REPORT TO TE PUNI KŌKIRI

TE ARA E HEKE MAI NEI

SCIENCE, INNOVATION AND THE MĀORI ECONOMY:
MAPPING MĀORI ENTERPRISE (SCOPING PHASE)

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SECTION ONE: TE WHAKARĀPOPOTANGA MĀTUA - EXECUTIVE SUMMARY

1. HE KUPU WHAKATAKI - INTRODUCTION

1.1. The aim of this research project is to give insight into the extent to which it is possible to map the Māori economy from a High Value Manufacturing & Service Sector (HVMS) perspective. While the project focuses on the notion of High Value Manufacturing and Services, it does so from within the parameters of the wider innovation framework.

1.2. The project is informed by significant national-level policy work currently being developed by the New Zealand Government. These are:

- The instigation of Callaghan Innovation as the Government’s entity for engaging businesses in research and development (R&D) to help drive the New Zealand economy. The products and services of this new entity and its contribution to the Māori economy are still being determined.
- The He Kai Kei Aku Ringa Crown-Māori Economic Growth Partnership strategy that recommends an examination of how Māori enterprises and collectives undertake research and development, how they engage with the innovation system and how data about Māori economic development is collected (Māori Economic Development Panel, 2012, pp. 23, 24).

1.3. The project is further informed by the BERL Māori Science and Innovation report (2011a) that highlights the potential for the Māori economy to lift export productivity through the application of science and innovation. The BERL report estimates the Māori economy in 2010 as being $36.9bn, with $10.6bn in Māori Trust, Incorporations, Iwi or Rūnanga, $20.8bn of assets attributable to Māori employers and $5.4bn attributable to Māori self-employed (BERL, 2011b). This data, while identifying the significance of the Māori economy, is aggregated and therefore presents some challenges from a science innovation perspective.

1.4. This project has explored the relationship between the Māori economy and the current innovation system operating in New Zealand. This draws us to reflect that the current approach to innovation in New Zealand only captures a small sub-set of New Zealand firms, and we suggest an even smaller sub-set of Māori firms. Therefore, it becomes of importance to know:

- who these business enterprises are;
- where they are located;
- what type of business activity they are involved in; and
- whether innovation science, as opposed to some other type of ‘input’, will support them.
1.5. This leads to the question that if the New Zealand innovation system including research funders, connectors or providers (innovation agents) is going to make a difference for Māori collectives or individual enterprises, interventions need to be geared to the reality of those enterprises. However, without a ‘map’ or more detailed picture of the productive capacity of those industrials sectors within which Māori operate and the firm dynamics of those Māori enterprises, this will prove difficult.

1.6. Ultimately, the ‘big picture’ data needs to be disaggregated to ensure that those who have to implement any science and innovation policy will be able to see where their effort is best placed if it is to achieve its target of increasing the value of the Māori economy. However, first we must have a clearer picture of what the ‘big picture’ data is telling us. Therefore, this scoping project sets out to look at two different but interrelated aspects:

1.6.1. Using information from research, practitioner and trade sources, are we able to define and understand the terms ‘Māori economy’, ‘Māori enterprise’, the ‘innovation system’ - and its subset ‘research & development’ - and ‘High Value Manufacturing and Services’? By gaining clarity around these terms we argue that it will enable government and business to be more precise in relation to the innovation products, processes and services required to achieve their innovation objectives. The relationship between the innovation system and the Māori economy that leads to high value manufacturing and service is of particular interest.

1.6.2. By examining the statistical data that we can collect, and by using other data sources and modelling techniques, are we able to add to the BERL 2010 Māori Economy report? Or to really capture the reality of Māori enterprise, does some other type of metric or approach need to be developed? The purpose of this part of the project is to more accurately locate Māori enterprises and to understand their value drivers as well as the extent to which they are or are not like comparative groups within their industrial segment or group. Clearer understanding of the Māori economy is essential to enable appropriate targeting of funds and supporting infrastructure for positive innovation outcomes.

1.7. As a scoping project, the methodology followed involved two approaches. First, we spoke to a number of agencies, both government and private sector, that have sources of data related to the Māori economy. For this exercise the aim was not to engage with informants beyond soliciting for information about their sources of data on Māori businesses, however ‘off-the-cuff’ comments did show a high degree of
‘practical’ or ‘tacit’ knowledge (Cavusgil et al., 2003) drawn from informants’ deep experience of engagement with Māori businesses.

1.8. Second, given the complexity and volume of the qualitative data, we conducted a ‘snap-shot analysis’ using NVivo, a qualitative data analysis software package, supplemented by other key documents. The focus and constraints of this scoping exercise has meant the qualitative team has done a thorough, but not exhaustive, search in government, trade and academic works. Relevant literature and materials from the sources identified were reviewed and imported into NVivo where they were coded to facilitate purposive analysis, within and between the main themes – Māori enterprise, Māori economy, Innovation system, and High Value Manufacturing and Service sectors.

2. **TE WHĀINGA - PURPOSE**

2.1. Our intention for this project is twofold. From a practical perspective, we want to determine what the current system is able to offer Māori business from a research, science and innovation perspective and to what extent Māori enterprises are ready to, are capable of, or have the desire or need to access those offerings. To answer this question, we examined the current state of information about Māori enterprises from a number of Government and Non-Government Organisations, to identify ways of defining what we mean when we talk about ‘Māori’ and ‘innovation’ and how this might have implications for how activities are funded and implemented.

2.2. From a theoretical perspective, we are interested in the discourse about R&D and ‘innovation’. We want to better understand how this discourse intersects with what is already known about how New Zealand enterprises succeed and whether such models are applicable to Māori enterprises or whether other factors, such as Māori culture, need to be factored in. We are particularly interested in the characteristics of the innovation system in New Zealand and whether its current configuration is meeting Māori business aspirations or needs, and whether indeed, there is an awareness of the innovation system by Māori.

2.3. As a concluding observation, we suspect that developing a national innovation system that is comprehensive, flexible and capable of responding to an indigenous economy is ground-breaking from an international perspective and are unaware of any other jurisdiction that has attempted such an approach. We believe that New Zealand is likely to be world-leaders in this field.
3. **NGĀ MAROHI - RECOMMENDATIONS**

3.1. Like other countries, New Zealand is trying to develop a more firm or market-led innovation system as opposed to a science ‘push’ approach. This has been one of the rationales for restructuring Industrial Research Limited into Callaghan Innovation. In examining definitions of what is meant by innovation, it is clear that it is more than just the application of science-led research and development. It is an integrated and encompassing system of inputs – of which R&D is one type of input - that take place within both a national and global context leading to firm-level outputs in the shape of products, services or process. One of these outputs is manufactured products and services of high value.

3.2. Given New Zealand’s relatively low level of R&D investment, HVMS is being seen as one way to improve the country’s low productivity by developing innovative or ‘disruptive’ technologies. While much of the focus has been on manufactured products, the place of services has been less well catered for as can be seen in the limited number of services identified in the Martin Jenkins report prior to the instigation of Callaghan Innovation. Additionally, the issue of what makes a product or service of ‘value’, beyond financial considerations, is not addressed in the Martin Jenkins report.

3.3. As the literature review shows, most firms do not connect with R&D ‘push’ systems because they seek for innovation solutions within their immediate networks. Hence, the issue for science, technology and innovation systems is: how to connect and to whom?

3.4. We have also looked at what is meant by the ‘Māori economy’. Focussing on objective characteristics such as the control and use of assets, whether collective or individually owned, is one way to define the Māori economy. However, there are other facets that might be considered such as the nature of how assets are managed and used; governance or organisational forms; and the size and characteristics – such as cultural characteristics – of the Māori entity.

3.5. While the label ‘Māori economy’ is useful to highlight the increasing contribution of Māori to the overall economy, it does not give much guidance when it comes to policy intervention. The objective characteristics of the Māori economy have been a focus in policy consideration. However, these characteristics – number, size, financial attributes, and economic behaviour - cannot be defined with a high degree of accuracy.

3.6. To be able to achieve a picture of the overall performance of the Māori economy would require more systematic capture of key data. Statistics New Zealand has indicated that there are constraints in merging census information that identifies ethnicity with business data that is collected through the IR10. Providing such
matching by attaching an ethnicity identifier to the IR10 would provide the most efficient mechanism to obtaining robust information about the Māori economy. However, Statistics New Zealand’s current data capture project, *Tatauranga Umanga Māori*, is focussed on more clearly capturing information about collectively managed assets. It would therefore seem crucial that the recommendations in *He Kai Kei Aku Ringa* in relation to improved data gathering about the various components of the Māori economy are progressed rapidly.

2.1 Therefore, from a national and regional data gathering and data management perspective, it would be useful to undertake some or all of the following activities.

- **Recommendation 1.** Given that Statistics New Zealand is still considering the implications of adding ethnicity data to the IR10, it might consider adding such information to its biennial R&D survey.

- **Recommendation 2.** A more systematic approach to data-collection and record-keeping across Government agencies (including Crown Research Institutes and other providers that receive Government funding) should be considered. This might include some sort of shared repository of research initiatives that have been undertaken with Māori firms. Consistent capture by central agencies of whether a firm or entity considers itself Māori should be implemented.

