From:	no-reply@mbie.govt.nz
To:	Research, Science and Innovation Strategy Secretariat
Subject:	Draft Research, Science and Innovation Strategy submission
Date:	Friday, 8 November 2019 6:10:46 p.m.
Attachments:	Online-submission-form-uploadsdraft-research-science-and-innovation-strategy-submissionsMassey-University-submission-on-draft-Research-Science-and-Iinnovation-Strategy-2019.pdf

Submission on Draft Research, Science and Innovation Strategy recevied:

Are you making your submission as an individual, or on behalf of an organisation?
Organisation

Name
Jo Whittle

Name of organisation or institutional affiliation
Massey University

Role within organisation
Research Projects & Policy Manager

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Which of the below areas do you feel represents your perspective as a submitter? (Please select all that apply)

If you selected other, please specify here:

Gender

Ethnicity

Name of organisation on whose behalf you are submitting, if different to the organisation named above

In which sector does your organisation operate: (Please select all that apply)
Research , Start-up, Interface of research and industry

If you selected other, please specify here:

How large is your organisation (in number of full-time-equivalent employees)?

Please indicate if you would like some or all of the information you provide in your submission kept in confidence, and if so which information.

Please upload your submission document here
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MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA

8 November 2019

The Research, Science and Innovation Strategy Secretariat
Ministry of Business, Innnovation and Employment
PO Box 1473
Wellington 6140

To whom it may concern

Thank you for the opportunity to make a submission on the draft *Research, Science and Innovation Strategy*. Please find below the submission by Massey University on the document. This submission consists of:

1) Direct feedback into the submission template, and
2) Additional feedback in two appendices, regarding:
    a. issues of open access relevant to the Strategy (feedback provided by Bruce White, Open Access and Copyright Advisor, Massey University), and
    b. the role that design can play in driving innovation and developing an innovation culture (copy of submission from Massey University's College of Creative Arts on behalf of DesignCo).

The University endorses the messages in this additional feedback and the submission should be read in conjuction with these two appendices.

Yours sincerely

Dr Viv Smith
Director Research Operations
Massey University

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

Research, Science and Innovation Strategy
Submission

Contribution of Research, Science and Innovation

This strategy is about New Zealand's Research, Science and Innovation (RSI) at a high-level. Its aim is to identify challenges and opportunities that will have the broadest impact on our research and innovation activities. For this reason, it mentions few specific areas or sectors of research and innovation. For this draft version of the Strategy, we are keen to hear from researchers, innovators, businesses, and providers of public services on what the RSI system could be doing to accelerate progress on Government's priorities.

Question 1: Where can the RSI system make the greatest contribution towards the transition to a clean, green, carbon-neutral New Zealand?

Question 2: Where else do you see it making a major contribution?

Question 3: What else could else the RSI system be doing to accelerate the progress towards the Government's priorities*?

* see list of the Government's twelve prioritiesincluded in Part 1 of the draft Strategy.

Researching and innovating towards the frontier

Question 4:	Do you agree that the RSI Strategy should be focused on innovation at the "frontier" (creating new knowledge) rather than behind the frontier (using existing knowledge to improve the ways we do things)?
Question 5:	In which research and innovation areas does New Zealand have an ability to solve problems that nobody else in the world has solved? Why?
Question 6:	In which areas does New Zealand have a unique opportunity to become a world leader? Why?
Question 7:	What do you consider to be the unique opportunities or advantages available to the RSI system in New Zealand?
Question 8:	What RSI challenges are unique to New Zealand, that New Zealand is the only country likely to address?
Question 9:	What are the challenges of innovating in the public sector? How do they differ from those in the private sector?

Please type your submission below. If applicable, please indicate the question(s) to which you are responding.

Question 4: Do you agree that the RSI Strategy should be focused on innovation at the "frontier" (creating new knowledge) rather than behind the frontier (using existing knowledge to improve the ways we do things)?

We support the ambition expressed in the Strategy to support research at the "frontier" and the creation of new knowledge across the full range of disciplines and research areas. It is not clear, however, why the RSI Strategy should not embrace both the creation of new knowledge *and* the use of existing knowledge in creative and practical ways, to effect change and create impact on society, the economy and the environment. The importance of both these aspects of RSI needs to be acknowledged, rather than the current assumption that (a) innovation taking place "behind the frontier" consists solely of "the adaption of existing technologies" (p.18) and (b) that this equally important aspect of RSI is adequately addressed outside the Strategy. We are concerned that to place so strong an emphasis on what is novel creates the potential to focus researchers on trying to demonstrate that their ideas fit the concept of being at the frontier, and MBIE officials on trying to assure themselves that proposed ideas are indeed "new". As stated in the document, the distinctions between new and existing knowledge are often indistinct, and it should also be noted that "innovation" is not necessarily a direct synonym for "new". While we appreciate that the government does not want to see tax payer funding spent on replicating research that has been done elsewhere, the focus should be on the quality and impacts of the research, not on whether it can be demonstrated to be truly "at the frontier".

