

## Industry-led spearhead project directions

### Science for Technological Innovation (SfTI) NSC

Six high level directions were developed in three workshops in 2017 – a Māori ICT hui on 20 February, a Māori business leaders' high tech summit on 28 February, and an industry-led workshop on 28 March.

Four of those high level directions have been selected to be further developed into spearhead project proposals by teams of NZ researchers and industry leaders.

The background is described in a) a report on the status of the research in New Zealand around each area, and b) in a context report.

A separate document calls for industry leaders, research leaders and teams to come together and show an expression of interest in developing a proposal and team to address one of the directions.

Some key concepts should be developed for each project proposal through workshops:

1. Context (both NZ and international)
2. Vision and what success looks like
3. Value proposition
4. Alignment to key SfTI themes and portfolios
5. Project summary
6. Team members (initially potential leaders and key members)
7. Current state
8. Science questions and stretch
9. How the project addresses Vision Mātauranga and the extent to which Māori leadership and approach is 'mission critical'
10. The capacity development opportunities and plans.

**NOTE:** *It is intended that a kaupapa Māori methodology will be used to develop and lead **at least one** of the spearhead projects, in consultation with the Kāhui Māori and Māori enterprise leaders.*

## 1. Connecting Fragmented Communities / The Digital Marae/Whare

This is about connecting communities and families, hāpori/marae and whānau to create online spaces to transfer knowledge and tikanga inter-generationally.

This might incorporate virtual and augmented reality, smart whare/houses/marae/ communities with an ‘internet of things’ approach, and might include the ability for communities/hapū to determine how AI-collected data benefits individuals and groups, including creating economic benefits.

This spearhead is not about bringing all of New Zealand together, but rather focuses on bringing localised or particular communities/groups/iwi/ hapū together.

### Why?

- With many Māori disconnected from their ancestral places, this is an opportunity to create compelling connections to marae/iwi and other Māori institutions, using mātauranga Māori, to support Māori aspirations.
- With the increasing influence of Māori in the agricultural sector, disparate Māori landowners could be more closely linked to their whenua and land-holdings to help with future decision-making and enable greater participation for productive gains.
- Given New Zealand’s size, connectivity is important and a technology-infused approach is one way to pilot, then take to scale.

### How?

- Start with a gap analysis
- Smart houses/whare/marae, intra- and interconnected. Could be an online learning and experiential site
- How might virtual reality/augmented reality/mixed reality/artificial intelligence contribute to this?

### NOTE:

This spearhead has been contextualised from a Māori-focused framework, but does not exclude other types of communities. A strong theme in this potential spearhead is the attachment to particular lands and places and the ability of technology to enable, enhance, and connect Māori to these.

Potential science stretch includes the ‘internet of things’ technology to make smart houses; augmented reality technology for creating visual presentations of cultural and historical knowledge and events;

interactive technology for people in smart houses; and new social networking technology to reflect indigenous knowledge and cultural protocols.

## 2. Intelligent Oceans / Smart sustainable farming in the ocean

Aquaculture is established in New Zealand. There is little automation and a gap in sensing and monitoring, which is necessary to show the status and growth rate of, for example, mussels growing on ropes (particularly as there is evidence that they grow faster in open ocean waters).

There is potential to improve aquaculture practice with automation and to reduce labour costs. Also there are potential links to the Sustainable Seas National Science Challenge.

### Why?

- New Zealand's Exclusive Economic Zone is one of the biggest in the world so we need to look to the oceans for opportunity. While mussels were talked about at greater length at the workshops, there was more general discussion about the broader aquaculture opportunities for Intelligent Oceans.
- Mussels are just one example – they are difficult to farm, despite being anchored, mussel ropes can float away in high swells and get lost. Also, it is difficult to know when to harvest. The current use of ropes was a solution for the time, and there may now be better ways to farm.

How can we be constantly informed about what's happening underwater to inform what we are doing on the surface? Might sensor-based technology be used more?

There are many researchers across New Zealand in 3-D vision, machine learning and artificial intelligence and some in robotics.

The Sustainable Seas Challenge (<http://sustainableseaschallenge.co.nz/>) and Cawthron Institute are important links.

### 3. Small scale production, learning robots and robots in harsh environments

This research direction is about fast set-up and programming of robots for small sized runs in factories. It also includes robots, using artificial intelligence, learning and being adaptable to changing job requirements.

It is also about robots being semi-autonomous in harsh outdoor environments, and being adaptable to the changing environment, including handling natural variations.

#### Why?

- New Zealand has a lot of unstructured environment in which farming of one kind or another is carried out and it can be dangerous work.
- This kind of technology would be highly exportable.

#### How?

- There is a lot of data on unstructured biological systems generated in New Zealand which can underpin development of this type of technology. Unfortunately, it is messy data and will likely require new ways of making it useable and applicable.
- Biological irregularities should be at the heart of anything to be used in the environment.

There are many researchers across New Zealand in 3D-vision, machine learning and artificial intelligence, and some in robotics.

## 4. Personalised value chain / the individual as a customer

This is about technology to market goods and services directly to customers overseas. Technologies include remotely understanding markets using data we can collect and analyse.

Possible research areas include analytics, blockchain, cybersecurity, traceability for bringing goods and services to remote customers around the world; and enabling us to understand what happens to our goods and services in the market.

This may support agile manufacturing and/or specialised runs in factories. Such data might enhance New Zealand's reputation as the most ethical producer of products, including food, noting that there is extensive research into food processing in New Zealand, so research in this spearhead should complement this. For clarity, this direction is not just about food; it is about all products and services.

### Why?

- How do we better connect with individual consumers? How do we let them find us easily so they can let us solve their problem? How do we reduce the physical miles between us and our markets using online?
- How will enabling technologies create new business models? For example, in the UK the Butcher of the Year has no physical shops but does everything online using a subscription model to connect farm to table.
- The value/supply chain needs to be optimised for small runs of products as consumers seek a more personalised experience.
- Could we meet the challenge of matching offerings with consumers' nutrition needs?

### How?

- Analytics of consumer behaviour.
- Somehow flipping traceability around to focus on customers rather than goods/food.
- How might blockchain contribute?