- **Recommendation 3.** It is unknown the extent to which regional innovation or R&D providers are already engaging with Māori entities in either their individual or collective forms. Surveying such providers and then comparing this to Māori industry perspectives might provide insight into the extent and effectiveness of current provision. This might be done through regional case studies commissioned by a central government agency or at the regional level through a City or Regional Council. Research into the Māori economy has been undertaken by BERL in some regions (for example, Taranaki (2009), Waiairiki (2010) and Bay of Plenty (2012)) however we have not located regional level research with an innovation-specific focus.

- **Recommendation 4.** Data sharing between Non-Government Organisations to identify potential innovation or R&D intervention points (for example, along the lines of the New Zealand Māori Tourism, Federation of Māori Authorities and Poutama collaboration around tourism) should be encouraged. Such data sharing might require initial support to develop the infrastructure for a shared information repository.

3.7. The next set of recommendations relates to macro-economic considerations and theoretical concepts that have the most salience for innovation and in particular R&D
interventions. From the analysis, we have focussed on the notions of the ‘hybrid’ economy and the ‘catching-up’ economy.

3.8. In considering the Māori economy as hybrid, there is acknowledgment that such an economy operates alongside and within the New Zealand economy and is therefore influenced and regulated by the same overarching institutional frameworks that govern the general economy’s operation. However, the hybrid concept recognises the way in which indigenous economic systems are embedded in social relations that take into account indigenous worldviews. From this observation we conclude that only some parts of the Māori economy will be amenable to the types of products or services that innovation agents like Callaghan Innovation are offering. Innovation agencies should therefore consider such factors as they develop their Māori innovation policies.

3.9. We also postulate that the Māori economy might be thought of as a catching-up economy because of an initial low level of development, inability to effectively absorb new technologies (termed as ‘absorptive capacity’) and the inability to use indigenous innovative capacity to modify technology for their own purposes. Trying to apply policies that work for technologically advanced countries, like the Scandinavian countries, will not necessarily work without adapting them to the frameworks of the catching-up economy.

3.10. If the Māori economy might be considered as a catching-up economy, then from an innovation and R&D perspective, a focus on high-tech disruptive products and services may not be the first place to start and may, in fact, miss the opportunities to embed already-existing technologies.

- **Recommendation 5:** It would be useful to understand which elements of New Zealand’s innovation system are aimed at assisting the Māori economy to ‘catch-up’ or approach what is known as the ‘technology frontier’; and which elements of New Zealand’s innovation system in its form of R&D innovation (the role of Callaghan Innovation – but also other Crown-directed agencies) are about developing the truly radical high-tech parts of the Māori economy. This might best be done at a general level by organisations like Callaghan Innovation, which could establish a research informed Māori innovation policy framework.

- **Recommendation 6:** We have undertaken only a preliminary analysis into the innovation and R&D policies of catching-up economies and their potential as models of intervention for the Māori economy. We think there may be merit in further examination of this body of literature.

3.11. The last set of recommendations focuses on micro-level considerations that might help innovation agents to better link with Māori entities, either individually or
collectively. We argue that such enterprises can be thought of as being on a continuum, with some choosing to operate purely within a Māori domain driven by customary approaches; others seeing themselves as a Māori organisation but with no connection to tradition; and yet others somewhere in between.

3.12. Additionally, when considering Māori firms, one of the most salient features from an intervention perspective is size. Particular types of R&D solutions will for the most part only be taken up and implemented by medium to large Māori firms. However, if Māori business entities – only a few of whom might be considered medium-sized enterprises (and internationally most would be considered ‘small’) – are to be brought into the innovation and R&D sphere, some type of aggregation strategy such as clustering would seem warranted.

3.13. We posit that hapū or iwi and other collectives bound by a Māori ethos have a cultural tendency to aggregate from the individual to the collective to achieve social, political or economic objectives. This inherent size aggregation tendency might be utilised to develop an industry specific cluster facilitation strategy to support Māori collectives to act as innovation nodes or co-ordinators for either their own or other SMEs.

3.14. Whether or not such a strategy is considered, Māori entities need to be approached from their perspective with an understanding of how innovation works at the firm level. This is not merely a matter of ‘connecting’ the ‘push’ approach from science providers out to Māori firms. It is about science systems becoming part of the orbit of firm network worlds and vice-versa. Science institutions can play a role when they are attuned to a particular industry and recognise how, when and what type of innovation to apply, whether that is in the form of an R&D solution or some other type of process that makes up the broader innovation process.

3.15. If a goal is to embed innovation knowledge within Māori industry networks, innovation agents like Callaghan Innovation or other science agents need to approach potential clustering organisations from their perspective. Typical SME innovation messengers are suppliers, agents, customers, accountants, banks, whānau or friends, and, possibly for Māori SMEs, tribal and collective entities. Innovation institutions therefore will make their biggest inroads when they are part of this network of industry associates. This is a concept that provides a foundation for indigenous innovation that not only increases the capacity of cluster participants for innovation and productivity growth, but also allows focus on capacity sharing, collaboration and working with Māori enterprise to achieve better outcomes.

3.16. In light of the preceding discussion, the final set of recommendations relates to some ways that innovation agents can interact with Māori entities at the firm level.
• **Recommendation 7.** Statistics New Zealand should quickly complete its analysis of Māori collective entities as outlined in the *Tatauranga Umanga Māori* document as this will confirm the more objective characteristics of these entities and their need for, use of and potential for innovation.

• **Recommendation 8.** Following on from this, Māori collective entities with the requisite characteristics might be encouraged to consider their ability to provide an industry-specific innovation co-ordination function for either their own or other SMEs. This might be done as an extension to or refocus of initiatives already being undertaken by innovation agencies in conjunction with such collective entities.

• **Recommendation 9.** Depending on the appetite of Māori collectives to act as R&D facilitators or co-ordinators, there may still be a case for regional and national government-led cluster facilitation to support Māori SMEs to develop stronger innovation networks within their industry sectors. Research with already existing clusters that are government supported would provide evidence of whether such an approach might have potential.

• **Recommendation 10.** There is a need for innovation agents like Callaghan Innovation to consider the suitability of their products and services for Māori entities. As they develop their Māori innovation policy frameworks, such agents should give consideration to factors such as firm size and firm cultural motivation.
4. **TE WHAKAHAERE O TE PŪRONGO - ORGANISATION OF REPORT**

4.1. The report is organised into the following sections.

4.1.1. Section Two presents definitions of key terms, attempting to tease out some of the subtle meanings that lie behind their usage.

4.1.2. Section Three provides an overview of available quantitative data and is concerned with how to accurately describe the Māori economy using commonly accepted business metrics. It outlines the characteristics of currently available data sources, from both government and non-government sources, and assesses their suitability for providing a more detailed picture of the Māori economy.

4.1.3. Section Four discusses the previous two sections in the light of both macro and micro-level observations about the nature of New Zealand’s economic structure, making recommendations that might enable connectivity between the innovation system and Māori business entities. We are particularly interested in the characteristics of the innovation system in New Zealand and whether its current configuration is meeting Māori business aspirations or needs, and whether indeed there is an awareness of the innovation system by Māori.

4.1.4. We conclude the report in Section Five, offering some final observations.
SECTION TWO: TE HOROPAKI ME NGĀ TAUTUHI - CONTEXT AND DEFINITIONS

1 OVERVIEW

1.1 The aim of this section is to give definition to the main themes guiding this project. It is not designed to be a literature review. Rather, it acts as the foundation for Sections Three and Four, in terms of our intention to look at whether current attempts by the innovation infrastructure to engage with the broader Māori economy are not only appropriate to the types of systems of exchange and enterprise that constitute the Māori economy, but are also productive.

2 INNOVATION, THE INNOVATION SYSTEM AND HIGH VALUE MANUFACTURING

2.1 The OECD (2005, p.46) defines innovation as:

“...the implementation of any new or significantly improved product (goods or services), operational processes (methods of production and service delivery), any new marketing methods (packaging, sales and distribution methods), or new organizational or managerial methods or processes in business practices, workplace organization or external relations.”

2.2 This can be contrasted with the definition of research and experimental development (Frascati Manual (2002 Edition), 2010, p.30)

“Research and experimental development (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications. The term R&D covers three activities: basic research, applied research and experimental development.¹”

2.3 The Frascati Manual (p. 18) clarifies the difference between technological innovation and R&D:

“Technological innovation activities are all of the scientific, technological, organisational, financial and commercial steps, including investments in new knowledge, which actually, or are intended to, lead to the implementation of technologically new or improved

¹ We note that IRD definition of R&D for the purposes of receiving a tax credit differs from that used by government agencies.
products and processes. *R&D is only one of these activities* (italics added) and may be carried out at different phases of the innovation process.”

2.4 Innovation is viewed as one of the key drivers of economic growth, promoting technological progress and underlying the main policy objectives of governments around the world (NZ Manufacturers & Export Association, 2009). Innovation occurs in many guises, and as Figure 1 illustrates, takes place in the firm when operational resources, such as technology, people, skills and knowledge can be filtered through innovative capability, and either commercialised or exploited in some manner to produce outputs that can be characterised as high value.