This has particular relevance to the goal for innovation in the public sector, where there is great potential to address major economic, environmental, social and culture issues through the scaling-up or innovative implementation of research. Too often novel research is funded for a pilot stage, but the funding structure does not allow for this

knowledge to be further transformed and extended in ways that create maximum impact. This is also a field where co-design with public sector stakeholders and other forms of collaborative connections can have a major influence on research and development that makes real change. A focus on the creation of new knowledge may offer unacceptable risks for public sector organisations, whereas the adaption, upscaling of exploration and transformation of knowledge can offer exciting opportunities for innovation, creativity and impact for public sector organisations. These opportunities should be addressed within the scope of the RSI Strategy.

Our key challenge – Connectivity

Question 10: Do you agree that a key challenge for the RSI system is enabling stronger connections? Why or why not?

Please type your submission below.

We commend the document in attempting to address the difficulties the New Zealand RSI sector faces in connecting with international researchers and markets; however, we consider that the current argument is not sufficiently clear to demonstrate that, as the document states, connections "are at the core of many of the issues in the RSI system" or that enabling stronger connections is likely to make the biggest difference to the performance of the RSI system. New Zealand universities have strong networks of connections with researchers and end users both nationally and internationally, and this needs to be recognised in the strategy, along with a greater focus on supporting and building on existing connections. The Indicators of Success (Annex Two) identifies a range of connection indicators; however, it is not clear how such connectivity will be measured, nor how a demonstration of stronger connections equates to achieving the ambitious goals in the strategy for RSI in New Zealand. A demonstration of connectivity is not in itself a guarantee of quality research and potential for creating impact. We consider that deeper analysis and evidence is needed before we can be confident that the focus on connections is the way to make the biggest difference to the performance of the system.

We further note that connections are not best served by the current 'co-opetition' model demanding co-operation in the National Science Challenges, but competition across other funds, and believe that a lessening of this competition element would provide greater opportunity for connections. For example, success in the Marsden Fund runs at around 9% but is limited by the funding quantum not the quality of the applications. The number allocated could easily triple without any loss in the quality/excellence of the proposals that are submitted. Rather, the current investment has very high application preparation costs in time and energy that are not recognised as part of the character of the investment portfolio. As a result, we are losing good researchers from New Zealand. We recognise benefits of some level of competition, but we are concerned that the focus of attracting overseas researchers and business investment at the expense of investing in the best of our researchers is not a well-balanced approach.

Guiding Policy – Excellence

Question 11:	Do you agree with the definition of excellence presented here as the best thing possible in its context? Why or why not?
Question 12:	How can we achieve diversity within our research workforce? What are the current barriers preventing a diverse range of talent from thriving in the RSI system?
Question 13:	Do you agree that excellence must be seen in a global context, and draw from the best technology, people, and ideas internationally? Why or why not?
Question 14:	Do you agree that excellence is strengthened by stronger connections?

Guiding Policy – Impact

Question 15: How can we improve the way we measure the impact of research?

Please type your submission below.

As noted in the draft Strategy, measuring the impact of research is challenging. We are concerned that the measures referred to in the document are fairly narrow, given the scope of the vision for RSI stated, and the statement that the government is focused on 'the change to the economy, society or environment that will arise as a result of our research and innovation'. Despite the recognition of the types of impact in the document, the Indicators of Success (Annex Two) focus heavily on: 1) citations of publications, which is one way to measure academic excellence and impact on the discipline but not the impact on the economy, society or environment; 2) commercialisation of the results of research, and 3) measures of the number, range and status of collaborating parties. The document refers to linking impact to the Treasury's Living Standards Framework (LSF) which recognises 12 wellbeing domains across four capitals: natural, human, social, and financial and physical. While this provides one useful frame of reference, the impacts of research extend beyond the wellbeing indicators in the LSF. The United Nation's Sustainable Development Goals provide a further, and broader, lens for considering impact. The government reports internationally against these goals via Statistics New Zealand, which are also directly relevant to the research sector. The Times Higher Education's international University Impact Rankings aim to measure the impact of universities on society, based on their success in delivering the Sustainable Development Goals so their omission is surprising especially when New Zealand Universities feature so highly on this ranking.

Furthermore, none of the indicators reflect impact as it would be interpreted from a Te Ao Māori or indigeneity lens, which is necessary if the government is serious about ensuring the RSI system is capable of 'engaging productively with Maori'. The 'line of sight to impact' recognised by Māori is to whanau. The 12 wellbeing indicators in the Living Standards Framework are measured at the level of the individual, and do not reflect fully the relationships involved in the flow between the different capitals. Extending the Vision Mātauranga policy provides ample opportunity to build this indigeneity lens into indicators of research impact that align with Te Ao Māori, Te Tiriti o Waitangi and whanau-centred thinking. We suggest that the discussion paper on *An Indigenous Approach to the Living Standards Framework* by Te Puni Kōkiri and The Treasury provides a useful starting for considering the measurement of impacts of RSI through an indigeneity lens. We further note that this model does not comment on the overarching principle of 'holism' that applies in Te Ao Maori over the whanau-centric approach, that is not considered in the LSF or the SDG and should be incorporated in impact measures of relevance to Māori. In this, the document suffers from not taking cognisance of the relevant research that already explores what could/should be used to reflect wellbeing or other outcomes for Maori.

