SUBMISSION to the
ASSESSMENT OF STRATEGY AND MANAGEMENT, 2016

Marsden Research Fund

Summary of key points

1. This is a submission to the *Assessment of Strategy and Management, 2016* for the Marsden Fund. Coordinated by IITP, this joint submission is from the leading representative bodies from New Zealand's Digital Technology industry including:
   - **The Institute of IT Professionals (IITP),** the professional body for those working with technology and in the IT industry, with thousands of members nationwide;
   - **The NZ Technology Industry Association (NZTech),** the voice of the technology sector representing over 300 tech-related companies;
   - **InternetNZ**, the voice of the internet community;
   - **NZRise**, the representative body for NZ-owned digital technology companies;
   - **IT Service Management Forum NZ**, the network for IT Service Management professionals;
   - **Project Management Institute of NZ**, the association for the project, programme and portfolio management profession;
   - **TUANZ**, the representative body for ICT and communications users
   - **Health Informatics NZ**, the national organisation that supports the field of health informatics;
   - **Test Professionals Network**, the leading forum for promoting excellence in systems and software testing;
   - **NZ Open Source Society (NZOSS)**, sharing the freedom of open source software, open standards and open information
   - **Canterbury Tech Cluster**, the organisation helping Canterbury's tech sector succeed at home and worldwide.

2. This is the largest group of technology industry representative bodies to ever come together on a single issue in New Zealand, reflecting the importance the New Zealand technology community attributes to digital technology-related research.

3. We welcome this review and the opportunity to meaningfully engage with the process. As noted at the end of this submission, we are happy to also present or discuss with you in person or assist in any other way in the investigation of this issue or consideration of potential solutions.

4. This submission primarily addresses the following areas from the Terms of Reference for the above assessment and review:
   - 7.3 (Key Drivers): *"…In particular, how the Fund ensures that different fields of research are treated in an unbiased fashion across panels."*
   - 10.6 (Management of the Fund): Various sections
   - 11.1 (Key Questions): *"How, and to what extent, does the Fund's overall portfolio of research investment contribute to new knowledge and other outputs that generate long-term benefit to New Zealand?"*

5. This submission is within the following scope of the review:
   - 10.1: *The nature of the research funded in the investment portfolio*
   - 10.2: *The balance of research across the investment portfolio*

6. As outlined later in this submission, we hold serious concerns about the imbalance and apparent structural bias within one particular area of the fund, which has led to an evidenced significant under-investment in research within scientific domains related to Digital Technologies and IT such as *Computer Science*, *Information Systems*, *Software Engineering*, and *Information Technology*.

7. Research applications from these domains come through the *Maths and Information Sciences* panel. However only a slim proportion of the funding through this panel has funded CS/IS/SE/IT-related research in recent years. Most years this percentage has been 10-15% of approved proposals, with an average over 10 years of 17%.

8. This compares very poorly internationally. For example, Australia's equivalent *Discovery Fund* approves an average of 46.5 proposals per year in digital tech-related areas (vs an average of 1.5 per year in NZ). In their case this is around the same number as maths. i.e. when comparing to the Marsden Fund MIS panel, around **50%** of an equivalent domain are digital tech areas in Australia versus **17%** in NZ.

9. Investing in research in the areas related to IT and digital technologies provides significant and clear long-term benefit to New Zealand. We are of the view that a failure to address this issue now will result in the Fund being unable to achieve its overall balance and benefit objectives.

10. Given the nature of the apparent structural bias, it is our view that the most appropriate way of resolving this matter is to split the current *Maths and Information Sciences* (MIS) panel into separate *Maths and Statistics* (MAS) and *Information and Computer Sciences* (ICS) panels, thereby ensuring adequate research investment in the areas related to digital technologies.

The New Zealand technology sector

11. New Zealand's tech sector is growing fast and contributing significantly to the country's economic success. The growth of the sector leads to growth in high-wage jobs (with tech regularly featuring as one of the highest paid professions) and provides significant long-term economic and social advantage to New Zealand.

12. Recent research[1] shows that the tech sector is a large contributor to the New Zealand economy – creating many jobs, GDP and exports. There are over 28,000 companies, employing almost 100,000 people or 5% of the workforce.

13. These companies created $32b in output in 2015, which generated $16.2b GDP, or 8% of the economy.

14. The sector also exported $6.3b in 2015, 9% of the country's exports. For every 4% growth in productivity in the tech sector, it generates 1% growth in GDP, or $2.7b.