![Figure 1 The Innovation System](image)

2.5 Innovation can improve productivity on the one hand, through science, research and development (R&D), by creating *ground-breaking, radical or disruptive technologies*. On the other hand, innovation can act in a less direct way to *enable better use of existing technologies*. Innovation can also be considered as incremental (slow and considered) or radical (fast and pioneering) adjustments or improvements. In either case, innovation enables new industries to emerge and existing ones to become more competitive (Māori Economic Taskforce, 2011).

2.6 New Zealand’s industrial structure has an emphasis on agriculture supplemented by a small manufacturing sector (largely concentrated on low and medium-technology sectors) and a large service sector especially in health and education (Smith, 2006). Notably, there is a relatively low level of investment in R&D by New Zealand business: 0.54% of gross domestic product (GDP) in 2010, compared with the Organisation for Economic Co-operation and Development (OECD) average of 1.62%.
2.7 Similarly, there is a relatively low level of overall expenditure on R&D as a percentage of GDP: 1.30% in 2010, compared with the OECD average of 2.4%. Government funding of R&D was 0.59% of GDP in 2010, while the OECD average is 0.73%. As illustrated by Figure 2, these ratios are considerably less than those in other OECD economies. (Ministry of Science & Innovation, 2011; NZ Manufacturers & Export Association, 2013; MBIE, 2012).

2.8 None of the above statistics are particularly surprising given that as a country New Zealand has specialised in low R&D industries that inevitably generate a low R&D to GDP ratio at the country level (Schmidt-Ehmcke & Zloczysti, 2011, pp. 2-3). Nonetheless, the lack of investment in R&D has led to calls for increasing investment in and use of R&D to cure what is said to be New Zealand’s ‘productivity paradox’.

Figure 2  New Zealand’s R&D Intensity (Source: OECD 2006)

2.9 This theory posits that New Zealand suffers from low comparative productivity despite all the right ingredients being in place for growth, such as flexible worker arrangements, a small government sector, absence of corruption, ease of doing business and high entrepreneurialism (Shangqin, McCann, & Oxley, 2009). The reasons for and hence solutions to this productivity paradox have been well canvassed by economists and policy-makers which in turn has led to structural and institutional reform. The restructuring of Industrial Research Limited into Callaghan Innovation is an example of how it is hoped that institutional reform will help to improve productivity by increasing the ‘flow’ of R&D into firms.

2.10 There are some economic schools of thought that posit that institutional reform alone is unlikely to make much of a difference due to New Zealand’s isolation from markets, global markets unfavourable to New Zealand products and lack of economies of scale to generate internal markets. Despite this, increased R&D is seen as a way to improve the agricultural sector (New Zealand is only 16th in OECD for agricultural productivity).
Additionally, it is posited that New Zealand firms and organisations need to be larger to encourage outward global engagement (McCann, 2009). We will deal with this second observation in Section Four.

2.11 In recent years, there has been increased emphasis from various governments that the formalised ‘agents’ of innovation - Universities, Crown Research Institutes (CRIs) and other government research funded agencies - need to better connect their R&D capability with firms. The Ministry of Science and Innovation’s (MSI) Powering Innovation report (2011) describes New Zealand’s formal Science, Technology and Innovation (STI) system as a linear commercialisation or ‘push’ approach. Key indicators of innovation in STI systems have been R&D intensity, patenting, ICT and formal education of the workforce. The underlying assumption is that innovations are a direct result of R&D activities, and hence there is a need to invest in and co-operate with the formalised R&D mechanisms. Such systems have a focus on ‘radical’ technologies.

2.12 STI systems of innovation are most suited to large firms, particularly those involved in new product development. However, as the Deloitte’s Demand Study for MSI (2012) noted the majority of innovation initiatives in New Zealand conform to the demand or market ‘pull’ model that identifies a market need and matches that to an industry-led innovation.

2.13 From a systems perspective, this market or ‘pull’ approach can be characterised as a ‘Doing, Using and Interacting’ (DUI) approach that works on the assumption that rather than the ‘formalised’ knowledge of the STI system, it is ‘tacit’ knowledge that counts. Firms seek to solve problems, learning from experiences and competencies acquired by employees on-the-job (Jensen, Johnson, Lorenz, & Lundvall, 2007). Such challenges may come from the firms’ own activities, but they often relate to the requirements and needs of customers and users and thus the DUI mode often involves a degree of interaction within and between organisations and functions (Lundvall, 2007). Table 1 outlines some of the key features of the ‘pure’ models of these different innovation systems, although in reality most countries adopt a mixture of both.

2.14 STI approaches can be termed as ‘know-what’ or ‘know-why’ models; DUI approaches as ‘know-how’ and ‘know-who’. Therefore, it is not books, scientific articles or the internet that matters (know-what, know-why) but repeated and mainly informal interaction, imitation and learning by doing (know-how) and ‘social capital and local buzz’ (know-who) (Fitjar & Rodriguez-Pose, 2013). DUI systems can be characterised as a process whereby a solution is sought for an immediate problem from amongst the network of known associates - suppliers, agents, customers, accountants, banks, whānau and friends - which in turn leads to innovation.

Table 1 STI and DUI policies for Research Innovation Systems

<table>
<thead>
<tr>
<th>STI mode (science driven)</th>
<th>DUI mode (user driven)</th>
</tr>
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<tbody>
<tr>
<td>Aim: Increase the R&amp;D capacity of the actors in the system and increase cooperation between firms and R&amp;D organisations</td>
<td>Aim: Foster organizational and inter-organisational learning and increase co-operation between particular producers and users</td>
</tr>
<tr>
<td>---</td>
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</tr>
<tr>
<td>Typical innovation policy</td>
<td>Typical innovation policy</td>
</tr>
<tr>
<td>• Increase the R&amp;D capacity of organizations</td>
<td>• Support on-the-job learning and organizational innovations</td>
</tr>
<tr>
<td>• Support joint R&amp;D projects between firms and universities</td>
<td>• Matchmaking activities and building and sustaining existing networks</td>
</tr>
<tr>
<td>• Support higher education programmes</td>
<td>• Stimulate trust building and joint innovation projects between actors in the value chain (producers–suppliers–users–consumers)</td>
</tr>
<tr>
<td>• Subsidies for R&amp;D infrastructure (laboratories, research and technology centres, research groups, etc.)</td>
<td>• Stimulate joint projects between competing and auxiliary businesses (e.g. food–health)</td>
</tr>
<tr>
<td>• Support (financial) for increasing mobility between academia and industry</td>
<td>• Support for commercialisation of research results</td>
</tr>
</tbody>
</table>

Source: (Isaksen & Nilsson, 2012, p. 6)

2.15 Being ‘practical’ and ‘innovation’ are not opposing concepts. It is more a matter that engagement with the formalised agents of innovation is not generally seen as the first step in looking for firm solutions. Despite this, the literature suggests that STI systems can support firms to make the innovative and hence productive ‘leap’. Hence, a combination of both will make the biggest gains for both firms and countries.

2.16 New Zealand can be said to be attempting to shift its innovation system from an STI to a DUI model. Callaghan Innovation has been set up in an effort to recognise this shift and to perform a co-ordination function in High Value Manufacturing and Services (HVMS) in a country that has been noted as having a fragmented innovation infrastructure (OECD, 2007). As it says on its website, Callaghan Innovation will “work across the whole innovation system to help businesses be more innovative and derive greater returns on that innovation” (Callaghan Innovation, 2013).

2.17 The focus on HVMS is unsurprising given the additional productive value that can be attributable to firms in this sector. In 2012, Martin, Jenkins & Associates prepared a profile for the Ministry of Science & Innovation prior to the instigation of Callaghan Innovation (Martin Jenkins, 2012). The report notes that there is no single way to categorise the HVMS sector and several variations are possible depending on the variables chosen to create the sector (Martin Jenkins, 2012, p. 120).

2.18 Using Statistics New Zealand industry classifications, the Martin Jenkins list of the HVMS sector included both high-tech and ‘high value’ non-high-tech sectors (e.g. textiles, clothing, wood and furniture manufacturing) while excluding some services commonly found in OECD definitions such as real estate, legal, accounting, recreational and education. Table 2 summarises the Martin Jenkins categories.
Table 2  High Value Manufacturing and Services

<table>
<thead>
<tr>
<th>Manufacturing</th>
<th>Energy and Mining</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Food &amp; Beverage</td>
<td>• Mining – Extraction &amp; Exploration</td>
</tr>
<tr>
<td>• Textiles, Clothing and Footwear</td>
<td>• Energy Generation &amp; Transmission</td>
</tr>
<tr>
<td>• Wood &amp; Paper</td>
<td></td>
</tr>
<tr>
<td>• Printing</td>
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<tr>
<td>• Petroleum &amp; Coal</td>
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<tr>
<td>• Non-metal Materials</td>
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<tr>
<td>• Metal Materials</td>
<td></td>
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<tr>
<td>• Furniture &amp; Other</td>
<td></td>
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<tr>
<td>• Basic Chemicals</td>
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<tr>
<td>• Polymers &amp; Rubber</td>
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<tr>
<td>• Pharmaceuticals</td>
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<tr>
<td>• Electrical Equipment &amp; Appliances</td>
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<tr>
<td>• Machinery &amp; Equipment</td>
<td></td>
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<tr>
<td>• Motor Transport Equipment</td>
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<tr>
<td>• Marine Transport Equipment</td>
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<tr>
<td>• Other Transport Equipment</td>
<td></td>
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<tr>
<td>• Scientific Instruments</td>
<td></td>
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<tr>
<td>• Electronic Equipment</td>
<td></td>
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</tbody>
</table>

(Source: Martin Jenkins Report, 2012 p. 9)

2.19 From an implementation perspective, such a list provides a useful overview of which industries might respond more productively from innovation interventions by a government sponsored agency, such as Callaghan Innovation. More importantly, as the report notes, such firms:

- have higher labour productivity rates (value added per employee);
- are considered a larger firm (by New Zealand standards ie 20+ employees);
- are more likely to undertake innovative activities and spend more on product development (particularly very large HVMS firms);
- are more likely to undertake R&D;
- are more likely to have introduced ‘new to market’ products; and
- are more likely to have significant amounts (>25%) of foreign investment.