Guiding Policy – Connections

Question 16:	Where do you think weak connections currently exist, and what are the barriers to connections at present?
Question 17:	What actions will stimulate more connectivity between parts of the RSI system?
Question 18:	How could we improve connections between people within the RSI system and people outside it, including users of innovation, and international experts, business communities, and markets?

Please type your submission below. If applicable, please indicate the question(s) to which you are responding.

Questions 16 – 18

The draft Strategy places emphasis on a connected national research system in order to gain optimal value from New Zealand's research activity. While open access to published research is specifically mentioned as a means of achieving this, we believe there is considerable scope for a greater emphasis on open access, particularly as a good deal of the document describes goals and activities that would be enhanced by broader public access to the published research outputs of universities and other research institutions. New Zealand's current performance on open access is poor, particularly in those areas where research is likely to make a social or economic impact. Centrally funded research paid for by taxpayers is largely inaccessible to those outside research communities, and depositing of author manuscripts in existing digital repositories would be a simple and effective means of improving the situation. Central funder mandates are likely to create an immediate lift in performance and would signal a firm intention on the part of government towards achieving the stated aims of the draft strategy. Please refer to Appendix 1 for additional information relevant to this part of the submission.

Actions – Making New Zealand a Magnet for Talent

Question 19:	How can we better nurture and grow emerging researchers within New Zealand and offer stable career pathways to retain young talent in New Zealand?
Question 20:	How could we attract people with unique skills and experience from overseas to New Zealand?
Question 21:	What changes could be made to support career stability for researchers in New Zealand? What would be the advantages and disadvantages of these approaches?
Question 22:	Do you agree with the initiatives proposed in the Strategy to support and attract talented researchers and innovators? Are any changes needed for these initiatives to be successful? Are there any other initiatives needed to achieve these objectives?

Please type your submission below. If applicable, please indicate the question(s) to which you are responding.

Question 19: How can we better nurture and grow emerging researchers within New Zealand, and offer stable career pathways to retain young talent in New Zealand?

We are concerned that the lack of support for the indirect costs of research to universities and other organisations can lead to suboptimal outcomes, such as including less expensive PhD students in research teams over the valuable capability of more expensive postdoctoral researchers.

Mechanisms to support this stage of early career researcher development would be welcomed beyond the specific ECR research funds. For example, investment in and support for a scheme that would build financial and project management skills would address an immediate capability building need. Standardisation of basic skills in these areas could become a requirement of hosting a research project, as might more investment in research leadership initiatives including mentoring schemes.

Given that around 8 to 9% of doctoral students end up in academic careers, we would like to see more initiatives that showcase and build pipelines to employment in other sectors. Specifically, we suggest that a paid internship/placement scheme established across the public sector for postdoctoral researchers with exposure to policy, implementation practice, and research leadership (including links into the Ministry Science Advisors) would be a useful way to build connections between research and practice and retain more talent within New Zealand.

Question 21: What changes could be made to support career stability for researchers in New Zealand?

Increased funding to the basic contestable funds would make a difference with this. Please refer to our comments on the key issue under Question 10. The increasing numbers of researchers contesting limited funding is a fundamental pressure on the system as is the proliferation of funds, poor planning of fund management across the system, and

inconsistencies in application information across the government funders. Providing systems that are easier to access, with increased chances of success, would help reduce system obstacles and provide greater career stability.

Actions – Connecting Research and Innovation

Question 23:	What elements will initiatives to strengthen connections between participants in the RSI system need to be successful?
Question 24:	What elements will initiatives to strengthen connections between participants in the RSI system and users of innovation need to be successful?
Question 25:	What elements will initiatives to strengthen connections between participants in the RSI system and international experts, business communities, and markets need to be successful?
Question 26:	Are there any themes, in addition to those proposed in the Strategy (research commercialisation and international connections), that we need to take into consideration?

Actions – Start-up

Question 27:	How can we better support the growth of start-ups?
Question 28:	Do the initiatives proposed in the draft Strategy to support growth of start-ups need to be changed? Are there any other initiatives needed to support start-ups?
Question 29:	What additional barriers, including regulatory barriers, exist that prevent start-ups and other businesses from conducting research and innovation?

Actions – Innovating for the public good

Question 30:	How can we better support innovation for the public good?
Question 31:	What public-good opportunities should our initiatives in this area be focused on?

Please type your submission below. If applicable, please indicate the question(s) to which you are responding.

Question 30: What elements will initiatives to support innovation for the public good need to be successful?

We support the plan to develop cohesive goals and partnerships across the government, society and the private sector, and would welcome more details on the purpose and focus of the proposed 'innovation missions'. It is also unclear how the sector will work with government departments and public agencies to set priorities, or how investment to support this will be targeted. We note that the Prime Minister's Chief Science Advisor's internship programme, aimed at strengthening the interface between researchers and policymakers, offers one useful model in this area as the focus of the interns is to provide synthesis of research on a particular topic

We suggest that the synthesis of research with the public sector needs and goals requires specific investment, beyond the research funding mechanisms currently available. We do not consider that the government's objectives in this area can be addressed fully by the re-examination of rules around how the system functions rather than making specific investments (p.29). Past funding to engage government agencies in setting priorities for research has been discontinued, and we recommend the government takes the opportunity to develop a new and coherent funding offer to address this gap in the current system. The assumption that knowledge dissemination is funded as part of a mission-led research project does not leverage the greatest value from that investment as knowledge mobilisation requires additional resourcing beyond the life of that project. The public sector is not well configured to providing either coherent pipeline processes, nor systematic synthesis and application of research on a topic-focused basis. There is increasing use of the government ministry's Science Advisors to comment on policy or implementation practice and the contributory research behind it, but a funding investment specifically to prompt better research synthesis and use would be a significant step forward. This would assist with another important system goal that could be made explicit in the Strategy; that of shortening the pathway from research delivery to uptake/adoption. Envirolink is one example of a mechanism that enables research to be directed toward regional council needs, but earlier ideas including Government-link or Iwi-link should be revisited.

