New Zealand Research, Science and Technology Priorities Submission

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Hon Dr Wayne Mapp
Minister of Research, Science and Technology
PO Box 5336
Wellington 6145
New Zealand
feedback@morst.govt.nz

Thank you for the opportunity to make a submission on New Zealand's research, science and technology priorities: feedback document. This submission is made on behalf of the NZICT Group Members ("NZICT"), and input from its Communities of Interest, notably the NZ Health IT Cluster, and other stakeholders including the University of Auckland Computer Science Department, Square Kilometre Array Research & Development Consortium, and the Square Kilometre Array Industry Consortium.

Regrettably the discussion paper was not sent directly to NZICT Group for comment, therefore this submission has had to be somewhat restricted in terms of the depth of its commentary. NZICT Group looks forward to the opportunity to develop many of these issues in more detail and further discussions with Government as we mutually seek in partnership to achieve important long-term economic and social goals for New Zealand.

Areas of alignment:

- The principles outlined by the NZ RS&T paper include: multidisciplinary approach to reduce waste, focus on training and skills base including a national internship programme, balance of supporting discovery through to exploitation. Each of these principles is recognized as either specific strategic themes or underlying assumptions behind NZICT Innovation sub-committee's strategy (see the attached presentation document).

- Investment Structure, High Tech industries are the second biggest area of focus. The NZICT Innovation sub-committee believes that High Tech (ICT) in particular represents one of the biggest opportunities for NZ productivity growth.

- Investment Structure, principles listed include, co-funded with users, strategic long term, and commercialisation support. Each of these areas was mentioned as critical by the NZICT Innovation sub-committee.

Areas for improvement:

- Potential platforms for investing are listed. Innovation in ICT (and the use of ICT) is not one of these. The NZICT Innovation sub-committee believe that Innovative ICT is/should be a key enabler of productivity growth and innovation in other sectors. We propose adding an investment platform supporting research into how ICT could better enable productivity in the other sectors mentioned in conjunction with the Government's investment in ultra-fast broadband. This ICT-broadband platform could sit across all of the other ones mentioned.

Any enquiries with respect to the attached submissions should be made in the first instance to Brett O'Riley, Chief Executive Officer, NZICT Group, 021 02709021 or via email at brett.oriley@ict.org.nz.

No part of this submission is confidential and the NZICT would be happy for it to be made publicly available.

Thank you for the opportunity to submit. The NZICT would welcome the opportunity to discuss this submission in more detail.

SUBMISSION ON NEW ZEALAND RESEARCH, SCIENCE AND TECHNOLOGY PRIORITIES

1. EXECUTIVE SUMMARY

1.1. The NZICT Group is the information communications and technologies industry body representing the supply side of the industry. NZICT is materially interested in improving New Zealand's research, science and technology priorities as part of its goal of improving the country's global competitiveness.

1.2. The areas of alignment are:

a) The principles outlined by the NZ RS&T paper include: multidisciplinary approach to reduce waste, focus on training and skills base including a national internship programme, balance of supporting discovery through to exploitation. Each of these principles is recognized as either specific strategic themes or underlying assumptions behind the NZICT Innovation sub-committee's strategy (see the attached presentation document).

b) Investment Structure, High Tech industries are the second biggest area of focus. The NZICT Innovation sub-committee believes that High Tech (ICT) in particular represents one of the biggest opportunities for NZ productivity growth.

c) Investment Structure, principles listed include, co-funded with users, strategic long term, and commercialisation support. Each of these areas was mentioned as critical by the NZICT Innovation sub-committee.

1.3. The areas for improvement are:

a) On slide 14 potential platforms for investing are listed. Innovation in ICT (and the use of ICT) is not one of these. The NZICT Innovation sub-committee felt that innovation ICT is/should be a key enabler of productivity growth and innovation in other sectors. We recommend adding an investment platform supporting research into how ICT could better enable productivity in the other sectors mentioned in conjunction with the Government's investment in ultra-fast broadband. This ICT-broadband platform could sit across all of the other ones mentioned.

