

SCIENCE FOR
TECHNOLOGICAL
INNOVATION

Kia kotahi mai –
Te Ao Pūtaiao me
Te Ao Hangarau

SECOND TRANCHE FORWARD STRATEGY

2019-2024
Summary Document

SEPTEMBER 2018



As the SftI Challenge heads into its second five-year tranche of operation, it is time to reflect on what we have already achieved and what our future strategy is.

1. OUR CHALLENGE

WHAT IS OUR MANDATE?

The Science for Technological Innovation (SfTI) Challenge's objective is to enhance the capacity of New Zealand to use physical sciences and engineering for economic growth.

Our future vision is for a New Zealand that has a vibrant, prosperous, technology-driven economy in which researchers are fully integrated and actively contributing to strategy, government policies, and daily activities with new businesses who are offering high-value products and services that may not yet have been invented.

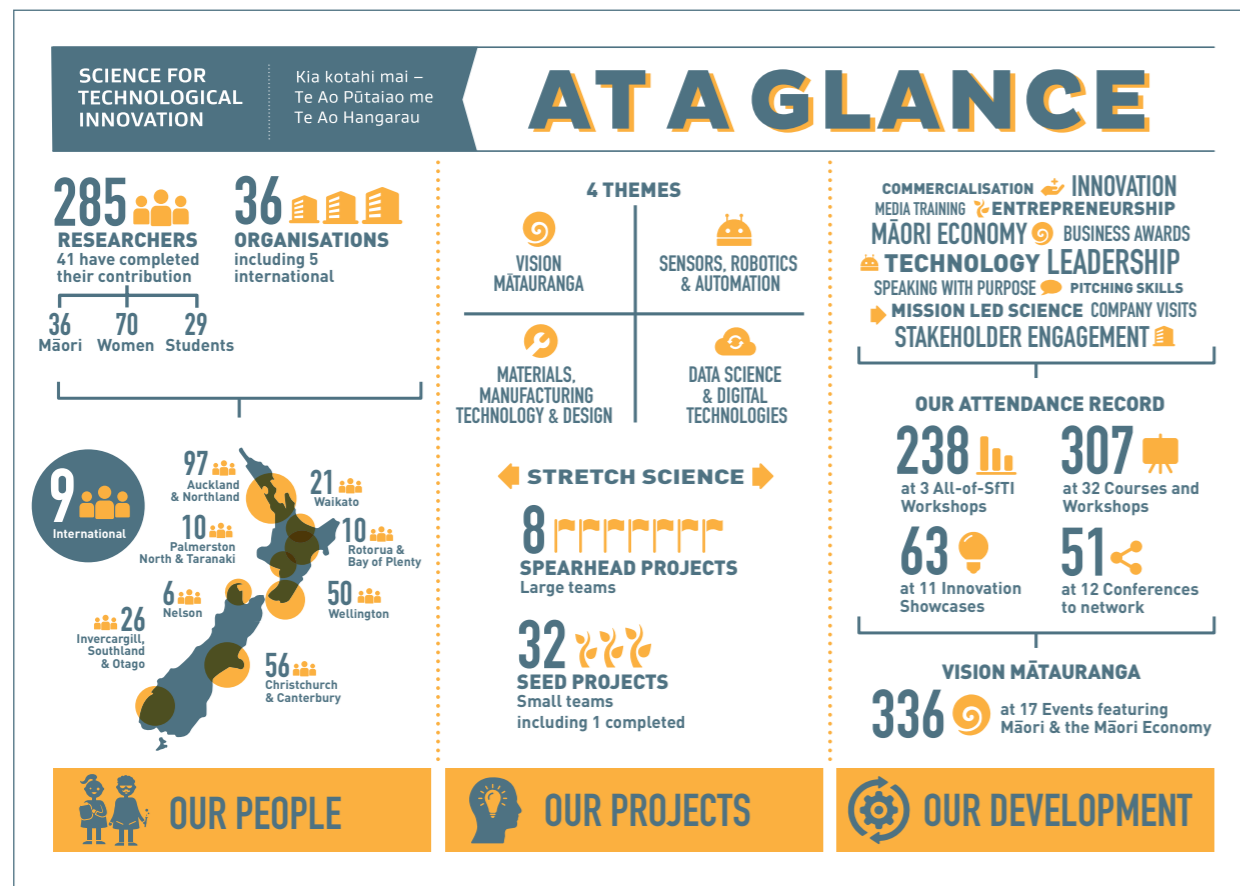


Diagram 1: SfTI is engaging with around 200 researchers across 29 organisations throughout the country and beyond.