Actions – Scale up

Question 32: What is the best way to build scale in focused areas?

Question 33: Do the initiatives proposed in the Strategy to build scale in focused areas need to be changed? Are there any other initiatives needed to build scale?

Note: see following page to comment on possible areas of focus

Scale up – Choosing our areas of focus

For this draft iteration of the strategy, **we seek input on the selection of possible areas of focus**. We will consider establishing around five focus areas, but, depending on the eventual selection, are likely to introduce them over time, rather than immediately. In addition to the criteria set out in the Strategy document, we invite stakeholders to consider the following factors in their suggestions –

- The ambition of this strategy to focus efforts in the RSI portfolio at the global frontier of knowledge and innovation.
- Ways in which the RSI system can accelerate progress on the government's goals.
- The focus areas already determined by *From the Knowledge Wave to the Digital Age*.
- Work already underway where we are already seeking to build depth and scale in the RSI system.

The following areas could be a useful start, and are highlighted in *From the Knowledge Wave to the Digital Age:*

- **Aerospace**, including both autonomous vehicles and our growing space industry.
- **Renewable energy**, building on recent investments in the Advanced Energy Technology Platform.
- **Health technologies** to improve delivery of health services and explore opportunities in digital data-driven social and health research.

We invite comment on these suggestions and welcome input on other possible focus areas.

Actions – Towards an Extended Vision Mātauranga

This section of the draft Strategy signals our intention to consult and collaborate further with Māori stakeholders to co-design our responses and initiatives. From that perspective, we consider the signals in the draft Strategy to be a start, rather than a set of final decisions. Nonetheless, we are keen on initial feedback in the following areas.

Question 34: Does our suggested approach to extending Vision Mātauranga focus in the right five areas? If not, where should it focus?

Question 35: How can we ensure the RSI system is open to the best Māori thinkers and researchers?

Question 36: How can we ensure that Māori knowledge, culture, and worldviews are integrated throughout our RSI system?

Question 37: How can we strengthen connections between the RSI system and Māori businesses and enterprises?

Please type your submission below. If applicable, please indicate the question(s) to which you are responding.

Questions 34 through 37:

Recognition that more could be done to reflect Māori interests in research is helpful but the section on an 'extended' Vision Mātauranga is not described well. The content on page 26 suggests that the issues are around participation by Māori in RSI activities that can be addressed by working with Māori stakeholders. We take issue with this approach. Rather than a policy positioned to drive outcomes desirable by Māori, that would then be of benefit to New Zealand as a whole, the Strategy continues to be driven from the viewpoint of benefit for the researchers/research team in engaging with Māori – a fundamentally different approach that will not achieve impact for Māori. While we commend the co-design approach that is mooted, it is disappointing to have no forward plan, timetable or understanding of what "extending' the Vision Mātauranga policy might mean. Furthermore, in looking to Māori to address the issues, the Strategy fails to position the policy clearly for the non-Māori who make up the majority of researchers currently in our research system. We suggest deeper thinking is needed to identify how this might be done and that this is a key challenge to be addressed.

Lack of acknowledgement of Māori anywhere in the document other than in section 4 (on an Extended Vison Mātauranga) is telling. We suggest a set of other questions need to be asked of the new Strategy:

- What analysis has been done on this strategy in meeting the intent and provisions of Te Tiriti o Waitangi? How will this inform the extension of Vision Mātauranga and the shape/content of the overall strategy?
- How might the research system be positioned to more clearly reflect the outcomes sought from Vision Mātauranga?
- As the only country in the world with a kaupapa Māori knowledge base, how can the system support synergies between this and other research methodologies?

- Given New Zealand's international leadership on indigenous research (a) is at the global frontier (Q 4) and has the potential to solve problems that nobody else has solved (Q5, Q6, Q7), how can it be supported to flourish?
- What is the role of the RSI system in advocating for impact measures that reflect indigenous perspectives and how might indigenous research be advocated up into international research coding and impact assessment?

Actions – Building Firm Foundations

Question 38:	Do the current structures, funding, and policies encourage public research organisations to form a coordinated, dynamic network of research across the horizons of research and innovation? What changes might be made?
Question 39:	Is the CRI operating model appropriately designed to support dynamic, connected institutions and leading edge research? What changes might be made?
Question 40:	What additional research and innovation infrastructure is necessary to achieve the goals of this Strategy? What opportunities are there to share infrastructure across institutions or with international partners?
Question 41:	What elements will initiatives in this area need to be successful?

Please type your submission below. If applicable, please indicate the question(s) to which you are responding.

