.53	14.00	7.79	**68.00**
Architecture, Design, Planning, Surveying	18.29	60.03	57.28	13.50	**149.10**
Biomedical	64.25	161.89	121.17	124.47	**471.78**
Chemistry	31.70	84.15	44.93	48.79	**209.57**
Clinical Medicine	50.00	93.44	70.49	25.86	**239.79**
Communications, Journalism and Media Studies	12.00	45.19	45.05	14.00	**116.24**
Computer Science, Information Technology, Information Sciences	40.75	136.44	104.08	51.72	**332.99**
Dentistry	8.73	10.06	18.20	7.88	**44.87**
Design	14.32	38.11	40.88	9.00	**102.31**
Earth Sciences	47.26	71.16	24.95	31.16	**174.53**

SUBJECT AREA	A (FTE)	B (FTE)	C (FTE)	C(NE) (FTE)	TOTAL
Ecology, Evolution and Behaviour	63.57	110.92	41.64	41.42	**257.55**
Economics	11.57	59.16	50.91	15.00	**136.64**
Education	51.53	143.80	238.50	54.13	**487.96**
Engineering and Technology	103.19	237.86	125.60	116.29	**582.94**
English Language and Literature	15.31	41.94	12.10	3.00	**72.35**
Foreign Languages and Linguistics	16.60	58.30	29.18	21.24	**125.32**
History, History of Arts, Classics and Curatorial Studies	30.61	78.54	34.27	5.05	**148.47**
Human Geography	16.29	36.27	13.62	8.94	**75.12**
Law	31.07	107.14	29.10	19.00	**186.31**
Management, Human Resources, Industrial Relations International Business and Other Business	23.01	131.08	78.13	28.10	**260.32**
Māori Knowledge and Development	26.12	59.12	64.57	25.06	**174.87**
Marketing and Tourism	14.32	71.16	49.38	36.50	**171.36**
Molecular, Cellular and Whole Organism Biology	38.56	85.43	61.01	65.45	**250.45**
Music, Literary Arts and Other Arts	29.54	69.05	32.67	5.60	**136.86**
Nursing	4.51	19.09	49.09	15.38	**88.07**
Other Health Studies (including Rehabilitation Therapies)	12.18	67.62	71.29	29.15	**180.24**
Pacific Research	5.61	23.70	15.80	9.50	**54.61**
Pharmacy	11.30	20.02	8.25	7.00	**46.57**
Philosophy	17.30	33.24	6.88	2.92	**60.34**
Physics	31.97	57.68	13.32	26.00	**128.97**
Political Science, International Relations and Public Policy	13.79	65.39	27.85	10.27	**117.30**
Psychology	70.28	86.76	66.68	25.75	**249.47**
Public Health	37.37	106.18	105.96	56.80	**306.31**
Pure and Applied Mathematics	34.06	54.35	18.02	14.80	**121.23**
Religious Studies and Theology	8.00	13.00	15.60	3.90	**40.50**
Sociology, Social Policy, Social Work, Criminology and Gender Studies	26.86	69.68	79.65	23.01	**199.20**
Sport and Exercise Science	7.00	33.76	26.40	13.30	**80.46**
Statistics	12.09	29.26	21.32	10.00	**72.67**
Theatre and Dance, Film and Television and Multimedia	12.64	36.62	20.44	2.50	**72.20**
Veterinary Studies and Large Animal Science	9.00	17.62	22.00	6.23	**54.85**
Visual Arts and Crafts	27.33	60.77	56.01	6.78	**150.89**

Appendix 2: Additional information on the average quality scores

The following calculations and box and whisker diagrams for both the AQS(S) and AQS(E) provide additional information on the two intensity measures used in the 2018 Quality Evaluation.

AQS(S) calculation

Numerator

This is the staff FTE associated with EPs awarded a funded Quality Category (A, B, C, or C(NE)) using data collected as part of the 2018 Quality Evaluation with the agreed weightings for each Quality Category: A = 5, B = 3, C(NE) = 2, and C = 1.

Denominator

This is the FTE-weighted number of all staff reported as academic or research staff or teaching staff (PTEs only). The denominator is based on a multi-year average of FTE totals at each participating TEO. The TEC used staffing data for the 2015, 2016 and 2017 calendar years to calculate this average.