WE DO STICKY!

We have a mandate to support research that makes sense for New Zealand because it can stick in New Zealand, building on our unique capabilities and competitive advantages, now and in the future.

WE DO STRETCHY!

We encourage our researchers to look at least 5-10 years into the future in terms of both industry needs and scientific capability, rather than focusing on the now or near future, and to target novel technologies that have not yet been created and are not already in R&D lab development.

WHAT ARE WE FOCUSING ON?

SfTI has, and will continue to, cast the net wide in terms of developing science and technology for industry and community application. SfTI's (renamed) Themes are:

- 🌀 Vision Mātauranga (VM)
- 🤖 Sensors, Robotics and Automation
- ☁️ Data Science and Digital Technologies
- 🔧 Materials, Manufacturing Technology and Design

These areas of capability are arguably at the top of the list when it comes to important knowledge areas where New Zealand needs strength in order to prosper. They underpin many current global technology trends, and our economy, including the Māori economy, will not flourish without them.

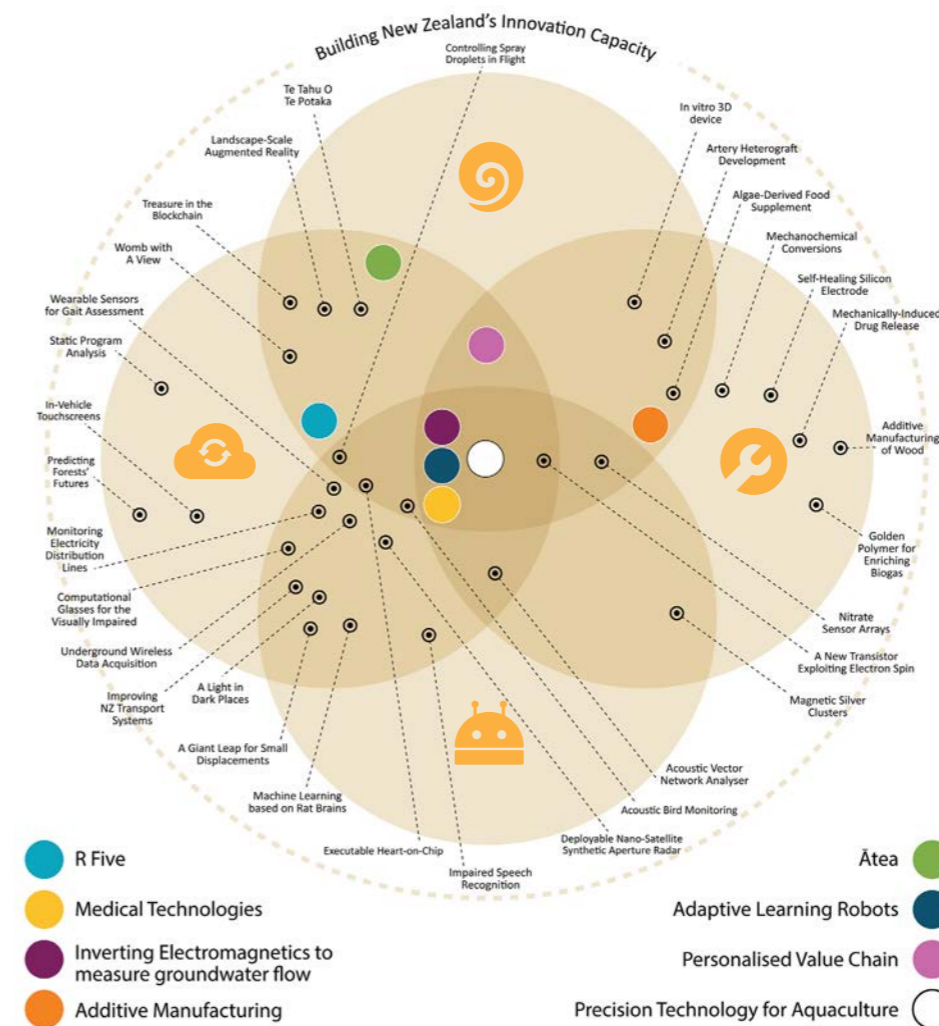


Diagram 2: SfTI's current projects against the four Themes.