Question 38: Do the current structures, funding, and policies encourage public research organisations to form a coordinated, dynamic network of research across the horizons of research and innovation? What changes might be made?

Extant research funds administered through MBIE, the HRC or the Royal Society do not seek or support fundamental Creative and Performing Arts (CPA) research, despite the role which design plays in the innovation process. CPA research is cast in a subservient role with limited opportunity to follow its own basic disciplinary research agendas in order to develop new approaches, methods, expressions and output forms. It is disappointing that the significant contributions to New Zealand's innovation through CPA research are not more generously supported by discipline-specific government investment. Consideration should be given to establishing a new and separate fund, modelled along the lines of the Arts and Humanities Research Council (AHRC) and the Royal Society of the Arts (RSA) in the UK, and separate from the Royal Society, to channel blue skies research funding to the CPA. The fund would need to be staffed by specialists to encourage research in this field. Such a fund would support international sector competitiveness, maintain our international excellence in university-level education in these fields and expand our ability to express and utilise our culturally-based CPA practices to bring innovative solutions to the social, cultural and economic challenges and opportunities of our age. Please refer to Appendix 2 for additional information relevant to this part of the submission.

Actions – General

Question 42: How should the Government prioritise the areas of action, and the initiatives proposed under each area?

General

Question 43: Do you have any other comments on the Strategy which have not yet been addressed?

Please type your submission below.

We commend the government for setting out strategic goals for the RSI sector, and for the direction that the document aims to give researchers and stakeholders. Overall we feel there is more work needed to align the ambitious and inclusive aims the Strategy outlines for the sector, with the more specific goals and priorities expressed in the document. Examples include the narrow measures of success for research commercialisation; the restriction of the mention of the need for social science to support the government's health and safety priorities (p.12); the particular focus on connections with Australia and Singapore; equating the goal of supporting thriving and sustainable regions with the narrow focus on improving productivity improvements and generation of new products and industries (p.11), and the attempt to identify focus areas and technologies for start-ups and scale-ups. In addition the Indicators of Success (Annex Two) offers a narrow range of measures against the scale of the stated vision for New Zealand's RSI sector. While we understand the need for prioritisation and measurement, there is a danger in 'second guessing' or limiting future needs and opportunities. We consider that more work needs to be done to provide a coherent framework across these kinds of specific priorities and/or examples, and to ensure that the RSI sector remains sufficiently flexible and agile to respond to emerging issues and opportunities for New Zealand and internationally. This would be an ideal time to take a lead internationally in developing impact measures that reflect the needs of groups eg whanau- or hapori-centric or community groups rather than just of individuals.

In addition, we do not share the confidence expressed in the Strategy that the RSI investment system is well-designed and fit for purpose (p.7). The current system will require a significant increase in funding in order to achieve the goals in the Strategy and careful consideration need to be given to the infrastructure to support such funding and to avoid the introduction of perverse incentives. The proliferation of discrete funding rounds, such as those associated with the National Science Challenges and the splitting up of the Catalyst Fund into smaller more directed funds, that are spread throughout the year, puts enormous pressure on researchers, research managers, and MBIE officials to manage the associated application and assessment processes leaving little capacity for developing innovative ideas or developing valuable connections. This proliferation of funds could be argued to be increased opportunity, but it has also resulted in much higher administration demands and funding uncertainty.

The statement *'To be successful, innovation relies on fluid connections, change encounters, and free sharing of knowledge'* (p. 14) is a bold one, without providing evidence as to why this might be. There are many examples of innovation that have evolved through deliberate encounters building off long-established connections. We note this particularly because innovation is an ongoing characteristic of Māori endeavour yet would not be recognised as such as described in the draft Strategy. This and other such confidently made statements in the document should be challenged to avoid the potential to preclude innovation that occurs where these conditions do not apply.

While we support the introduction of the R&D tax incentives, we are not convinced that the quantum of funding investment shown in the Strategy system funding diagram will be realised. We recommend that attention be given to optimising uptake of this opportunity by ensuring both industries and researchers understand how to access and use the incentives. At this point we understand that the IRD do not themselves know how to interpret or apply the condition in the incentives scheme around the 'novel' nature of the research to be eligible to claim the tax credit so that significantly more guidance is needed.

The document is predicated on the NZRIS system being used universally, but we note that there is no such agreement at this point, given that the benefit and cost case is still being established.

The term 'Environmental preservation' (p. 17) continues to be used, but is inappropriate. Agencies involved in environmental management use terms such as 'maintenance or enhancement of the environment' or 'environmental protection'; we encourage this terminology to be adopted in the strategy.

While questions 27, 28 and 29 ask about supporting more start-ups, there is nothing in the document that recognises the need to evaluate the benefit of the historic and current investment in start-ups.

The performance of New Zealand innovation driven by Government investment would benefit from a broadening of the current conceptualisation of innovation, to recognise the role of innovation in delivering social as well as economic benefits, the value of design to innovation, and the need for and the importance of an innovation culture. The current policy settings and funding for government support for innovation in New Zealand are very science-focused. There is a growing recognition that through the effective integration of design, companies are more likely to be innovative. The draft Strategy should include specific initiatives aimed at increasing the use of design in the private and public sectors to drive innovation to enhance New Zealanders' wellbeing. It should include financial levers and incentives to encourage business investment in initiatives, and the establishment of a fund that supports the marriage between the creative and science sectors. Please refer to Appendix 2 for additional information relevant to this part of the submission.