1.4. We look forward to engaging with the Government on these issues to ensure that there is alignment between the ICT industry, consisting of providers of; Hardware, Services, Networks, Education and Training. We continue to look forward to working with the broader RS&T community.

1.5. NZICT Group will be the champion for leveraging quality ICT to increase New Zealand's global competitiveness.

Summary of Recommendations in this paper:

1. **Recommendation:** That RS&T activity associated with the deployment of Ultra-fast Broadband be identified as a core long-term priority across the Economic Outcomes, Public Good and Top Talent and Research Infrastructure areas, with funding directed to maximise outcomes.

2. **Recommendation:** That SKA is specifically identified as a key long-term government science, research and technology priority given its potential to step change technology development in New Zealand. Clearly funding priorities will change depending on the success of the ANZAC bid, but there are opportunities that would remain even if the southern African bid is preferred by the international research consortium. Regardless of final location, opportunities for economic growth in NZ will be realized through investment in the SKA project in the niche areas of strength in NZ. Such an investment will be maximized via both direct investment in the ICT opportunities and through increased human capital.

3. **Recommendation:** That New Zealand consider a direct investment and/or establishment of relationship with the International Centre of Radio Astronomy research based in Perth, Western Australia, as a means of securing New Zealand's involvement in SKA related RS&T.

4. **Recommendation:** Specific areas where RS&T in relation to ultra-fast broadband will make an impact are:
   a) High technology industries
   b) Health & Society
   c) TopTalent
   d) International Relationships
   e) Research infrastructure

5. **Recommendation:** That New Zealand establish a centre of excellence for environmental monitoring, analysis and decision support, including a consortium between industry, research and governmental bodies.

6. **Recommendation:** That New Zealand provides direct investment into developing projects to address identified environmental problem areas in the areas of environmental monitoring, analysis and decision support.

7. **Recommendation:** Expand the priorities to include the development of network enabled applications to drive productivity growth for the business and public sectors.

8. **Recommendation:** Expand the priorities to include developing a national remote monitoring network based on KAREN and other infrastructure to stimulate the development of network based analysis and data processing.

9. **Recommendation:** Develop oil & gas research and resource monitoring capability including 3D seismic based on the deployment of ultra-fast broadband, and additional investment in subsea infrastructure leveraged off the proposed Kordia Optikor Trans-tasman cable which will pass close to the Taranaki Hydrocarbon resources.

10. **Recommendation:** Develop automated mining options utilising robotics and minimal human intervention.

11. **Recommendation:** Develop New Zealand as a leader in green ICT by concentrating content and processing power at optimal power and environmental locations, and develop low power standards for hardware and infrastructure utilising remote monitoring and renewable energy.

12. **Recommendation:** Expand the priorities to include developing a national environment remote monitoring network based on KAREN and other infrastructure, to stimulate the development of network based disaster early warning, analysis and data processing.

13. **Recommendation:** NZICT Group and its stakeholders act as an advisory group for the Foundation for Research Science & Technology in relation to the platforms identified within this submission.

14. **Recommendation:** NZICT Group and the Health IT Cluster, act as an advisory group for the Health Research council in relation to the platforms identified in this submission.

15. **Recommendatio**n: NZICT Group continues to pro-actively coordinate industry participation in RS&T projects like the SKA in order to maximise the direct and indirect benefits to the ICT vertical industry, and the consequent impacts on the horizontal ICT platform that supports New Zealand's economy and society as we seek to step change the country's economic and social performance.

2. INTRODUCTION

2.1. In this submission we have responded to the specific structure and questions raised in the document. However we also wish to highlight the work undertaken by NZICT's "Imagine NZ" Innovation sub-committee, looking at areas where improvements are required in the innovation eco-system. Many of these issues are also canvassed in the discussion paper.

2.2. We look forward to the opportunity of developing many of these issues in more detail and to further discussions with Government as we mutually seek in partnership to achieve important long-term economic and social goals for New Zealand.