2. OUR RESEARCH

Our projects come in two flavours: Spearheads and Seeds.

- Spearheads are generally large, collaborative projects driven by industry views (through mission labs – see below) and engaging national multidisciplinary teams, and continue over three or more years. Annual funding for Spearheads ranges between \$750,000 and \$1m.
- In contrast, Seed projects are smaller and bring fresh new ideas to the SfTI portfolio and community. They are driven by researchers' ideas, and annual funding sits around the \$100k mark.

HOW ARE WE ENSURING HIGHEST QUALITY OUTPUTS?

The Challenge has a range of projects at varying stages along the technology readiness continuum from fundamental research to nearer product commercialisation. We will continue to focus on a long term portfolio approach to research, and develop projects through the innovation pipeline towards commercialisation, including those with high-risk/high-return potential.

We ensure science quality through assessment of proposals, external review, and monitoring detailed milestones with the senior management team. SfTI management instigated our inaugural independent Science Quality Review process in 2017, and the conclusions constitute a useful resource for SfTI Board decision-making; this process will be repeated periodically throughout the life of the Challenge.

“Unless our research is the best of the best in a rapidly changing world, it won't be successful.”

OUR LARGE SPEARHEAD PROJECTS HAVE BEEN RE-INVIGORATED FOR THE SECOND TRANCHE

All current Spearhead teams have created new Tranche 2 plans. Most of these plans have been assessed and accepted by a review panel, with conditions on detailed plans to ensure novelty, NZ stickiness, specific and measurable milestones, and high quality Māori engagement.

SPEARHEAD 1: BUILDING NZ'S INNOVATION CAPACITY

The focus on why the transformation of research inputs into outputs might differ in the New Zealand context aligns with and complements other country-level analysis of policies affecting NZ innovation, which highlight differences in particular inputs and (less frequently) outcomes.

SPEARHEAD 2: INVERTING ELECTROMAGNETICS – A NEW WAY TO MEASURE GROUNDWATER FLOW

The intent of the Inverting Electromagnetics research is primarily to help solve the NZ and global impasse in understanding groundwater flow; it is broadening to include technology for clean water.

SPEARHEAD 3: A SYSTEMS TECHNOLOGY APPROACH TO HOME-BASED TYPE 2 DIABETES TREATMENT

The Vision is to create and implement integrated technology-based solutions for patient-centric, personalised, home or community treatment of chronic disease, with a focus on type 2 diabetes.

SPEARHEAD 4: R FIVE

At the completion of Tranche 1, Track 1 and Track 2 of this Spearhead will pivot towards full industry funding and commercialisation, while Track 3 will continue within a different Spearhead and will focus on applying data analytics techniques to find lost Iwi shareholders within legacy records.

SPEARHEAD 5: ADDITIVE MANUFACTURING AND 3D AND/OR 4D PRINTING OF BIO-COMPOSITES

The project is designed to provide skills and tools to harness new opportunities to develop products, including rapidly growing global circular bio-economy concepts which also address climate change.

THEME



OUR SECOND ROUND OF SPEARHEADS IS MAKING GREAT PROGRESS

These projects were spawned from our very first Industry Consultation Workshop in 2017. We knew even then that involving smart business and Māori representatives to steer our researchers in the best directions was vital. Spearheads Six and Seven are already in progress, while Ātea is now ready to commence after careful refinement of methodology and purpose. The Personalised Value Chain project is still going through the development process.

SPEARHEAD 6: KARETAO HANGARAU-A-MAHI: ADAPTIVE LEARNING ROBOTS TO COMPLEMENT THE HUMAN WORKFORCE

The Vision is to be at the forefront of research for highly flexible and easily adaptable robots within the next 15 to 20 years.

SPEARHEAD 7: PRECISION FARMING TECHNOLOGY FOR AQUACULTURE (PFTA)

The 10-year vision is a scalable technology design facilitating deployment across hundreds of farms and enabling management of farms 'from the desk', and at bay-wide, regional, and national scales.

SPEARHEAD 8: ĀTEA

The project will provide Māori end users with a learning environment that connects the past and the traditional, with the future of modern Te Ao Māori (Māori world) as Māori wish to define it.