Appendix 1:

Open Access and the *Research, Science & Innovation Strategy* Consultation Draft

Bruce White, Open Access and Copyright Advisor, Massey University

Summary

- The draft strategy places emphasis on a connected national research system in order to gain optimal value from New Zealand's research activity
- Open access to published research is specifically mentioned as a means of achieving this
- New Zealand's current performance is poor, particularly in those areas where research is likely to make a social or economic impact
- Centrally funded research paid for by taxpayers is largely inaccessible to those outside research communities
- Depositing of author manuscripts in existing digital repositories would be a simple and effective means of improving the situation
- Central funder mandates are likely to create an immediate lift in performance and would signal a firm intention on the part of government towards achieving the stated aims of the draft strategy

Discussion

The only mention of Open Access in the draft document occurs on page 29 –

> "We want to focus on increasing the opportunities for individuals and resources to connect easily. We expect this will mean mainly re-examining some of our rules around how our system functions, rather than making specific investments. For example, we may consider our policies around open access to data and research, management of intellectual property within our research organisations, and the incentives our policies place on researchers and innovators to connect and share freely."

However, a good deal of the document describes goals and activities that would be enhanced by broader public access to the published research outputs of universities and other research institutions. For example –

> "Create a progressive investment programme to enhance the contribution of main RSI funds to government health, social, environmental and economic objectives. Focus on sustainable increases to the R&D Tax Incentive, the Endeavour Fund, the Marsden Fund and the Health Research Council." (p3)
>
> "By systematically exploring problems and opportunities through research, we generate new knowledge. This helps us to understand and address social and environmental challenges, as well as generate ideas and technologies. By applying this knowledge through innovation, we can develop capabilities and services that can make a real difference to our people and our environment." (p8)

Data from the Council of New Zealand University Librarians' Open Access project suggests that there is still a considerable distance to go before OA is making its full contribution to these goals. For example,

only 43% of research articles published by staff of New Zealand universities in 2017 were openly accessible to the public[1]. These percentages become particularly troubling in relation to those research areas likely to have a direct impact on the New Zealand economy and society –

- Agriculture (30% open)
- Business (24% open)
- Engineering (21% open)
- Social sciences (23% open)

There is reason to believe that the consequences of this situation are not well understood within research communities themselves for the simple reason that researchers generally do not rely on openly accessible documents to carry out their work – they are generally employed within institutions that give them almost unfettered access to the journals and research publications they need to carry out their work. However, there is a considerable body of potential users of New Zealand research publications who do *not* have this sort of access and who may encounter significant barriers (including financial) in making use of this research. These include –

- Professional practitioners such as veterinarians, social workers, agricultural advisors, engineers and lawyers
- Small and medium businesses
- Journalists who play a vital role in promulgating research to the general public
- Entrepreneurs and innovators
- Policymakers at central and local government level
- Educators and students outside the University system
- Community groups and NGOs
- Members of the general public

While there is a general perception that in order for research articles to be publicly accessible it is necessary for payments to be made to publishers (in the form of Article Processing Charges) this is not, in fact, the only route to this goal. All New Zealand universities run institutional repositories that are able to legally archive and make available published articles, often with an embargo of twelve months. (This is known as Green Open Access.) If these allowances were fully taken up it would be possible to substantially increase the open percentage and make the bulk of New Zealand research available to the public within a reasonable timeframe. No loss of commercial advantage is involved in doing this as the work has already been published, but the likelihood that it would be taken up by local practitioners and innovators would be significantly increased.

Instead, we face the situation whereby the majority of taxpayer-funded research is confined behind paywalls, with the result that it is available for use by large overseas research institutions with strong links to industry and government while at the same time being unavailable for use by New Zealand companies, organisations and individuals. The table below[2] illustrates this point –

[1] Open access in New Zealand universities: an environmental scan. Report to CONZUL, 12 August 2019. https://www.universitiesnz.ac nz/sites/default/files/uni-nz/OA%20CONZUL%20Environmental%20Scan%20version%201.02.pdf

[2] Statistics on the open status of documents are based on data from unpaywall.org supplemented by a search of New Zealand institutional repositories, October 2019

Funder	Papers from New Zealand universities 2017	% Open	% Open Green
Royal Society of New Zealand	402	39%	16%
Health Research Council of New Zealand	414	43%	14%
Ministry of Business Innovation and Employment	360	32%	11%

That Open papers are likely to make a greater social and economic impact, as well as influencing other researchers, can be measured from references to them in the media and policy documents and by traditional scholarly citations[3]. From this it is possible to determine that they have made some sort of impression outside of academia and that a route to real-world impact has been established. The table below shows the greater likelihood of papers being mentioned in the media if they are openly accessible –

Funder	Media mentions all papers	Average papers mentioned Open	Average papers mentioned Closed	Average papers mentioned Green
Royal Society of New Zealand	12%	22%	6%	17%
Health Research Council of New Zealand	18%	26%	13%	25%
Ministry of Business Innovation and Employment	8%	17%	3%	21%

Effects on real-world policy award difficult to measure as research publications are rarely cited in policy documents, but the evidence that is available suggests that openness is a significant factor.