Formula for AQS(S)

$$((((A*5)+(B*3)+(C(NE)*2)+(C)))*10) \div (\textstyle\sum \text{ of staff FTE})$$

Staffing data for the denominator

Staffing data from selected academic and research categories collected by Tribal Group will be used to calculate the AQS(S) denominator for ITPs, universities and wānanga.

Staffing data from the 'Teaching Staff' category of the Workforce Questionnaire will be used to calculate the AQS(S) denominator for PTEs as Tribal Group does not collect data from these organisations.

AQS(E) calculation

Numerator

This is the staff FTE associated with EPs awarded a funded Quality Category (A, B, C, or C(NE)) using data collected as part of the 2018 Quality Evaluation with the weightings as set out above.

Denominator

This is the number of EFTS at degree level or higher associated with enrolments in qualifications at level seven or higher on the New Zealand Qualifications Framework as part of the single-data return by participating TEOs for the year ending 31 December 2017. The number of EFTS that a TEO delivers at postgraduate-degree level or higher will also be provided.

EFTS data include all EFTS irrespective of funding source, for example, including domestic and international students.

Formula for AQS(E)

$((((A*5)+(B*3)+(C(NE)*2)+(C)))*10) \div (\sum \text{ of EFTS reported at degree level or higher})$

An AQS(E) for each of the 2003, 2006 and 2012 Quality Evaluations is presented in the report as contextual information. The denominator uses EFTS data from 31 December 2003, 31 December 2005 and 31 December 2011.