SPEARHEAD 9: (PROPOSED) PERSONALISED VALUE CHAIN

The direction includes three potential research strands which are aimed at creating novel technology that will help strengthen relationships and understanding directly between sellers and buyers in ways that empower both sides of the market. This proposed project is going through a development process to identify researcher capability in readiness for funding in Tranche 2.

THEME



OUR EXCITING NEWEST MISSIONS ARE TAKING SHAPE ... WILL THEY MAKE THE CUT?

Our new project plans for Tranche 2 are already taking shape, based on the new concepts developed by visionary NZ industry and Māori leaders in our March 2018 Mission Lab. We are now working to further refine these ideas to identify where there is key 'stretch and NZ-sticky' research potential.

As with all our research, in order to be funded, each new mission will need to demonstrate how it will leverage NZ's unique strengths, capability or resources to take a measurable, future-oriented leadership position.

Accompanied by feedback from industry and Māori leaders, the concepts currently being developed are:

MISSION 1: PLACE-BASED AWARENESS

How might it be possible to bring together AR, IoT and myriad other technologies to create contextual awareness about a place, what is happening there, how that place is performing, and how systems (human and technological) are working?

"Location is the piece of data that knits everything else together – it is what can help disparate pieces of other data to be aligned, analysed, integrated and ultimately value realised that would have been missed."

MISSION 2: SPACE AND SPATIAL

How can our nascent space technology industry be supported and capitalised on to advance potential benefits for New Zealand? Could it be a fusion of multi-modal high resolution satellite observation data or technologies for space travel and planetary colonisation.

"We want to link space with what's going on underground from a thousand years ago to a thousand years in the future."

MISSION 3: A NEW VERSION OF SMARTHOUSES

Are there new areas of science and technology that will lead to better understanding and augmentation of housing to improve on existing technologies that are expensive and not widely deployed?

"We want to bring houses to life, to actively participate in and augment people's lives, from the start of construction; what is the next step in technology for smart houses?"

MISSION 4: VERACITY

What is the technology that sits behind proving we are delivering on claims about products and services, or in other words, how can the truthfulness of data, place and people, be verified? What is the future of "trust"?

"How can we share data on the internet, yet keep our privacy, and trust the results of our sharing?" (Industry/Māori feedback)

THEME



3. OUR FUTURE

HOW WILL WE ENSURE OUR INVESTMENT HITS THE MARK INTO THE FUTURE?

Now that we've developed a programme of research, and tested new ways of operating, SfTI has identified general principles that will guide how we approach the next five years. We have learned that moving to a far more collaborative, 'NZ Inc' approach for a technology driven economy must provide benefits for all society.

Our timeline shows indicative milestones throughout Tranches 1 and 2 in terms of both research projects and supporting innovation activities.