2.20 We would make two comments about how the Martin Jenkins report characterises HVMS. First, while the report focuses on one aspect of ‘value’, it is worth noting that value in HVMS need not be restricted to purely economic or financial gains. KPMG (2012) positions value as a concept that goes beyond profit and revenue to include a social impact as shown in the Table 3 framework developed by The Institute for Manufacturing (IfM) at the University of Cambridge.

Table 3 External Value Matrix
(Source: KPMG, 2012, p. 9)

2.21 Such a definition should be borne in mind when we consider how value is created and sustained in the Māori economy. We turn to this aspect in the next section on definitions of the Māori economy.

2.22 Second, traditional approaches to the capture of R&D metrics (on which has been based observations about New Zealand’s performance) have mostly been derived from manufacturing ‘product’ type R&D. Services have been less well captured until quite recently (Frascati Manual (2002 Edition), 2010). However, services and product or process R&D are increasingly intertwined (OECD, 2012). While the Martin Jenkins report acknowledges that the ‘distinction between manufacturing and services has also become increasingly blurred’ (Martin Jenkins, 2012, p.7), the list of services is small and perhaps will have less of a focus for the new entity.

2.23 To conclude this section, we need to be clear that innovation is not the same as R&D. As the OECD (2012) states “these two terms are too often confused in the debate”. R&D is a specific sub-set of the innovation system. The two are related, particularly in today’s highly interdependent global value chain, but there needs to be a distinction in the minds of policy-makers. R&D does appear to be an important driver of knowledge creation facilitating knowledge absorption, perhaps because carrying out R&D leads to greater awareness and understanding of external knowledge, and also increases the capability to apply this knowledge (Blakeley, Lewis, & Mills, 2005)(Palmer, 2009). However, R&D is not the only driver of innovation performance, nor is it the only mechanism available for creating new knowledge.

3. DEFINING THE MĀORI ECONOMY

3.1 In our examination of how the Māori economy has been defined, the most notable aspect has been the focus on the objective characteristics of economy. For example, the BERL
report (2011b) describes the Māori economy as constitutive of all entities and enterprises that self-identify as part of the Māori economy:

- those managing and controlling collectively-owned assets;
- Māori entrepreneurs active in individually-owned businesses and/or small to medium-sized enterprises (SMEs); and
- Māori employees as wage earner.

3.2 Focussing on objective characteristics creates an assumption that the Māori economy in its constitutive parts (collective, enterprise and individual) shares similar characteristics as any other type of business in its industry and so is affected by the same issues as others, including issues of innovation, R&D and productivity. While we do not necessarily disagree with this assumption, there has been acknowledgement that to truly grasp the potential of the Māori economy, there needs to be a more comprehensive understanding of the social, cultural and moral imperatives of a Māori economy. In particular, cultural values and systems of traditional knowledge that make the Māori economy different need to be recognised and acknowledged (BERL, 2011; Raine, Teicher, & O’Reilly, 2011). It is these that make Māori economy, ‘Māori’.

3.3 These more qualitative definitions pay attention to culture, organisational form and socio-legal aspects. For example, one definition of a Māori enterprise is where Māori tikanga or customs are important to business transactions or where the commercial transactions involve Māori culture and services oriented to specific Māori needs (NZIER, 2003). Another definition posits that the defining characteristic of a Māori business is its Māori style of governance and organisation (Spiller, Erakovic, Henare, & Pio, 2011). Another consideration is whether a Māori business can be described as being whānau or community-oriented within its organisational culture, practice and product or service offerings, or is a purely commercially-oriented. However, one does not preclude the other (Durie, 2003).

3.4 In terms of organisational form, Māori enterprises encompass the broad spectrum of organisational types from independent small businesses operating solely in their local community, to large export-oriented corporations, to organisations that have emerged out of Treaty settlements (some small and others of a significant size) as well as Trusts managing collective assets that may or may not be economically productive. Much attention has been paid to iwi or tribal enterprises. This is unsurprising given their ongoing level of adaptation and entrepreneurial flair (Sautet, 2008) (Petrie, 2006). A number of these utilise modern institutional, legal and governance models, for example Ngāi Tahu Holdings, Wakatū Incorporated, Te Ohu Kaimoana or the more recently formed Miraka, resulting in a ‘blended’ organisational structure where Māori cultural drivers exist in conjunction with market systems of organisation. However, it is privately-owned
Māori businesses, typically micro- and small-to-medium-sized enterprises (SMEs), which form the bulk of Māori enterprises².

3.5 Although an important factor, it is not the intention of this report to provide in-depth detail of the political and legislative infrastructure influencing the Māori economy. It is worth noting that the Māori Economic Development Panel (2012) considers the Crown-Māori relationship, founded on the Treaty of Waitangi, to be a key feature of Māori economic development initiatives. The process and infrastructure associated with the Treaty of Waitangi settlements have significantly increased the resource base of iwi enterprise and highlighted the potential to generate economic growth (Clydesdale, 2007). While the overall contribution to the national Māori economy from Treaty settlements is modest³ it is their longer-term contributions that are significant (Carter et al., 2011). We return to the innovation potential of post-settlement iwi in Section Four.

4.1 To conclude, we note that the focus on the Māori economy has been largely in relation to its objective characteristics. However, if there is an intention is to create innovation intervention points, then qualitative definitions also need to be considered as these offer insight into potential engagement. Thus, for the purposes of this report, we are choosing to define the actors in the Māori economy as those who by either word or deed espouse Māori-oriented characteristics, whether as a function of their organisational structure (such as iwi or hapū), their firm offering or their preferred mode of association. This does not discount the contribution that individual Māori employees make to the economic development of the nation. Nor does it minimise the non-productive areas of Māori assets (for example, land held for cultural purposes). However, when thinking about the innovation process, the focus must necessarily be on those groups or individuals able to control or give impetus to it.

4. SUMMARY

4.1 This section has considered New Zealand’s Innovation System. Like other countries, New Zealand is trying to develop a more firm or market-led innovation system as opposed to a science ‘push’ approach. As has been made clear, innovation is more than just the application of science-led research and development. It is an integrated and encompassing system of inputs – of which R&D is one type of input - that take place within both a national and global context leading to firm-level outputs in the shape of products, services or process. One of these outputs is manufactured products and services of high value.

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² Te Puni Kōkiri conservatively estimated that in 2011 there were 14,007 Māori SMEs representing a small but growing proportion of total SMEs in New Zealand (2011).
³ In 2006 it was estimated at 1.5% of the overall Māori economy.
4.2 Given New Zealand’s relatively low-level of R&D investment, HVMS is being seen as one way to improve the country’s low productivity by developing innovative or ‘disruptive’ technologies. While much of the focus has been on manufactured products, the place of services has been less well catered for as can be seen in the limited number of services identified in the Martin Jenkins report prior to the instigation of Callaghan Innovation. Additionally, the issue of what makes a product or service of ‘value’, beyond financial considerations, is not addressed in the Martin Jenkins report.

4.3 As the literature review shows, most firms do not connect with R&D ‘push’ systems because they seek for solutions within their immediate networks. Hence, the issue for STI systems is: how to connect and to whom? We return to these questions in Section Four when we consider innovation in the context of the Māori firm.

4.4 We have also looked at what is meant by the Māori economy. Focussing on objective characteristics such as the control and use of assets, whether collective or individually owned, is one way to define the Māori economy. Other facets might also be considered such as the nature of how assets are managed and used; governance or organisational forms; the size and characteristics – such as cultural characteristics – of the Māori entity. These aspects are discussed more fully later in the report.

4.5 We now turn to an examination of the different types of objective data about the Māori economy that currently can be gathered.
SECTION THREE: NGĀ PUNA TATAU - QUANTITATIVE SOURCES RELATING TO MĀORI BUSINESSES, SCIENCE, AND INNOVATION

1. Overview

1.1. This section provides examples of a variety of quantitative data sources that may be useful to understand Māori businesses’ relationship with science and innovation. The primary focus is to determine the availability of financial drivers or determinants that help explain growth opportunities in this area.