3. INVESTMENT STRUCTURE AND EMPHASIS

Response to NZ RST Priorities Section 4. Priority Investment Areas

3.1. The major weakness of this investment structure is that it does not direct RS&T funding to support and capitalise on other major government funding priorities related to the high-tech sector. Specifically we wish to highlight:

a) $1.5 billion investment in ultra-fast broadband by Crown Fibre Holdings;

b) The joint Australia-NZ bid for the Square Kilometre Array project;

c) Environmental management, including resource monitoring, analysis and tools to enable decision support based on this analysis.

4. ULTRA-FAST BROADBAND

Additional response to NZ RST Priorities Section 4. Priority Investment Areas

4.1. The Government has clearly identified this infrastructure investment as a priority long-term programme designed to deliver benefits across society:

a) to stimulate business sector productivity improvement and innovation;

b) to stimulate public sector productivity and innovation;

c) to lower back-haul costs for the deployment of wireless technologies; and

d) to specifically step change the delivery of services to the health and education sectors.

4.2. NZICT sees the critical need for this 10 year infrastructure investment programme to be supported by a 10 year public good programme of RS&T, to ensure New Zealand capitalises on this investment and maximises the cost benefit.

4.3. This is a step change opportunity for the new Zealand economy, across all sectors, with the potential to develop world leading RS&T in the "Kiwi UFB Laboratory", driven by public and private R&D investment. RS&T can drive paradigm changes in every sector of the economy.

4.4. Matching RS&T priorities to this infrastructure investment stands to provide massive benefits for New Zealand in developing world leading capability in relation to the development of broadband enabled applications, including cloud computing for multiple sectors. It is highly likely that a strong commitment to this programme will not only stimulate innovation directly, but also attract private sector RS&T funds from both multi-nationals and NZ based ICT players.

4.5. A long-term cohesive RS&T investment programme could provide multiple benefits for New Zealand including:

a) Regain its position as a global leader in health ICT, and the NZ Health IT Cluster is able to identify specific software and applications areas that could be stimulated by RS&T investment, including advanced health informatics remote diagnosis and patient monitoring, a key element of 21st century healthcare with an aging demographic.

b) Education applications including remote learning, advanced personalised learning, interactive class rooms, self paced education and international tele-learning. This RS&T activity could revolutionise education standards and outcomes in New Zealand, particularly in increasing the number of RS&T graduates, thereby driving innovation and productivity improvements. The RS&T activity could also develop Intellectual property and applications that New Zealand could generate foreign exchange from, supporting the already high global demand for NZ pedagogical expertise.

c) Development of cloud based services for New Zealand business and public sectors to drive productivity improvements.

d) Cyberspace security and monitoring.

e) High performance computing to support the delivery of content and services delivered over the ultra-fast broadband infrastructure, including related aspects like security and data storage.

f) High speed networking including the commercialisation of 100 Gbps interfaces in the Wide Area Network and network performance.

g) The development of digital technologies driving machine to machine interfaces, across both wireline and wireless technologies with application across a range of sectors, but notably agriculture, aquaculture, tourism, manufacturing, processing, transport and social services.

h) Developing applications associated with the development of green ICT.

i) Developing applications to enhance productivity and drive potential export earnings including virtual reality, 3D modelling, game development and web enhancement applications.

j) Developing applications associated with carbon emissions monitoring and trading.

Recommendation: That RS&T activity associated with the deployment of Ultra-fast Broadband be identified as a core long-term priority across the Economic Outcomes, Public Good and Top Talent and Research Infrastructure areas, with funding directed to maximise outcomes.

4.6. Other areas where RS&T in relation to ultra-fast broadband will make an impact are:

a) High technology industries

b) Biological Economy

c) Environment

d) Hazards & Infrastructure

e) Health & Society

f) International Relationships

4.7. NZICT Group and its stakeholders are developing a digital economy measurement framework with the Ministry of Economic Development to measure improvements in New Zealand both in real terms, and in relation to other countries globally. This will continue to provide direction as to RS&T priorities that support the government's economic transformation agenda. NZICT is able to provide more detail around this methodology and modelling work, being developed in association with the International Institute of Software Economics Innovation and Entrepreneurship.