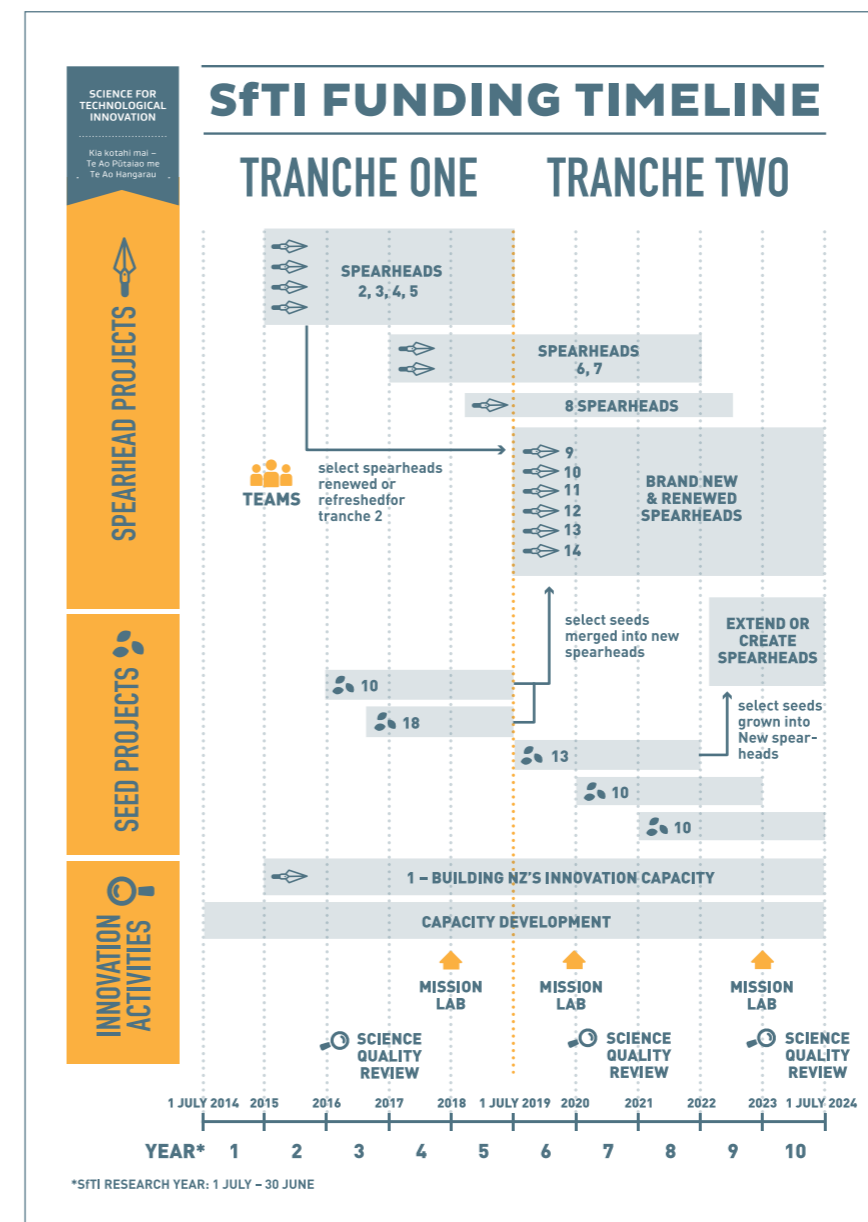


Diagram 3:
 SfTI's
 Timeline

THEME



MISSION 5: BIOSECURITY

How can science and technology assist New Zealand to identify biohazardous incursions before they arrive in order to keep them out, and find solutions to bio-problems we already have? What are the future novel technologies that will make a step change?

“A useful tool would be analytics to empower crowd sourced monitoring and modelling of biosecurity risks in NZ.”

MISSION 6: SOFT ELECTRONICS

Is there potential to create new kinds of soft electronics technologies based on novel NZ soft, stretchy materials?

“I think the next step is to develop soft electronics to the point where we can create a soft transistor and build digital logic gates directly into the material itself.”

MISSION 7: MĀORI DATA SOVEREIGNTY

How can data be used in ways that are appropriate and beneficial for Māori, including how it gives effect to foundational Māori philosophies, and how we might ensure that the development of tech tools is guided by Māori values and inherently acts as a positive force for Māori?

“Does data have Māori whakapapa?”

RANGATAHI SPEARHEAD: INSPIRED, FORMED AND LED BY EMERGING TECH LEADERS AND RESEARCHERS

How can we provide a permanent pathway for Rangatahi to contribute inspiring new leadership to NZ's technological innovation system? What are the new technologies that will be desired by emerging innovators when forming future companies in New Zealand, and how will they want to develop them?

“We envision that initiatives arising from the Rangatahi Mission Lab will be empirically studied in order to demonstrate the benefits of youth-led science to New Zealand's wider science system and economy.”

We think we've created something pretty special, something unique inside New Zealand's Science System. More details are provided on the following pages for how we will realise SfTI's future.

ADDITIONALITY

It's not just the specific technologies that will provide the most impact for NZ's economy, it's also the change in behaviour in our innovation system.

- This Challenge will continue to increase the skills of our researchers in several areas including: how to connect with industry, Māori organisations and the wider research ecosystem; how to communicate with a range of different stakeholders; how to collaborate for best outcomes; and how to incorporate commercial thinking into their work.
- Our move from 'competition around funding' to 'contestability for bringing capability to a genuinely new collaboration' supports blending of a diverse range of researchers and industry leaders to form best teams, and to learn from each other as projects progress. The focus on the team skills needed for solving problems will continue.
- We are achieving additionality through: building the research and innovation community; achieving our agreed targets; sharing our stories and discoveries; and scaling up our activities based on what we've learned so far. Our ability to do this effectively is improving as we progress.