1.2. A number of data sources were examined for their potential to elicit information about Māori businesses. The information was gathered via phone discussion or in person from organisations and via a review of databases. These sources were:

- **Government organisations**: Statistics New Zealand, Callaghan Innovation, Ministry of Primary Industries, Te Puni Kōkiri, Ministry of Business, Innovation and Employment;
- **Non-government organisations**: Poutama Trust, Federation of Māori Authorities, Waikato Management Research Centre, New Zealand Māori Tourism, Business and Economic Research Limited (BERL), Māori Trustee, Business New Zealand; and
- **Commercial Databases**: Bureau van Dijk Orbis, Kompass, GlobalVantage, Compustat.

1.3. We also provide a brief summary (detailed in Appendices G and H) of a preliminary analysis of:

- Regional Māori education data matrixed against HVMS data to examine human capability as a potential driver of firm performance; and
- HVMS companies, using a DuPont analysis, comparing New Zealand, Australia, and Denmark in order to assess the feasibility of providing national and international benchmarks for Māori firms should such data become available.

2. Data Sources

**Government Organisations**

2.1. Statistics New Zealand: Overview

In 2012, Statistics New Zealand circulated a discussion paper, *Tatauranga Umanga Māori*, outlining their intention to collect credible and reliable information about the Māori economy (Statistics New Zealand, 2013a). The *Tatauranga* project is at a relatively early stage, focussing in the first phase on developing systematic information about collectively managed assets (CMA) (See Figure 3 below). Hence, only a small percentage of the Māori economy will be able to be mapped.
2.2. However, Statistics New Zealand does have some data within its current collection that might be useful in estimating the Māori economy across the other categories. As discussed below, matching education data from the IDI-LEED data set may prove to be a useful avenue that could be explored.

2.3. Statistics New Zealand has indicated that there are constraints in merging census information that identifies ethnicity with business data that is collected through the IR10. Providing such matching by attaching an ethnicity identifier to the IR10 would provide the most efficient mechanism to obtaining robust information about the Māori economy.

2.4. Census Data

2.4.1. The NZ.Stat database\(^4\) can be used to cross-tabulate Census data to map the geographical location of Māori employees and self-employed individuals against occupation and industry (See Appendix G). The potential use of such data can help to determine where Māori industry expertise is concentrated geographically and might help inform both Māori and non-Māori HVMS industries about the skilled labour pools available.

\(^4\) NZ.Stat is available at http://nzdotstat.stats.govt.nz/
2.4.2. We performed a preliminary data analysis along these lines by matrixing Māori educational qualifications against geographical region to show concentrations of educationally qualified Māori individuals within the HVMS sectors identified in the Martin Jenkins report. The analysis identified concentrations of Māori expertise by sector and region. For example, in the Mining sector, Māori employees are concentrated in Waikato (34%), Taranaki (12%), Auckland (11%), Northland (7%), and the West Coast (7%).

2.4.3. We also looked at which regions have higher qualifications of qualified Māori on the assumption that higher qualifications are an important indicator of innovation ‘absorptive capacity’. The analysis indicated that the top five regions are Auckland (27%), Wellington (13%), Waikato (13%), Bay of Plenty (10%), and Canterbury (7%).

2.4.4. The full analysis is explained in Appendix G.

2.5. Integrated Data Infrastructure (IDI)

2.5.1. The Integrated Data Infrastructure is a new database from Statistics New Zealand that captures longitudinal data about individuals (Statistics New Zealand, 2013b). In effect it accumulates data across government agencies for a given person across time. These agencies include the Ministry of Education and the Tertiary Education Commission. Because the Ministry of Education and the Tertiary Education Commission collect ethnicity data, the IDI dataset contains ethnicity information.

2.5.2. However, the ethnicity information in the IDI dataset currently is populated only for persons under the age of 30 as ethnicity information was not gathered in prior years. Ethnicity information for individuals over the age of 30 may be reflected in the IDI if they have been through the secondary or tertiary education system in recent years. Hence, the IDI allows for the near-complete identification of Māori under the age of 30, and for a small group of Māori over the age of 30 if they have been through school recently. The IDI is linked to the Linked-Employee-Employee Data (LEED) dataset.

2.6. Linked Employer-Employee Data (LEED)

2.6.1. The LEED dataset attempts to link the data from all employees to the data from all employers and businesses (Statistics New Zealand, 2013c). Because the LEED dataset is linked to the IDI dataset, this allows for the identification and matching of Māori employees to individual businesses, which can help to show which businesses are currently employing a larger proportion of Māori employees.
2.6.2. The 2006 census data shows that 60% of the total Māori population is under the age of 30, which means that potentially 60% of the Māori population can be identified through the LEED dataset through the IDI-LEED linkage. Although using this subset of the entire Māori population to draw inferences about the Māori economy may introduce some systematic bias due to the bias towards younger people, it is a dataset that is currently available and merged. Further assessments of the quality of the merged IDI-LEED dataset is beyond the scope of this initial project stage but future estimation of the Māori economy should attempt to utilise this data source comprehensively.

2.7. Business Frame

2.7.1. This dataset contains detailed financial information that is collected from the IR10 form administered by Statistics New Zealand. A non-exhaustive list of the types of data captured by the IR10 form can be found in Appendix B. It also contains non-financial information collected from surveys administered by Statistics New Zealand. These surveys include the R&D survey (Statistics New Zealand, 2013d), and the Business Operations survey (Statistics New Zealand, 2013e).

2.7.2. The R&D survey is conducted every two years, and samples approximately 3,700 organisations that are likely to incorporate R&D in their operations. The results of the R&D survey can be used to understand how New Zealand businesses use R&D strategically to improve business outcomes. If the R&D survey included an ethnicity identifier, it would indicate how Māori businesses operating in the HVMS sector utilise R&D to gain competitive advantage.

2.7.3. The Business Operations survey is conducted every year and samples approximately 7,000 organisations out of the entire population of New Zealand businesses. The scope of the Business Operations survey is wider than that of the R&D survey in that it captures additional factors relating to business performance. These factors include the expansion to export markets and export sales, level of investment in R&D, and the usage of information and communication technology (ICT) in enhancing business performance. Again, inclusion of a Māori ethnicity identifier would allow for a holistic understanding of how Māori businesses leverage technology and innovation into better business performance.

2.7.4. Finally, the Business Frame contains the names of directors and proprietors. Due to difficulties in achieving acceptable match rates between names from the Business Frame database and names from the Census dataset, it is not possible
to link the ethnicity variable from the Census dataset to the names of business owners and directors in Business Frame (Schulze, 2013).

3. Sources of Data from other Organisations

3.1. Alternative sources of data play several important functions in understanding the Māori economy and its intersection with HVMS. First, alternative sources of data help to triangulate the picture that emerges from analysing Statistics New Zealand data. Because, as outlined in Section Two, there are various definitions of what constitutes the Māori economy, official statistics may or may not capture the full extent of the richness of the Māori economy. Second, alternative sources of data may be timelier compared to Statistics New Zealand data.

3.2. Because of significant limitations placed on combining multiple disaggregated Statistics New Zealand data to create an overarching picture, it may be more expedient to attempt to understand small sections of the Māori economy using currently available alternative data sources, and then to subsequently triangulate the understanding gained from those small sections with Statistics New Zealand data when it becomes available. Finally, alternative sources of data can possibly capture other relevant non-financial aspects of the Māori economy.

3.3. Te Puni Kōkiri Māori Business Facilitation Service

3.3.1. MBFS administers an entry survey to potential clients to assess their level of business knowledge, including the client’s knowledge of R&D processes. Based on the results of the survey, MBFS then decides whether to aid the client in-house, or to refer them onwards to another external agency. In-house clients are then administered exit surveys at the end of the intervention and for several years after to assess the value of MBFS’s help.

3.3.2. MBFS has taken on 400 such clients every year, on average, for the past 10 years. For the past three years, in addition to the surveys administered at entry and exit, MBFS has attempted to collect additional, more detailed financial data from these clients. Discussions with key personnel from MBFS gives the following estimates of the data collected:

- 10 years of data from the entry survey, but only 3 years of financial data starting from 2010.
- MBFS accepts about 25% of (approximately 400) potential clients coming in through their doors, and refers 75% (approximately 1,200) to other agencies.
• The 400 potential clients whom they accept are roughly split into two groups, with half being existing businesses, and another half being new businesses.

3.3.3. Hence, the two types of data that can potentially be collected from the MBFS database are as follows:

• Simple quantitative data from the entry survey. The entry survey is attached as Appendix C.
• More detailed financial data from 2010 to 2012. In the best case scenario, there will be 400 companies from 2010 that have three years of data from 2010 to 2012, with another 400 companies from 2011 with two years of data, and a final 400 companies from 2012 with a single year of data. That gives us a potential pool of 1,200 + 800 + 400 = 2,400 observations, but with significant time series effects. A selection of variables collected can be found in Appendix D.

3.3.4. The potential issues with the MBFS dataset, along with those already mentioned, is the presence of significant selection bias. Because MBFS’ potential clients are self-selected, and because MBFS chooses a subset of those potential clients to aid (around 25% of potential clients are aided in-house), the selection bias is considerable. In addition, geographical accessibility creates bias too, as many Māori businesses may not be able to access MBFS centres due to issues of travelling distance. Such a bias may mean any statistical descriptions and analysis may not be representative of the wider population.