Funder	Policy mentions all papers	Average papers mentioned Open	Average papers mentioned Closed	Average papers mentioned Green
Royal Society of New Zealand	3%	3%	2%	3%
Health Research Council of New Zealand	3%	3%	3%	2%
Ministry of Business Innovation and Employment	4%	6%	3%	10%

While only one MBIE-funded paper in twenty-five is subsequently mentioned in a policy document, this figure rises to one in ten for those available through repositories. Although the numbers involved a relatively small, this is nonetheless suggestive of the fact that policymakers themselves do not have

[3] Media and policy document mentions based on data from altmetric.com. Bibliographic citations based on data from crossref.org.

optimal access to published research and are to a significant degree reliant on those that have been made openly accessible.

Funder Mandates and Green Archiving

Internationally, the depositing by authors of published research papers in repositories has been disappointing and this is true of New Zealand universities where the need for institutions to optimise their publishing outputs can run counter to their goal of making these outputs as accessible as possible. On the subject of institutional mandates the CONZUL report commented that

> "Mandates by funders tend to be more powerful in terms of compliance because they can hold back payments in response to noncompliance. The UK's Wellcome Trust and the US National Institute of Health have a compliance rate of around 90%."[4]

The absence of funder mandates for open access is reflected in the relatively poor performance in this area of New Zealand research. The table below is based on figures from the Leiden Rankings of publication outputs 2004-17 from 963 major universities worldwide[5] –

Country	**# Papers**	**# OA papers**	**Percentage OA**
New Zealand	29,091	11,266	38.70%
Australia	273,486	113,789	41.60%
Canada	281,304	117,247	41.70%
Germany	397,439	190,543	47.90%
Ireland	26,548	12,966	48.80%
US	1,876,219	1,013,502	54.00%
Norway	42,608	23,109	54.20%
UK	454,802	322,827	71.00%

Conclusion

While it is difficult to conclusively demonstrate the social and economic impact of any given piece of research without a detailed case study, it is nonetheless clear that such impacts are less likely to occur in the absence of a clear path between the published research and its potential users, be they innovators, entrepreneurs, practitioners or engaged citizens. As the New Zealand research ecosystem is currently structured, however, there are only weak incentives to encourage the opening up of research and considerable barriers. If government is to take a leading role in this area, as the draft strategy document appears to suggest, then the use of funder mandates would be a sensible and straightforward means of doing this.

[4] Open access in New Zealand universities: an environmental scan.
[5] CWTS Leiden Ranking 2019 https://zenodo.org/record/3339177#.XcCCI5ozaUk

Appendix 2

DesignCo.

Submission to the Government's new research, science and innovation strategy by Massey University's College of Creative Arts

MARCH 2019

Staff of Massey University's College of Creative Arts attended the MBIE workshops in December 2018 which sought input into the Government's new research, science and innovation strategy. We appreciated the tone of the workshops, which were refreshingly open to new ideas and approaches. The Ministry offered those attending an opportunity to provide additional input.

The performance of New Zealand innovation driven by Government investment would benefit from a broadening of the current conceptualisation of innovation. This would serve to recognise the role of innovation in delivering social as well as economic benefits, the value of design to innovation, and the need for and the importance of an innovation culture.

It is our view that design in New Zealand is unused and poorly understood. We think that efforts to increase the use and understanding of design in New Zealand would provide huge benefits to New Zealand. Our aim is for the Government's new research, science and innovation strategy to be infused with design at all relevant touch points.

1. WHAT IS DESIGN?

In the last few decades, there has been a broadening of how design is defined and understood. Design is no longer viewed through a narrow lens of making a product such as a chair or brand look good, or as something that is added at the end of a process. Nor can design be defined by listing its types or disciplines, i.e. visual communication design, spatial design, product design, or the more recent design thinking and service design. Design is much more.

- Design is a systemic creative process rooted in the field of the creative arts. It frames its contribution through the lens of the human condition and generates tangible outcomes that comprehensively define highly desirable future states for products, processes, communications, environments, services or organisations.
- Design is a collaborative and speculative process that demands the contribution of multiple disciplines and specialist experts to come together to discover new solutions.
- Design is a tool for business and organisational growth and policy planning at the highest strategic level.
- Design is a powerful commercialisation tool, 'a link between creativity and innovation, shaping ideas into practical and attractive propositions'.[1] It has value and capacity to shape ideas to become practical and attractive propositions for users, customers and communities.
- All products, services and policies need design.

There is a growing recognition that through the effective integration of design, companies are more likely to be innovative.[2] Companies that work with design strategically or as a process are far more likely to develop new products that customers need and want. SMEs that use design are more likely to engage in developing new products and services for new customers. And design staff are a major source of ideas for innovative activities in high-tech and medium-tech sectors.

[1] The UK Cox Review (2005) available online

[2] Commission of European Communities (2009), Fortune 500 study.