Figure 1: AQS(S) box and whisker graph by TEO type
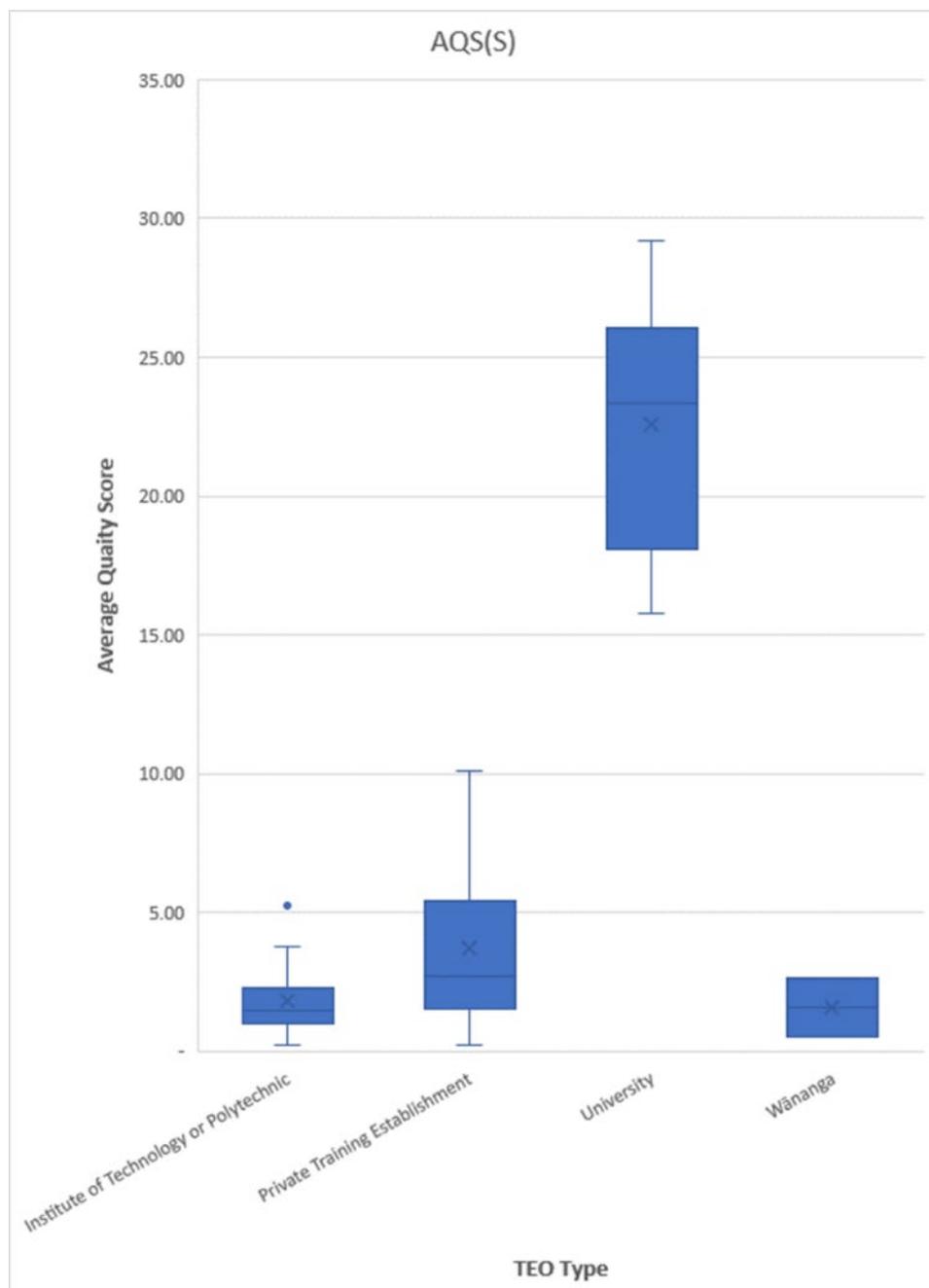
Figures 2 and 3: Box and whisker graphs show 2018 results by TEO type and all TEO