3.4. Ministry of Primary Industries (MPI)

3.4.1. The MPI is a recently (2011) formed government organisation consisting of the former Ministry of Agriculture and Forestry and the Ministry of Fisheries. It deals with Māori entities on a daily basis, and at varying levels of engagement, from providing advice, to funding and collaborating.

3.4.2. MPI does not maintain a central repository or database that systematically collects information on its past or current engagements. However, when MPI administers funding pools (e.g. the Sustainable Farming Fund), they may collect more detailed information about those businesses that receive funds. These businesses may include Māori businesses, and the information collected includes some of the standard financial measures (e.g. size of business, turnover). In addition, MPI periodically deals with Māori farming enterprises via the Māori Trustee and the Federation of Māori Authorities.

3.4.3. To date, MPI is unable to estimate the number or level of Māori engagements that the organisation has undertaken, because the systematic collection of this data would require a significant investment in time and resources that the MPI
directorate cannot presently support. However, a tentative list that includes some Māori engagements can be found in Appendix E.

3.5. Callaghan Innovation

3.5.1. Callaghan Innovation has access to two databases, which were established by Industrial Research Limited (IRL) prior to its merger into Callaghan Innovation. The first database contains financial data that spans the past 10 years. This database was used by IRL to record their interactions with businesses. The database contains observations for roughly 1,800 separate businesses. However, because IRL only worked with 300 of these businesses, more detailed data is only available for this subset. The database contains business names and contact persons, addresses, and project outlines, but does not contain any information regarding ethnicity.

3.5.2. The second database is an international commercial database of company listings called Kompass. The categories of businesses included:

- Therapeutic biochemical
- Chemicals
- Energy
- Materials (e.g. ceramics, plastics, nano-materials)
- Advanced Manufacturing (e.g. robotics, precision engineering)
- Medical devices
- Agri-tech (incl. machinery)
- Digital (incl. creative industries)
- ICT (incl. software development and communications)

3.6. Ministry of Business, Innovation, and Employment

3.6.1. The Ministry of Business, Innovation, and Employment (MBIE) collects information from businesses that apply for R&D funding. Although MBIE does not have a strict definition of what constitutes a Māori business, they do attempt to collect information about whether a business may be Māori. This is based on criteria such as whether the business has a Māori owner or manager, and also whether the business plan may have implications for Māori knowledge as defined in Vision Mātauranga (MBIE’s Māori-focused science strategy). If a business is deemed to be Māori, a flag will be entered beside their name in the MBIE database. Normally, when a proposal for funding is submitted, it first goes into the general funding pool to see if it can be supported from this. If it is
unsuccessful in attracting funding from the general pool, it is then submitted the Vision Mātauranga funding pool if it is a proposal that is deemed to be of value to Māori.

3.6.2. When businesses applies for funding, MBIE’s application form includes the following items, to be answered with information from the past three years:

- Total revenue
- Profit
- Export revenue
- R&D expenditure, which includes all expenditure on research and development, regardless of whether it is expensed or capitalised
- Number of full-time equivalent employees
- Number of full-time equivalent R&D staff employed, including contractors
- Financial statements, including profit and loss and balance sheets

3.6.3. However, the coverage of potential Māori businesses is not currently complete, as MBIE fund managers do not always populate the database with the Māori ‘flag’. Hence, it is difficult to estimate how many Māori businesses may have been supported by MBIE funding, although MBIE should be able to separately describe some of the iwi-based contracts that they’ve funded. MBIE also do not track who is employing Māori or the status of the Māori job market.

3.6.4. Traditionally, MBIE has seen itself as a type of knowledge broker that helps businesses to find out what types of R&D contacts are available to help them. MBIE often directs them to Crown Research Institutes (CRIIs) or other services.

3.6.5. Because business funding has now moved to Callaghan Innovation, MBIE is in an on-going conversation with Statistics New Zealand to get better data regarding a potential linkage between Callaghan Innovation’s data sources and MBIE’s data sources about Māori business.

3.7. Poutama Trust

3.7.1. The Poutama Trust was established in 1988 with a grant of $10 million from the Crown, with the mission of encouraging more Māori commercial enterprises. Since its inception, the Trust has received a steady stream of applications to undertake feasibility studies for new and growing Māori enterprises, and has provided them with financial assistance in the form of grants, and other non-financial assistance, to encourage their growth. In the course of its operations, the Trust has gathered information about Māori businesses over the past 25
years. However, the scope and details of the variables collected has changed over time, as the needs of Māori businesses have necessarily evolved.

3.7.2. To be accepted for funding, the clients fill in an online form5. Currently, the form collects data about:

- Latest financial statements
- Industry
- Description of business activity
- Number of employees
- Annual turnover (collected as categorical levels: below 100k, 100-500k, over 500k)
- Capital invested
- R&D related questions ("Does your business undertake R&D?", "Does your business have an innovation focus?")
- For repeat applications:
  - Key barriers to business growth
  - Changes in key financial data since last application

3.7.3. There are some potential issues with the Trust database. In particular, the self-selection effect is likely to be strong, as Poutama Trust reports that a large proportion of Trust clients are small businesses that are attempting to access funding and assistance for growth. In addition, the questions relating to R&D are often not filled in by clients, possibly because the question is not well defined. However, even in the presence of these issues, the dataset is likely to be very useful in understanding the types of small businesses that are looking for ways to leverage existing technology to grow.

3.7.4. In discussions with key personnel from the Trust, they recommend that the best way to support the Māori economy would be to go through the existing networks.

3.8. Waikato Management Research Centre

3.8.1. The Waikato Management Research Centre (MRC) is a business research arm of the University of Waikato. In its annual New Zealand Business Benchmarking Survey, the MRC collects financial data from New Zealand accountants, and then rigorously screens it to generate robust financial information on New Zealand businesses. The statistics reported are widely used as a standard for benchmarking SMEs in New Zealand (Waikato Management School, 2013).

5 The form can be accessed at http://poutama.co.nz/putea/appDownload/apply.download.htm
3.8.2. The data collected is classified by ANZSIC 2006 industry codes (Statistics New Zealand, 2013f), and includes financial ratios that cover income, profitability, overhead structure, including on a per employee basis, liquidity, capital structure, and common-sized income statements. Different levels of data aggregation can be accessed, from an industry-level perspective, to breakdowns by total income and location⁶.

3.8.3. Because the data collected by the MRC comes without any information that could identify the business, it is not possible to identify which surveyed businesses represent Māori interests, or are part of the Māori economy. However, the survey data can still help in terms of providing a benchmark, especially in the areas of understanding SME performance.

3.9. New Zealand Māori Tourism

3.9.1. Together with Poutama Trust and the Federation of Māori Authorities, New Zealand Māori Tourism sent out a survey in March 2013 to 300 Māori tourism businesses identified within the Poutama and Federation databases. Upon comparison, some tourism businesses were identified as being duplicated across the two databases.

3.9.2. New Zealand Māori Tourism included a wide variety of tourism operators within the survey. These included individuals, employees, iwi, corporate investors and other entities which were in a supply or service role in relation to other tourism operators (e.g. cafes). Most of these businesses are known personally to the three participating organisations. The survey included the following questions:

- Names of owners/operators/directors
- Type of business
- Location
- Number of employees
- Turnover


3.10.1. In discussions with BERL, two trends were noted in relation to the Māori economy. First, was that the Māori economy was dynamic, with high uptakes of higher education, especially amongst the younger end of the population. They

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noted the shift within the Māori economy from labour-intensive production towards knowledge-based production. The second significant driver of the Māori economy comes from investment by iwi and other Māori collective asset managers into high-value commercial projects. Iwi are significant stakeholders in the Māori economy, and they have committed to many investments in both physical capital and human capital, which creates a solid foundation to undertake high-growth production of goods and services.

3.10.2. BERL considers that there may exist a very good opportunity to reach out to medium-sized Māori businesses that currently receive less attention from both the public and private sector. Because start-ups and large businesses receive proportionately more attention, medium-sized businesses may benefit from increased attention, especially in terms of networking, support, and infrastructure building.

3.10.3. In relation to data collection, BERL recommended that it might be useful to approach data collection from a bottom-up, grassroots community-focused approach, where individual Māori businesses are invited to participate in data collection. With regards to current identification of Māori collectively-managed entities (CMEs), which is based on self-identification through the MA/MT tax code on the IR10 form, discussions revealed that this method is not comprehensive enough to achieve a good estimate of that portion of the Māori economy. Finally, BERL considered that council-driven projects may be a good way to identify Māori businesses, clustered within a geographical region that would benefit greatly from a targeted investment into their growth.

3.10.4. BERL also noted that anecdotally, many smaller Māori businesses saw a great benefit to having broadband access, which ties in with the current push by the Ministry of Business, Innovation, and Employment (MBIE) to provide Ultra-Fast Broadband (UFB) to enhance growth opportunities economy wide.

3.11. Māori Trustee

3.11.1. The Māori Trustee administers Māori land. Since the Māori Trustee Amendment Act 2009, the Trustee has operated independently of Te Puni Kōkiri.

3.11.2. The Trustee’s clients are the owners of the approximately 100,000 hectares of Māori land, which is held in about 2,000 blocks. The Trustee has become focussed on communicating and reaching out to its clients. It has a database which contains information relevant to its administrative and trust duties.