Diagram 4: Our Additionality Model takes a collaborative approach to innovation which is quite different to New Zealand's traditional science system.

CO-INNOVATION/PARTNERSHIPS

We've flipped how we develop large projects from being primarily investigator-led, to a facilitated 'Mission-Lab' process with industry and Māori thought leaders.

- SfTI is moving away from the concept of 'end-users' towards one of stakeholder 'users' being co-researchers: engaged from idea inception, proposal development and conducting research, through to applying outputs. The Mission Lab has been a key element of this. Our plan is to enhance and extend this engagement to become 'business-as-usual' in the formation and outputs of our new mission teams. We'll do this through continuing to facilitate Mission Labs and potentially running industry specific Labs to refine specific Missions.
- We are also observing the advantages of our joint work with strategic partners, including Callaghan Innovation, KiwiNet, Return on Science, and the NZ Product Accelerator, which feed the commercialization pipeline in a more seamless way. Other partners include research organisation commercialisation offices, NZTech, BusinessNZ and FOMA, as well as individual investors, private companies and Māori organisations.
- SfTI's Future Strategy includes accessing capability that exists in other research entities such as NSCs and Centres of Research Excellence. International research teams will also play an important role here.
- We will be increasing our outreach to all our partners to support our efforts to shepherd SfTI research achievements from early market validation through to successful commercialisation and economic growth. In the same vein, we will stay connected with researchers from 'finished' projects so they remain part of the SfTI community, and we may assist where possible on the journey towards impact.

VISION MĀTAURANGA (VM)

Bringing together the two knowledge systems of western science and Mātauranga Māori in the hi-tech sector has massive potential benefits.

- VM remains a priority for SfTI with many learnings and behavioural changes achieved across the SfTI community in Tranche 1. The Future Strategy for VM is to extend its importance in physical sciences and engineering so that it becomes business-as-usual due to potential positive impacts being better understood as unique to Aotearoa New Zealand.
- This will be achieved in three general ways: ensuring greater use of Māori knowledge, values and principles within our programme of work; actively supporting more Māori to participate in our technical research; and prioritising research that leads to greater benefit to Māori. Part of our strategy will be to focus on projects and people with high VM potential.