results over four Quality Evaluation rounds
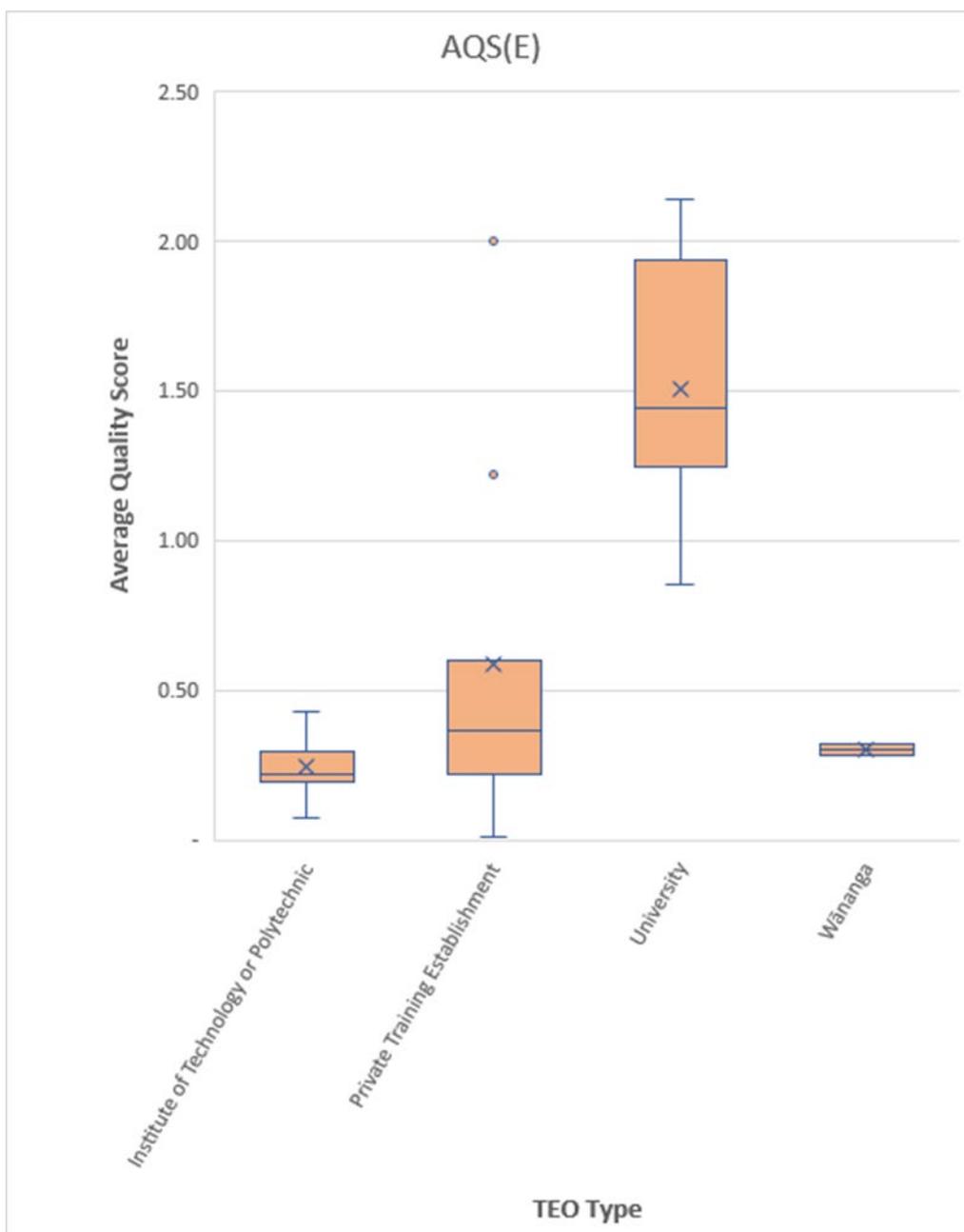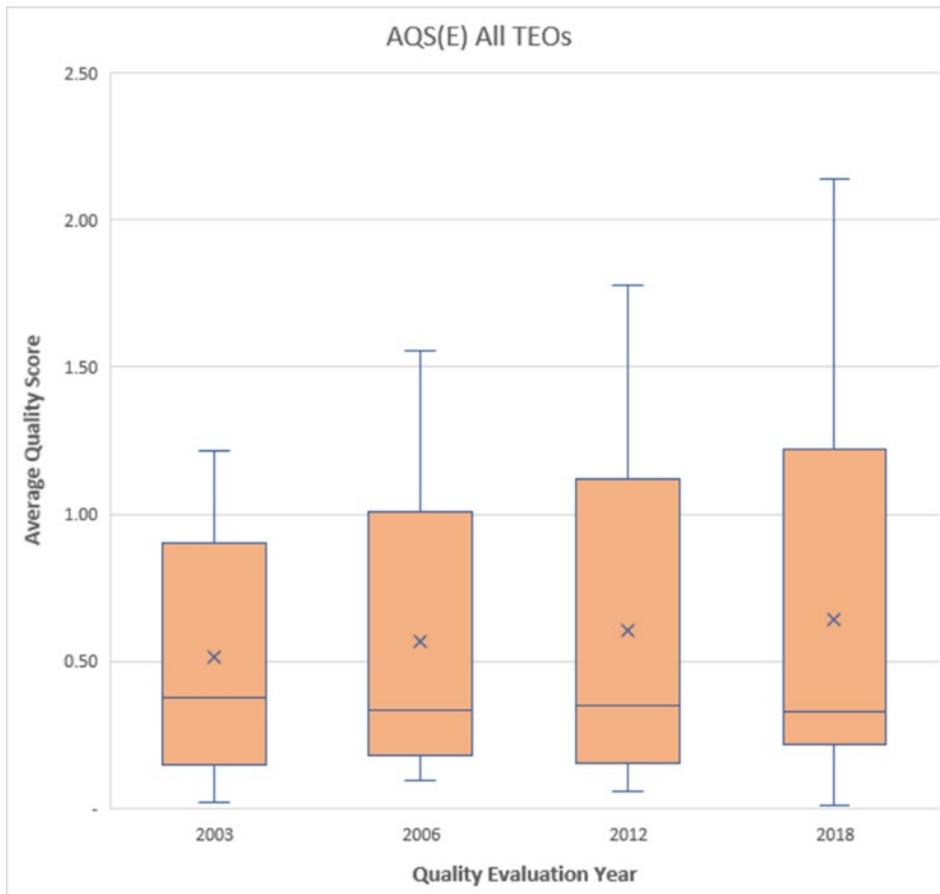
Appendix 3: Indicative funding allocations by TEO