3.11.3. This database includes the following items:
• Names of owners
• Records of financial dealings associated with each block of land
• Balance sheets
• Profit and loss statements
• Leasing and tenancy arrangements
• Inspection reports

3.12. Business New Zealand

Business New Zealand does not collect any data that can help to identify the ethnicity of a business.

3.13. Federation of Māori Authorities

The Federation does not currently maintain a comprehensive database. It has a list of members, which is not regularly updated. It is currently undertaking a joint project with Statistics New Zealand to explore the collection of more accurate information with regards to Māori businesses. In addition, it is a partner in data collection and survey projects with other organisations, such as New Zealand Māori Tourism.

3.14. To conclude this section, we have tabulated the preceding information to provide an overview of the strengths and limitations of each of the databases. This information is presented in Table 5.

Table 5 – Potential Sources of Data on Māori Businesses

<table>
<thead>
<tr>
<th>Data Source</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statistics New Zealand – IDI-LEED</td>
<td>Links Māori employees and employers under the age of 30 to company financial data. Has selection bias in favour of younger age demographic.</td>
</tr>
<tr>
<td>Statistics New Zealand – Tatauranga Umanga Māori Project</td>
<td>Identifies Māori collectively managed entities that self-report as a Māori authority. Coverage is not complete for this subset of the Māori economy; selection bias in favour of CMEs, and hence is unreliable for estimating entire Māori economy.</td>
</tr>
<tr>
<td>Te Puni Kōkiri Māori Business Facilitation Service (MBFS)</td>
<td>Has financial data covering the period 2010 to 2012. Significant self-selection bias due to nature of MBFS; only small businesses that require assistance will approach MBFS for help. Also, geographical bias may exist due to location of MBFS centres, as business owners may not travel to a MBFS centre if it is far away from the place of business.</td>
</tr>
</tbody>
</table>
| Ministry of Business, Innovation, and Employment (MBIE) | For every funding engagement, MBIE attempts to collect information about whether that business may be Māori. This information is represented as a flag in the MBIE funding database. However, coverage of potential Māori businesses is
not complete as fund managers do not always use the flag. Additionally, self-
selection bias towards businesses in need of capital may exist due to the nature
of funding engagements.

| Poutama Trust | Has roughly 6,000 clients in the Poutama database. Self-selection effect is likely
to be strong due to a large proportion of their clients are small business that are
attempting to access funding for growth. In addition, the financial data may not
be complete, as questions relating to R&D are often not filled in by clients. |
| New Zealand Māori Tourism, Poutama Trust, and Federation of Māori Authorities | New Zealand Māori Tourism sent out a survey in March 2013 to 300 Māori
tourism businesses identified within Poutama and Federation databases.
Financial data collected was limited and may not be useful for understanding the
role of R&D and innovation; also, self-selection bias limits generalizability of this
survey to larger Māori economy. |
| Māori Trustee | Financial data is collected with respect to ownership and financial dealings for
each block of Māori land. Financial information may not be representative of the
larger Māori economy as the Trustee administers mainly economic activities that
are connected with land such as forestry and agriculture. |

4. Commercial databases

4.1. There are several commercial databases available that contain detailed financial
information about companies from all over the world. These databases can be used
to build a profile of HVMS companies in New Zealand and globally to create sector
specific benchmarks for Māori companies operating within the HVMS sector.

4.2. Bureau van Dijk Orbis

4.2.1. Orbis is a database that is marketed by Bureau van Dijk\(^7\). It contains
information about private and publicly listed companies, worldwide. 20,000 New
Zealand private and public companies are listed in the Orbis database, out of
which Orbis contains detailed financial information for 1,200 companies. Orbis
does not contain ethnicity information, and a visual inspection of company
names did not reveal any company names that strongly signalled for their
inclusion in the Māori economy.

4.2.2. With information from the 1,200 companies, it is possible to build up a profile
of New Zealand companies as a benchmark.

4.2.3. Some of the important financial and non-financial data that Orbis provides
includes the following:

- Industry classification code (NACE, NAICS)
- Total assets
- Current assets

\(^7\) Accessible via http://orbis.bvdinfo.com/
- Fixed assets
- Turnover/Revenue
- Sales
- Gross profit
- Earnings before interest and taxes (EBIT)
- Net profit after taxes (NPAT)
- Net operating cash flow
- Research and development expenses
- Total liabilities
- Current liabilities
- Total equity
- Number of employees

4.2.4. Using the Orbis data (See Appendix H, Table 6.2.1), we provide a preliminary benchmark of these New Zealand companies against companies from Australia and Denmark. These countries were chosen as they are often used as benchmarks in New Zealand economic policy analysis in terms of market proximity, population size, demographics, and sector composition.

4.2.5. We undertook a Dupont analysis which is a standard analysis to determine the factors influencing financial performance. This analysis shows that New Zealand appears to have a comparative advantage in Professional, Technical, and Scientific Services compared to the other two countries, with the highest return on equity (ROE) across the four years of the analysis.

4.2.6. Additionally, New Zealand appears to be comparatively stronger in the area of capital productivity, particularly in Manufacturing, Information Media and Telecommunications and Professional, Technical and Scientific Services which implies that New Zealand HVMS companies are able to earn a higher rate of return per unit of asset used in their operation as compared to companies from Australia and Denmark. However, in comparison to Denmark, New Zealand’s HVMS companies have a lower gross profit margin.

4.3. Kompass

4.3.1. Kompass is a business-to-business directory and search engine that provides business users with comprehensive information about companies, and the products and services that they offer⁸. The estimated number of New Zealand companies on the Kompass database totals 15,000, with roughly 3,000 operating in the High Value Manufacturing and Services sector. Ethnicity information is not available from Kompass.

- The information in the database includes:

⁸ Accessible via http://www.kompass.co.nz/
• Names and addresses
• Contact people
• Number of employees
• Estimated turnover of the business
• Industry sector
• Exports

4.4. GlobalVantage
4.4.1. GlobalVantage is a database marketed by Standard and Poor’s. It contains financial accounting data about publicly listed non-North American companies. GlobalVantage coverage of New Zealand companies is relatively sparse, with 160 companies listed, and roughly 100 companies with detailed financial data. The 160 companies listed in GlobalVantage are a subset of the companies that Orbis covers; thus, the use of GlobalVantage does not provide an incremental advantage over Orbis.

4.5. Compustat
4.5.1. Compustat is a database marketed by Standard and Poor’s. It contains financial accounting data about publicly listed North American companies. The focus of Compustat is on North American companies; hence, the information in Compustat may not directly allow for the understanding of the Māori economy. However, Compustat allows for a profile of the North American economy to be built up over time, which may assist in understanding how targeted research and innovation funding can help to similarly build up companies in the Māori landscape.

4 Summary
4.1 Statistics New Zealand has the most comprehensive data on the New Zealand economy and its people. That is, some disaggregated Statistics New Zealand data is in the public domain and accessible through NZ.Stat through their website. This allows for broad analyses (for example, as we have performed in the appendices). However, to perform more detailed analyses requiring individual-level data, researchers would need to apply for access through the Data Lab services administered by Statistics New Zealand.

4.2 There are constraints in creating a comprehensive picture as there is a lack of systematic linkages between census data and business frame data by ethnicity. The Tatauranga Umanga Māori project will gather data systematically on collectively managed assets, and this is a promising first step. The IDI-LEED project is a new way to link individual ethnicity data via the education sector to business data. This provides reasonable
coverage for those individuals under-30 and Māori are well represented in this demographic.

4.3 As it is not possible to identify HVMS sector firms based solely on Statistics New Zealand data, we have examined alternative data sources. Both Government and non-Government organisations collect data about Māori enterprises however this is not collected systematically or regularly, although there have been some moves made by TPK and Poutama Trust to examine their data more conscientiously. Data sharing across organisations is extremely limited and approached from a project-based orientation.

4.4 Commercial databases capture financial and non-financial data from public and private companies worldwide. While these databases do not included ethnicity, and, as outlined above, using Māori names would not provide a tolerable match, such databases are best used to develop benchmarks relating to financial performance, R&D, and labour productivity, in order to better understand possible drivers of growth in the New Zealand and the Māori economy. Should Māori firm-level data become available, these databases will provide useful in understanding how innovation inputs have affected Māori firm performance.

4.5 In conclusion, in order to perform an unbiased and critical analysis of the relationship between the Māori economy and innovation, some characteristics are required of the data to be collected. These are:

- **Ethnicity information on companies.** In order to understand the Māori economy as distinct from the general New Zealand economy, it is necessary to differentiate Māori businesses from non-Māori businesses. This requires ethnicity data (the option to self-declare as being a Māori business) to be collected in conjunction with financial data. Some organisations, such as Te Puni Kōkiri’s Māori Business Facilitation Service and the Poutama Trust do collect ethnicity data by default, because their mission and purpose is the servicing of Māori companies. However, many other organisations which collect R&D and innovation-relevant information, such as Callaghan Innovation, do not collect ethnicity data.