15. Aside from tech companies, the flow-on impact from developments within Digital Technologies, and via the IT profession, leads to significant improved productivity and profitability of companies in other sectors, and every dollar invested in growing technology productivity brings a $3 Return On Investment (ROI).

16. For example, companies that make smart use of internet services are 6% more productive than average firms in their sector. If all firms made better use of internet services, it could potentially lift GDP by $34b.

17. New Zealand is competing with the rest of the world, and it is clear that long-term visionary "blue skies" research investment in tech-related scientific domains such as Computer Science, Information Systems, Software Engineering and Information Technology results in a significant and long-term economic benefit to New Zealand.

Digital Technology and the Marsden Fund

18. As noted above, research applications from scientific domains related to the tech sector generally come through the *Maths and Information Sciences* panel.

19. In late 2013 IITP wrote to Ministers Steven Joyce and Amy Adams concerned that:

> *… in four out of the last five years* ***just 10% of "Mathematics and Information Sciences" research funding through the Marsden Fund – intended to fund both mathematics and ICT-related fields such as Computer Science – appears to have been allocated to Computer Science or ICT-related fields*** *– the vast bulk (88-90%) being restricted to mathematics and statistics instead.*

[1] NZ Technology Industry Association (2016). *From Tech Sector to Digital Nation*. Retrieved August 1, 2016, from http://www.epageflip.net/i/693432-economic-impact-study-report-ebook

Without research funding through the country's Universities and Polytechs, our sector is placed in a position of significant disadvantage compared with other countries and other disciplines.

20. Despite attempts to correct this, this situation has not changed. The Computer Science and Information Systems communities recently noted that:

    The CSIS community does an informal debrief when the Marsden results come out. In the latest such debrief (2016 first round results) we noted well over 45 submissions to the MIS panel, of which 4 progressed to round 2. Even more concerning, it appears that all four were Fast Starts (which are smaller, and which means that not a single CSIS non-early-career application progressed to the second round). In 2015 the informal debrief noted 78 applications, 6 of which progressed to round 2.

21. The grants awarded by the MIS panel over the last 10 years, and the proportion of these that are for Computer Science, are listed below:

Year	Grants Awarded by MIS Panel	Maths/CS crossover	CS Grants	CS proportion
2006	8	0	2	25%
2007	9	0	1	11%
2008	11	1	4	36%
2009	13	0	1	8%
2010	8	1	0	0%
2011	9	1	3	33%
2012	10	0	1	10%
2013	10	1	2	20%
2014	11	0	0	0%
2015	10	1	3	30%
TOTAL	**99**	**5**	**17**	**17%**

22. Over the last decade, an **average of 17%** of the panel's approved proposals were for Computer Science researchers, or just 14% in the last 7 years. It's worth noting that no funding has been granted to Information Systems over that entire time.

23. This compares very poorly with other countries. For example, the Australian Research Council's equivalent *Discovery Fund* funded **42 research proposals**[2] in the *Information and Computer Sciences* area in 2016 (compared with 1-2 in New Zealand), and also 42 research proposals in *Mathematical Sciences*.

24. So in Australia, 50% of successful research proposals in the equivalent of NZ's combined MIS Panel domain area were Digital Technology-related, compared with

[2] Australian Research Council (2016). *Scheme Round Statistics for Approved Proposals - Discovery Projects 2016 round 1*. Retrieved August 1, 2016, from https://rms.arc.gov.au/RMS/Report/Download/Report/a3f6be6e-33f7-4fb5-98a6-7526aaa184cf/5

17% within New Zealand's Marsden Fund. In previous years this was even more pronounced in Australia. For example, 2015: 40 DT-related vs 37 Maths; 2014: 52 DT vs 42 Maths; 2013: 52 DT vs 43 Maths.

25. The 2012 PBRF assessment interim report indicates that the subject areas of Statistics, Pure and Applied Mathematics, and CS/IS respectively had 72.1 funded Evidence Portfolios (EPs), 118.9 funded EPs, and 271.13 funded EPs. In other words, **the three community's relative sizes are 15-16% (statistics), 23-26% (mathematics), and 59-61% (CS/IS).**

26. Not including fast-start applications, looking at top researchers, the 2012 PBRF also showed Statistics had 12 A-ranked EPs, mathematics had 31.5, and Computer Science and Information Systems had 23.01. So while it could be argued that "maths and stats" has disproportionately more leading researchers, by these numbers **at least 35% of funded research from the MIS panel should be being undertaken by CS/IS researchers on average over time.**

27. The apparent bias against CS/IS researchers also likely leads to a reduction of A-ranked researchers over time and it's likely that the number of A-ranked EPs in CS/IS would be higher without this structural bias. For example, according to a recent release from the Royal Society of New Zealand[3]:

> *A recent evaluation conducted by researchers at Motu – an economic and public policy research institute – has found that Marsden funding **significantly** increases the scientific output of the funded researchers. Compared to similar groups that do not receive funding, a team that is given Marsden funding showed a 6-12% increase in their academic publications and a 13-30% increase in the papers that cite their work.*

28. However putting that aside, even at the current relative size of the research communities we would expect around 60% of the MIS panel funding to fund research from within the Digital Tech-related communities. At worst, taking just A-grade researchers as a measure, if there was no structural bias we would see an average of 35%+ of funding from the MIS panel going to Digital Tech-related scientific domains. The current long-term average level of 17% of research funding to DT-related fields demonstrates a structural bias in the panel funding.

29. Anecdotally, only a small number of proposals from Digital Tech-related disciplines progress to round 2, fewer than other scientific domains. This means that most aren't examined by external reviewers who are experts in the research domain. Given the broad area covered by the digital technologies domains, we don't believe a panel of researchers primarily outside the domain are in a position to adequately assess the quality of research proposals in this very broad digital technologies area.

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[3] Royal Society of New Zealand (2015). *Set for success: researchers receive $54 million from Marsden Fund*. Retrieved August 1, 2016, from http://www.royalsociety.org.nz/2015/11/05/set-for-success-researchers-receive-54-million-from-marsden-fund/

30. One of the key drivers for the current assessment of the Marsden Fund is to explore "*how the Fund ensures that different fields of research are treated in an unbiased fashion across panels".* The evidence above shows that this is currently not being achieved in the Digital Technologies-related fields.

31. In conclusion, significant scientific research investment in the digital technologies sector clearly generates long-term benefit to New Zealand, however the domains of Computer Science, Information Systems, Software Engineering and Information Technology **are significantly under-represented in funding from the Marsden Fund** given their research community size and quality.

32. This situation cannot continue unabated and we are thankful for this assessment of the Marsden Fund so it can be considered and hopefully addressed. The final section of this submission outlines a solution to this issue that we strongly endorse.

Reason and the way forward: Digital and Information Sciences Panel

33. We are of the view that the likely cause of the structural bias against digital technologies-related research funding is the current Marsden Fund panel structure, which combines Maths/Statistics and Digital tech-related research.

34. While this was an appropriate matching in the early years of computer science, it is not appropriate in modern times; computer science has moved into a full discipline in its own right and only a portion has significant and major cross-over with maths. The other digital technology-related disciplines such as Information Systems are significantly removed from maths as a scientific domain, so a panel primarily made up of mathematicians would have a very difficult job assessing the quality of research in these areas.

35. The current MIS panel has one third Computer Science panel members and two thirds Maths and Statistics panel members. The proportion of Computer Science researchers has generally not gone higher than this. Given the size of the collective Computer Science, Information Systems, Software Engineering and Information Technology scientific domains, it is simply not possible for a panel with this makeup to adequately assess the quality of research in all of these DT-related domains.

36. We are of the view that the only way of addressing this situation is for the Marsden Fund to recognise that the disciplines have changed and the scientific domains of "maths/stats" and "information sciences" (as referred to in the panel) are no longer appropriate to be housed within a single panel.

37. The evidence shows a clear (and we believe unintended) bias against digital technology-related research domains within the MIS panel, over a long period of time and despite attempts to address that within the current structure. This cannot continue. We therefore propose that the *Mathematics and Information Sciences*

panel be **separated into two distinct panels**, being *Mathematics and Statistics* and *Information and Computer Sciences*.

38. We further propose that the **funding of the MIS panel is split evenly 50/50 between these two new panels**, to ensure the bias against digital tech-related research funding is redressed and funding of this important scientific domain supported to an appropriate level.

39. We understand that many researchers in the digital technologies domains have lost confidence in the Marsden Fund and this would also send a strong message that this research domain is valued by the Fund.

More information

40. We are very happy to provide further information about any aspect of this submission and would welcome the opportunity to discuss it in person. Please contact IITP Chief Executive **Paul Matthews** (ceo@iitp.nz, 021 705 212) in the first instance if you would like to discuss this submission further.

Co-signers listed on the following page

Signed on behalf of the organisations listed on the front of this submission.

Yours sincerely

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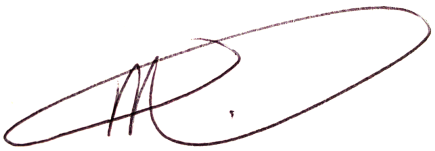

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