The table below includes indicative 2019 funding allocations for each TEO that participated in the 2018 Quality Evaluation. These will be finalised after the complaints process concludes later in 2019.

EDUMIS	Provider	QE Ratio	QE Funding	ERI Ratio	ERI Funding	RDC Ratio	RDC Funding	ACTUAL TOTAL
7001	University of Auckland	27.7%	$47,982,635.45	33.5%	$21,085,259.02	31.4%	$24,685,920.86	$93,753,815
7002	University of Waikato	4.9%	$8,496,002.10	4.2%	$2,671,320.58	5.5%	$4,314,437.28	$15,481,760
7003	Massey University	12.9%	$22,364,544.66	13.0%	$8,169,150.61	10.9%	$8,604,064.51	$39,137,760
7004	Victoria University of Wellington	11.2%	$19,355,547.11	10.6%	$6,702,190.73	12.2%	$9,578,966.36	$35,636,704
7005	University of Canterbury	8.4%	$14,519,553.95	7.3%	$4,599,140.74	11.6%	$9,102,517.51	$28,221,212
7006	Lincoln University	2.7%	$4,586,937.71	5.7%	$3,592,396.66	2.5%	$1,932,377.61	$10,111,712
7007	University of Otago	20.7%	$35,803,449.91	22.7%	$14,294,346.81	15.7%	$12,394,759.52	$62,492,556
7008	Auckland University of Technology	7.3%	$12,620,243.64	2.2%	$1,407,147.65	7.3%	$5,751,943.09	$19,779,334
	UNIVERSITY SUBSECTOR TOTALS	**95.7%**	**$165,728,914.53**	**99.2%**	**$62,520,952.80**	**97.0%**	**$76,364,986.74**	**$304,614,854**
6004	Unitec New Zealand	1.05%	$1,826,381.05	0.18%	$111,894.20	1.67%	$1,318,919.71	$3,257,195
6006	Ara Institute of Canterbury	0.30%	$528,250.56	0.01%	$4,416.51	0.00%	-	$532,667
6007	Eastern Institute of Technology	0.31%	$544,306.26	0.02%	$14,454.31	0.12%	$94,809.81	$653,570
6008	Wellington Institute of Technology	0.13%	$217,558.62	0.02%	$12,019.56	0.00%	-	$229,578
6009	Universal College of Learning	0.11%	$185,396.00	0.00%	-	0.00%	-	$185,396
6010	Manukau Institute of Technology	0.23%	$395,912.64	0.01%	$7,208.33	0.00%	-	$403,121
6011	Nelson Marlborough Institute of Technology	0.10%	$179,736.81	0.00%	$3,117.53	0.00%	-	$182,854
6012	NorthTec	0.03%	$44,044.35	0.01%	$6,845.64	0.00%	-	$50,890
6013	Otago Polytechnic	0.47%	$814,999.79	0.08%	$51,332.33	0.30%	$239,830.43	$1,106,163
6014	Whitireia New Zealand	0.21%	$367,104.56	0.01%	$4,146.36	0.00%	-	$371,251
6017	Western Institute of Technology at Taranaki	0.02%	$42,610.35	0.00%	$1,159.22	0.00%	-	$43,770

EDUMIS	Provider	QE Ratio	QE Funding	ERI Ratio	ERI Funding	RDC Ratio	RDC Funding	ACTUAL TOTAL
6019	Waikato Institute of Technology	0.37%	$634,238.69	0.19%	$122,416.93	0.45%	$354,576.89	$1,111,233
6022	Open Polytechnic	0.08%	$138,739.71	0.00%	$1,920.73	0.00%	-	$140,660
6025	Toi Ohomai Institute of Technology	0.21%	$365,158.42	0.03%	$21,812.79	0.00%	-	$386,971
	ITP SUBSECTOR TOTALS	**3.62%**	**$6,284,437.81**	**0.56%**	**$362,744.44**	**2.54%**	**$2,008,136.84**	**$8,655,319**
7548	ICL Business School	0.02%	$26,221.75	0.00%	-	0.00%	-	$26,222
8192	Media Design School	0.09%	$153,643.09	0.00%	-	0.00%	-	$153,643
8396	New Zealand College of Chiropractic	0.10%	$176,177.41	0.07%	$41,540.65	0.00%	-	$217,718
8509	Whitecliffe College of Art and Design	0.13%	$224,728.63	0.00%	-	0.00%	-	$224,729
8530	Auckland Institute of Studies Limited	0.05%	$87,064.42	0.00%	-	0.00%	-	$87,064
8550	IPU New Zealand	0.02%	$33,903.91	0.00%	-	0.00%	-	$33,904
8563	Laidlaw College Incorporated	0.04%	$70,214.89	0.00%	$451.94	0.04%	$33,080.06	$103,747
8619	New Zealand Tertiary College	0.00%	$5,121.44	0.00%	$420.33	0.00%	-	$5,542
8694	Bethlehem Institute Limited	0.02%	$40,971.49	0.04%	$26,363.00	0.02%	$18,016.82	$85,351
8717	Good Shepherd College – Te Hepara Pai	0.02%	$30,728.62	0.00%	-	0.00%	-	$30,729
8979	Carey Baptist College	0.03%	$60,432.95	0.01%	$5,537.52	0.00%	-	$65,970
	PTE SUBSECTOR TOTALS	**0.52%**	**$909,208.60**	**0.12%**	**$74,313.44**	**0.06%**	**$51,096.88**	**$1,034,619**
8630	Te Wānanga o Aotearoa	0.10%	$174,128.84	0.01%	$3,228.12	0.00%	-	$177,357
9386	Te Whare Wānanga o Awanuiārangi	0.09%	$153,310.20	0.06%	$38,761.21	0.41%	$325,779.52	$517,851
	WĀNANGA SUBSECTOR TOTALS	**0.19%**	**$327,439.04**	**0.07%**	**$41,989.33**	**0.41%**	**$325,779.52**	**$695,208**
	TOTALS		**$173,250,000**		**$63,000,000**		**$78,750,000**	**$315,000,000**