New Zealand Trade and Enterprise's Better by Design programme has demonstrated some elements of this over the past ten years. In their words 'design is the purposeful creation of value for a business and its customers. Design unlocks better business — creating more desirable products and services, and passionate customers, fostering more dynamic and purposeful cultures within business, stimulating faster growth and delivering tangible bottom-line results'. [3] Design adds significant value to products and services. A recent DesignCo report on the value of design to the New Zealand economy showed that if design were treated as an individual industry its contribution would be larger than agriculture, contributing an estimated 4.2% or $10 billion to New Zealand's GDP and 4.4% of New Zealand's total employment or 94000 FTE jobs.[4]

There is also a growing body of evidence that demonstrates the value of design thinking and processes as tools for driving innovation within the public sector[5] and that design can play a significant role in helping make the public sector more efficient. Design has the potential to deliver more holistic responses that better understand the complex connection between economic activity, health, housing, the environment, and whānau and community wellbeing. Architecture and urban design, for instance, help us all live better lives in our environment, and also offer huge opportunities from a culturally grounded perspective which recognises the connection between wellbeing, economics and the environment.

2. WHAT NEEDS TO CHANGE IN THE NEW STRATEGY?

The current policy settings and funding for government support for innovation in New Zealand are very science-focused. They fail to recognise the role of innovation in delivering social as well as economic benefits, the value of design to innovation, and the need for and the importance of an innovation culture.

The new strategy should address these shortcomings. It should develop and implement a broader innovation policy framework and back this up with investment in new (innovative) areas.

The role of innovation in delivering social as well as economic benefits

A recent NESTA working paper on inclusive innovation policy examined and compared innovation policy statements of ten countries (Brazil, Canada, Chile, France, Germany, Israel, Norway, South Africa, Sweden and the United Kingdom).[6] It found that:

- there is a growing emphasis on social impact as a direct goal of innovation policy;
- all ten countries aim to direct innovation towards some socially beneficial goals, with the most commonly observed themes being connection to the environment, health and urban sustainability;
- initiatives to encourage wider participation in innovation are common, but focus on some groups more than others; and
- inclusive governance is less evident than the other dimensions, but a number of countries at least report having involved a wide range of stakeholders in preparing their innovation policy strategies.

The NESTA paper notes: 'As innovation becomes more oriented towards societal goals, this challenges dominant ideas about the types of organisations that innovation policymakers should be concerned with. Rather than focusing mainly on research institutions and firms, civil society becomes relevant too.'

[3] Refer to http://www.betterbydesign.org.nz/why-design-matters

[4] See: http://designco.org.nz/value-of-design/the-value-of-design-to-new-zealand/. DesignCo comprises the schools of design at Auckland University of Technology, Massey University, Otago Polytechnic and Victoria University of Wellington; Nga Aho, a network of Maori design professionals; NZTE's Better By Design programme; Callaghan Innovation; the Auckland Co-design Lab; and the Designers Institute of New Zealand.

[5] Christiansen and Bunt, 2012.

[6] https://www.nesta.org.uk/report/how-inclusive-innovation-policy/

The value of design to innovation

The new strategy should include specific initiatives aimed at increasing the use of design in the private and public sectors to drive innovation to enhance New Zealanders' wellbeing. It should include financial levers and incentives to encourage business investment in initiatives, and the establishment of a fund that supports the marriage between the creative and science sectors (one need only look at the Brighton Fuse project to see the impact that the combination of creative and technological innovation can have on the performance of companies[7]).

The recent DesignCo report on the value of design to the New Zealand economy set out case studies of leading New Zealand firms and organisations which have used design to create value through new ideas. These include Gallagher, Fisher and Paykel Appliances, Xero, Allbirds, the Design for Health and Wellbeing Lab and Air New Zealand. The case study on Gallagher notes that one impact of the use of design has been to embed continuous innovation in the firm (it notes that previously innovation in the firm was partly based on hit and miss and partly based on heroics).

The importance of an innovation culture

The new strategy should recognise the importance of an innovation culture and support this through funding. As the Raine report of 2011 noted,[8] 'a future innovation culture in New Zealand will be characterised by a vibrant design and creative arts community, and by the innovative contributions of professionals in business, law, the humanities and social sciences.' Public investment is required in the creative sector to bring it up to par with investment in other components of New Zealand's innovation eco-system.

In keeping with this, the new strategy should provide support for the development of a national innovation-focussed curriculum at secondary school, one which recognises and supports creative arts subjects (as well as those in science, technology, engineering and mathematics). The Ministry for Business Innovation and the Employment should lead this initiative to bring all government agencies in line with an innovation system that is best able to contribute to New Zealand's prosperity and wellbeing.

If innovation is broadly understood as 'new ideas that are put into practice and create some kind of value', it is disappointing that the current policy settings have not embraced the important contribution of design. Whilst from a funding perspective it may be desirable to limit the scope of support to science only, this limits the impact of investment and the efficacy of the innovation system. We think a progressive government is well placed to embrace design's role in New Zealand's innovation system and recognise that it has an important role to play in contributing to New Zealand's prosperity and wellbeing, if given half a chance.

[7] See: http://www.brightonfuse.com/what-is-brighton-fuse/

[8] Powering Innovation. Improving access to and uptake of R&D in the high value manufacturing and services sector. Report prepared by panel members: Professor John Raine (Chair), Professor Mina Teicher, Philip O'Reilly. An independent report commissioned by the Ministry of Science and Innovation (2011).