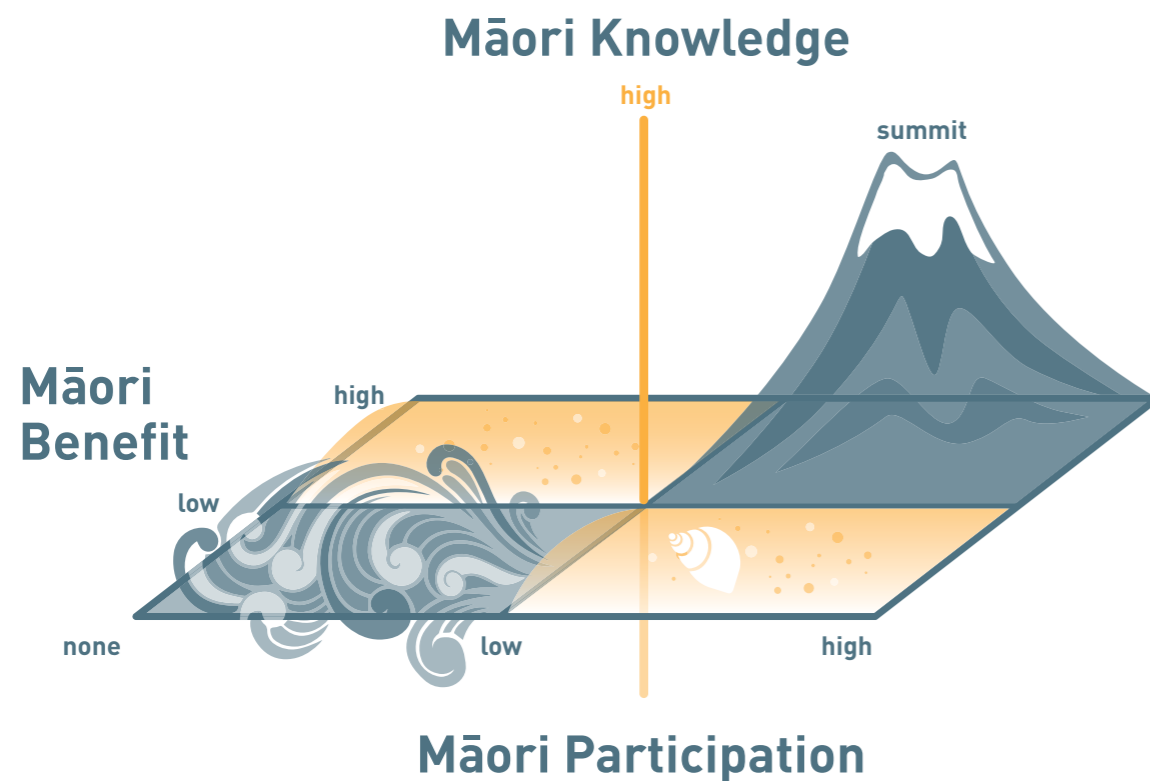


Diagram 5: SfTI's 'VM Cube'. This tikanga based framework is conceptually founded on how the takutai moana (beach/coastline) and the maunga (mountain) are interrelated and provide a stratum for the connection of Māori and non-Māori research reaching through to higher levels.

NEW MISSION DEVELOPMENT

Given the exponential changes we are seeing in global technology, we will ensure our structure maintains sufficient flexibility to pro-actively adjust as new exciting possibilities emerge.

- Areas such as medtech, water quality and low carbon energy are emerging areas of focus for scientists and will constitute key areas for future Spearhead development.
- Some ongoing Seeds will be grouped together, and with larger Spearheads, and managed as a programme where the work is related. For others, SfTI is considering a 'graduation' process for further support at Seed or (possibly) higher funding level.
- The Challenge will be expanding the scope of our research teams, and we'll achieve this in several ways including mapping existing capability (and gaps), providing opportunities for individual research teams to identify potential for collaboration, and being more focused in telling our stories. We will also experiment with an entirely Rangatahi (emerging researcher) formed and led Spearhead project.
- We'll simplify our organisation by removing the old portfolio structure, and instead group Spearheads and Seeds within enlarged Themes.
- Our focus on ensuring science quality will continue. Science Quality Reviews are scheduled for 2021 and 2024 to ensure we learn from external evaluation of our work.

“There is the opportunity now for scientific data and cultural data to sit right alongside one another, not to say one's more important than the other or means more or less, but they have an equal place in the world.”

4. HOW TO GET INVOLVED

Tranche 2 plans are subject to MBIE science board approval for funding. An outcome from the board is anticipated in November 2018. Upon funding confirmation, SfTI will advance the development of new SfTI projects.

MISSIONS/SPEARHEAD PROJECTS

Over the next 9 months, SfTI will be calling for expressions of interest from researchers to join national best teams forming large research projects starting in July 2019 (dependant of MBIE funding) that align to the SfTI research 'missions'.

SEED PROJECTS

In 2019, SfTI will also be running a contestable process inviting researchers to bring forward their seed project ideas. Seeds are smaller, riskier, proof-of-concept projects. At the Roadshow the management team discuss what SfTI is looking for in 2019 and how to maximise the likelihood of success.

Researchers, Industry and Māori representatives interested in getting involved in new SfTI projects can keep up-to-date by registering for our Innovate Newsletter via the SfTI website. Keep an eye on our Twitter page for updates as well.

A FINAL WORD FROM THE DIRECTORS:



Sally Davenport MNZM, Director



Bruce MacDonald, Deputy Director

We're heartened by how the SfTI community has come together and developed across NZ. We look forward to building on the technologies we're creating for NZ, and on the new ways we're creating tech projects with Māori, business, government, and researchers. Our goal is to create a significantly more high-tech NZ for greater wealth and well-being, with innovative thinking that is resilient to the rapidly changing tech world.

The image of Mangopare (Hammerhead shark) is a design from Tyler Dixon, Waikato-Maniapoto, Ngāti Porou, Ngāi Tuhoe, Ngāi Tahu. It symbolises the strength in duality to be found in combining traditional Māori knowledge and modern western science.

CONTACT US

Science for Technological Innovation NSC

c/o SfTI Programme Office

Callaghan Innovation

PO Box 31310

Lower Hutt 5040

Wellington, NZ

e-mail SfTIChallenge@callaghaninnovation.govt.nz

twitter [@sftichallenge](https://twitter.com/sftichallenge)

web www.sftichallenge.govt.nz