Appendix 4: Audit Report – Assurance over the PBRF 2018 Quality Evaluation

Independent Assurance Report

2018 Performance-Based Research Fund Quality Evaluation

Background

The Tertiary Education Commission engaged Cook & Associates, Limited to provide assurance that the 2018 Performance-Based Research Fund (PBRF) Quality Evaluation met the Commission's objectives. The Commission's objectives are that:

- the PBRF 2018 Quality Evaluation is conducted in a fair, robust and objective manner

- the process guidelines are designed to deliver on the purpose of the PBRF

- communication and engagement with participating Tertiary Education Organisations (TEOs) is adequate to ensure that TEOs are able to participate effectively in the process; that the process overall is communicated, conducted, and reported in a transparent, fair and unbiased manner to all TEOs

- the process is carried out in a manner that will ensure fair and accurate allocation of the fund, and

- the results of the process are reported accurately to support the TEC's decision-making and to inform participants.

Approach

Our approach consisted of three stages:

- In Stage 1 we reviewed the design of the processes that had been established to evaluate the quality of research and assign quality categories to ensure that they aligned with the intent of the PBRF.

- In Stage 2 we provided real-time assurance on the operation of those processes. Our work in Phase 2 was based on observations and enquiries in relation to the quality evaluation.

- In Stage 3 we reviewed the draft reports of the results of the Quality Evaluation process and plans to communicate the results. The publication of results will occur after this report is submitted to the Tertiary Education Commission.

Conclusion

Nothing has come to our attention that causes us to believe that the Tertiary Education Commission's processes, procedures and practices in relation to the Quality Evaluation were not conducted fairly and objectively. Overall, the design of the processes appeared to be consistent with the intent of the PBRF; and the processes were carried out and reported in accordance with the design.

Specifically:

- Robust processes were established for identifying and managing actual or potential conflicts of interest within the peer review panels. We are unaware of any outstanding probity issues relating to conflicts of interest.

- Sufficient attention was paid to processes to ensure the confidentiality of sensitive information. We are unaware of any outstanding issues relating to disclosure of sensitive information.

- Communications were well-managed and appropriately documented.

- Discussion of the merits of individual EPs was robust and resulted in the assignment of Quality Categories that clearly reflected the views of the peer review panels. The moderation process was sound, and assisted the panels to apply the evaluation methodology on a consistent, calibrated basis.

- The TEC has maintained an appropriate audit trail of the evaluation process and recorded results through the use of the PBRF IT system, panel advisors and note-takers.

- The TEC has robust processes in place to ensure that final decisions on the 2018 PBRF Quality Evaluation process have been accurately reflected in the draft interim *Final Results report – Improving Research Quality.*

Mary Beth Cook

Director

Cook & Associates, Limited

March 2019

Appendix 5: Acronyms used in this report

For the complete PBRF 2018 Quality Evaluation glossary, please refer to the *Guidelines for tertiary education organisations participating in the 2018 Quality Evaluation* (pp. 128 to 133).

ACRONYM	FULL NAME
AQS	Average quality score
AQS(E)	Average quality score that is based on number of EFTS that a TEO delivers at postgraduate-degree level or higher
AQS(S)	Average quality score that is based on number of teaching staff
EFTS	Equivalent full-time student
EP	Evidence Portfolio
ERI	External Research Income
FTE	Full-time equivalent
ITPs	Institutes of technology and polytechnics
NRO	Nominated research output
OECD	Organisation for Economic Co-operation and Development
ORO	Other research output
PBRF	Performance-Based Research Fund
PTEs	Private training establishments
RDC	Research Degree Completion
STEM	Science, technology, engineering and mathematics
TEC	Tertiary Education Commission
TEO	Tertiary education organisation