5. SQUARE KILOMETRE ARRAY

Additional response to NZ RST Priorities Section 4. Priority Investment Areas

5.1. The Square Kilometre Array will be the world's largest radio astronomy project, with 3.5 billion Euros estimated to be invested by a multi-lateral funding group. The SKA will collect more data in the first 7 hours of operation than all the world's radio telescopes have collected in the last 70 years. The science generated by the SKA will advance our understanding of the universe on an unprecedented scale, and for the first time will answer the questions of how the first galaxies formed, how magnetic fields form in the universe, what is dark energy and are we alone? This project is one of the four biggest science projects of the century, on the scale of the Haldron collider and the deep space programme, with all of the consequent technology challenges involved, including processing more data in a year (14 exabytes) than mankind currently generates in total (4 exabytes).

5.2. The SKA is being bid for by Australia and New Zealand, against southern Africa, for the location of its satellite dish infrastructure, and the supporting research and development, processing and dissemination systems. Success with this bid would result in an unparalleled innovation opportunity for the NZ ICT industry, in partnership with the broader RS&T sector.

5.3. NZICT has established the NZSKA Research and Industry Consortium, working with the scientific community to maximize the opportunity for this country. Together we have identified the following goals for New Zealand:

a) To be the world leader in radio astronomy science and technology by 2050.

b) To implement the best window into the history and makeup of our u economic & social growth for the next generation.

c) To host the world leading radio telescope producing paradigm shifting science & engineering.

d) For NZ to be coherent & contribute to Australia winning the bid

e) See further into the past

f) A credible world-leading role in a mega science project

g) New Zealand is recognised as a place where leading edge science and

technology happens, and we host the SKA.

h) To have SKA as a world class exemplar of trans-tasman science & technology collaboration.

i) Use the SKA to inspire a new generation of scientists & engineers: this is our 'mission to mars'.

5.4. Opportunities for the ICT industry are diverse and include:

a) Development of image and data processing technology.

b) Development of web dissemination tools including hosting.

c) Super computer resources and data storage.

d) Network architecture and design, and ultra fast broadband infrastructure, between the radio telescopes located in New Zealand and those in Australia.

Recommendation: That SKA is specifically identified as a key long-term government science, research and technology priority given its potential to step change technology development in New Zealand. Clearly funding priorities will change depending on the success of the ANZAC bid, but there are opportunities that would remain even if the southern African bid is preferred by the international research consortium. Regardless of final location, opportunities for economic growth in NZ will be realized through investment in the SKA project in the niche areas of strength in NZ. Such an investment will be maximized via both direct investment in the ICT opportunities and through increased human capital.

Recommendation: That New Zealand consider a direct investment and/or establishment of relationship with the International Centre of Radio Astronomy research based in Perth, Western Australia, as a means of securing New Zealand's involvement in SKA related RS&T.

Recommendation: Specific areas where RS&T in relation to ultra-fast broadband will make an impact are:

a) High technology industries

b) Health & Society

c) TopTalent

d) International Relationships

e) Research infrastructure

6. ENVIRONMENTAL MANAGEMENT

Additional response to NZ RST Priorities Section 4. Priority Investment Areas

6.1. Environmental management (resource utilisation, pollution and allocation) is increasingly becoming a contentious issue in NZ and globally, e.g. water management. Many areas of New Zealand are already experiencing significant contention for scarce resources (e.g. Canterbury Plains), or have significant problems with pollution of environmental resources shared by many other users (e.g. Rotorua Lakes).

6.2. Unfortunately our current understanding of many of these resources, and how they are being used, is very rudimentary and undeveloped. This lack of knowledge can severely hamper our ability to use these resources in a sustainable manner (e.g. allocate sufficient water resource for farming without compromising the environment).

6.3. ICT can provide a significant role in environmental management, and helping to deliver improved outcomes. Specifically to address our inability to understand our environmental performance and resource usage, and make informed decisions about these. ICT could work with research and government/local government communities to create new solutions for monitoring of environmental conditions, analysis of these and enabling decision support based on this analysis.

6.4. Opportunities for the ICT industry are diverse, and include:

a) Development of remote monitoring/sensor solutions to measure and report environmental factors such as resource availability, consumption, pollution.

b) Development of remote networks to support these monitoring/sensor solutions, including remote wired and wireless networks.

c) Design and development of computer applications to analyse and report these environmental parameters to enable more informed decision making by resource users.

d) Creation of an export industry around these environmental monitoring, analysis and decision support solutions.

Recommendation: That New Zealand establish a centre of excellence for environmental monitoring, analysis and decision support, including a consortium between industry, research and governmental bodies.

Recommendation: That New Zealand provides direct investment into developing projects to address identified environmental problem areas in the areas of environmental monitoring, analysis and decision support.

7. PRIORITY AREAS FOR INVESTING IN POTENTIAL PLATFORMS

Response to NZ RST Priorities Section 5. Strategic Research Platforms

7.1. NZICT Group and stakeholders recommend the expansion to the Priorities and Platforms in a number of areas as set out below:

- *High technology services*

  Recommendation: Expand the priorities to include the development of network enabled applications to drive productivity growth for the business and public sectors.
  Potential Platform: Network based services enabled by the ultra fast broadband infrastructure including Game Development, 3D enabled applications, High Performance Computing, Virtualisation, Neural Networks, Machine to Machine Applications.

- *Biological Services*

  Recommendation: Expand the priorities to include developing a national remote monitoring network based on KAREN and other infrastructure to stimulate the development of network based analysis and data processing.
  Potential Platform: A national science monitoring and telemetry network utilising the ultra fast broadband and wireless services to step change analysis and modelling of biological standards and outcomes.

- *Energy& Minerals*

  Recommendation: Develop oil & gas research and resource monitoring capability including 3D seismic based on the deployment of ultra-fast broadband, and additional investment in subsea infrastructure leveraged off the proposed Kordia Optikor Trans-tasman cable which will pass close to the Taranaki Hydrocarbon resources.

Potential Platform: A subsea research and monitoring network which can be utilised by private sector partners, for improved exploration and reservoir production outcomes.
Recommendation: Develop automated mining options utilising robotics and minimal human intervention.
Potential Platform: High-tech mining including robotic extraction.

- *Environment*

Recommendation: Expand the priorities to include developing a national environment remote monitoring network based on KAREN and other infrastructure, to stimulate the development of network based analysis and data processing.
Potential Platform: A national science monitoring and telemetry network utilising the ultra fast broadband and wireless services to step change analysis and modelling of the environment and outcomes.

Recommendation: Develop New Zealand as a leader in green ICT by concentrating content and processing power at optimal power and environmental locations, and develop low power standards for hardware and infrastructure utilising remote monitoring and renewable energy.
Potential Platform: Centralised data centre resources powered by renewable energy, and remote power monitoring of ICT infrastructure including hardware.

- *Hazards & Infrastructure*

Recommendation: Expand the priorities to include developing a national environment remote monitoring network based on KAREN and other infrastructure, to stimulate the development of network based disaster early warning, analysis and data processing.
Potential Platform: National science monitoring and telemetry network utilising the ultra fast broadband and wireless services to step change analysis and modelling of potential disasters and outcomes.

8. HOW FUNDING AND INVESTMENT AGENTS WILL GIVE EFFECT TO THE PRIORITIES

Response to NZ RST Priorities Section 7. How funding and investment agents will give effect to the priorities

8.1. NZICT Group and stakeholders recommend the following:

Recommendation: NZICT Group and its stakeholders act as an advisory group for the Foundation for Research Science & Technology in relation to the platforms identified within this submission.

Recommendation: NZICT Group and the Health IT Cluster, act as an advisory group for the Health Research council in relation to the platforms identified in this submission.

Recommendation: NZICT Group continues to pro-actively coordinate industry participation in RS&T projects like the SKA in order to maximise the direct and indirect benefits to the ICT vertical industry, and the consequent impacts on the horizontal ICT platform that supports New Zealand's economy and society as we seek to step change the country's economic and social performance.

9. OTHER INVESTMENT AREAS

Response to NZ RST Priorities Section 8. Other investment areas

9.1 NZICT Group and stakeholders wish to comment that ICT based applications could be used to enhance performance in these areas notably:

a) National Measurement Standards;

b) Engaging New Zealanders with RS&T;

c) Research Contract Management.