- **More detailed financial and non-financial data.** The relationship between innovation and financial performance is potentially complex, and may require many financial variables to tease out the direction of the relationship between R&D expenditure, productivity, return on equity, and other metrics of financial performance. Most currently available data sources do not capture financial data in detail. In addition, as explained in Section Two, the Māori concepts of innovation and

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9 See Appendix F of this report for a breakdown of Māori age demographics.
R&D may not be adequately captured through the traditional lens of R&D expenditure. For example, if a Māori business conducts a wholly new type of community outreach, it may be innovative and may improve future financial performance, but the expenditure incurred from implementing the programme would not be classified as R&D expenditure under Generally Accepted Accounting Principles (GAAP). Hence, more detailed measures of financial data are needed, along with fuller measures of non-financial data.

- **Unbiased sampling.** In order to produce unbiased and accurate estimates, it is required that the data used for any modelling is unbiased in nature too. Specifically, the data collected from many non-governmental organisations suffers from the issue of self-selection.

4.6 Ideally, the development of a linkage between census data and business frame data by Statistics New Zealand would allow for the clearest picture of the relationship between individuals and business statistics. It would then be possible to create a breakdown of where Māori companies are located geographically and which industries they are located in. It would also be possible to examine how the Māori economy may differ from the general New Zealand economy in terms of productivity, use of labour and capital, and the eventual impact on financial performance.

4.7 One challenge is to define how innovation and R&D are perceived, used and measured within a Māori context. As discussed in Section Two of this paper, these are terms that may not translate well from the general economy to the Māori economy. Moreover, as the intervention strategies to provide ‘innovation’ inputs into the New Zealand economy change, their impact on the Māori economy is not known.

4.8 More work needs to be done to understand how the Māori economy engages with innovation and R&D, so that appropriate measures can be developed for understanding the relationship between them. We now turn to such considerations in the next Section.
4. **OVERVIEW**

1.1. The previous section highlighted through an analysis of existing databases that, although we were able to map certain aspects of the Māori economy, we could not with any precision develop an evidenced perspective of the R&D state of Māori firms. Hence, we are unable to map the extent to which R&D interventions may be necessary or beneficial using such information.

1.2. As outlined in Section Two, the STI innovation system in New Zealand is being focused towards trying to attain economic growth through integrating R&D solutions into firms. This has captured only a small sub-set of New Zealand firms, and we surmise an even smaller sub-set of Māori firms. This raises the question: What are the intervention points in the Māori economy that connect enterprises to an innovation system?

1.3. This section offers observations and recommendations to support connectivity between the innovation system and the Māori economy. We are particularly interested in the characteristics of the innovation system in New Zealand and whether its current configuration is meeting Māori business aspirations or needs.

1.4. The BERL report (2011a) posited that innovation would play a critical role in the future economic development of the asset base of the Māori economy, but that the system is not currently delivering the outputs needed to transform that economy. As illustrated in Section Two there are various ways to consider the process of innovation, which are central to the current transition of the New Zealand innovation system.

1.5. Discussions of innovation structures have, until relatively recently, paid little attention to the key intervention points that might progress the Māori economy. Given that New Zealand’s innovation system is undergoing a major transition, this presents opportunities for new sets of relationships between agents in the innovation system and Māori entities.

1.6. In the first part of this section, we focus on macro-level issues, drawing attention to the types of information that should be captured in order to support the Māori economy across all its facets. In the second part, we look at micro-level issues, and in particular connectivity to Māori SMEs and the larger collectively owned-enterprises at both the regional and national levels. As the previous section showed, the innovation system

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10 This policy strategy appears to have been successful with firms investing in R&D in 2012 compared to 2010. See Statistics New Zealand. Research and Development in New Zealand 2012.
through some of its formal agents does connect with Māori entities, although the extent, longevity and impact of this engagement is unknown.

4. **Macro-Level Considerations**

2.2 While the label ‘Māori economy’ is useful to highlight the increasing contribution of Māori to the overall economy, it does not give much guidance when it comes to policy intervention. As noted in Section Two, the objective characteristics of the Māori economy have been a focus in policy consideration. However, as Section Three has shown, the objective characteristics of the Māori economy – number, size, financial attributes and economic behaviour - cannot be defined with a high degree of accuracy.

2.3 Databases used by the relevant actors in the innovation system do not capture whether a business is Māori (except in cases where funding is ‘tagged Māori’); they are fragmented across various Ministries, Crown Research Institutes or other providers and hence it is difficult to understand what types of initiatives have been undertaken, in which areas and with whom. Additionally, they do not evaluate whether science input has had any appreciable difference. Therefore, even when there are successful outcomes of innovation for Māori enterprises, it is difficult to accurately attribute benefit to the Māori economy.

2.4 To be able to achieve a global picture of the overall performance of the Māori economy would require more systematic capture of key data via Statistics New Zealand and the Inland Revenue Department and this will not occur imminently, although Statistics New Zealand’s current data capture project, *Tatauranga Umanga Māori*, is focussed on more clearly capturing information about collectively-held assets. It would therefore seem crucial that the recommendations in *He Kai Kei Aku Ringa* in relation to improved data gathering about the various components of the Māori economy are progressed rapidly.

2.5 Therefore, from a national and regional data gathering and management perspective, it would be useful to undertake some or all of the following activities.

- **Recommendation 1.** Given that Statistics New Zealand is still considering the implications of adding ethnicity data to the IR10, it might consider adding such information to its bi-annual R&D survey.

- **Recommendation 2.** A more systematic approach to data-collection and record-keeping across Government agencies (including Crown Research Institutes and other providers that receive Government funding) should be considered. This might include some sort of shared repository of research initiatives that have been undertaken with Māori firms. Consistent capture by central agencies of whether a firm or entity considers itself Māori should be implemented.

- **Recommendation 3.** It is unknown the extent to which regional innovation or R&D providers are already engaging with Māori entities in either their individual or
collective forms. Surveying such providers and then comparing this to Māori industry perspectives might provide insight into the extent and effectiveness of current provision. This might be done through regional case studies commissioned by a central government agency or at the regional level through a city or regional council. Such an approach enables locally-specific understanding of the needs of Māori businesses and is in keeping with the local economic development role that has emerged within city councils. Research into the Māori economy has been undertaken by BERL in some regions (for example, Taranaki (2009), Waiairiki (2010) and Bay of Plenty (2012)), however we have not located research with an innovation-specific focus.

- **Recommendation 4.** Data sharing between Non-Government Organisations to identify potential innovation or R&D intervention points (for example, along the lines of the New Zealand Māori Tourism, Federation of Māori Authorities and Poutama collaboration around tourism) should be encouraged. Such data sharing might require initial support to develop the infrastructure for a shared information repository. We recommend that data collected by various government agencies for their own purpose (for example, TPK collects data on small Māori businesses through their Māori Business Facilitation service) should be warehoused by Statistics New Zealand and made available to other government agencies. This facilitates inter-agency data sharing, and avoids redundant data collection.

2.6 From these macro-data recommendations, we now turn to a set of recommendations drawn from broad descriptors of the Māori economy using models and concepts that have been developed to describe other types of economies. An analysis of the different economic paths that others have followed gives insight into underlying principles of innovation (Lazonick, 2004) and reinforces the argument that there needs to be alternative ways to think about innovation with a broad range of policy settings (New Zealand Manufacturers and Export Association, 2013).

2.7 During our interviews, three different organisations - one private, one government and one Māori collective - described the Māori economy as a ‘developing’ economy. Within the economic literature, a developing economy refers to a non-industrialised nation that is seeking to develop its resources by industrialisation. It implies a desire to develop along traditional market modes of economic development. Alternately, emerging economies exhibit economic and institutional characteristics, such as underdeveloped market-supporting institutions for fostering economic exchange, weak laws and poor enforcement capacity of the formal legal institutions (Acquaah, 2007). We argue that developing and emerging are not accurate representations of the Māori economy.

2.8 Another concept is Whatarangi Winiata’s (1998) description of the Māori economy as a ‘dual’ economy. His description was based on the observation that because Māori were lagging in terms of social indicators (health, welfare, education, justice), that they
operated separately from the main economy. We think there is merit in his analysis, although we might not use the word ‘dual’ because, as more recent analysis has intimated, the Māori economy can be seen as a “globally connected, prosperous, and profitable sector of the New Zealand economy” (Spiller, C., Pio, E., Henare, M., & Erakovic, L., 2011) However, his comment that “each economy requires quite different prescriptions to prosper” is one that we have borne in mind.

2.9 In the context of indigenous systems of exchange, there is a strong argument for alternative approaches to understanding the notion of economy. Such alternate understandings take into account social relations and organisation form as well as indigenous worldviews (Altman, 2009). This approach is well explored within academic literature and highlights the existence of a “qualitatively distinct type of socially organised exchange that support[s] substantively different orientations to economic action and, hence, culturally different trading areas” (Biggart & Delbridge, 2004, p. 29).

2.10 Altman (2009) describes the indigenous economy as a ‘hybrid’ economy consisting of three components: the market economy, the state economy and the customary economy. The concept of hybridity, derived from Homi Bhabha (1994), reflects what Yang (2000) described as the hybridity of economies that act as a counter to capitalist and state economies. The notion of economic hybridity is evident in the relationship and emerging tensions between capitalist and non-capitalist forms of production in situations where a state sector is dominant. A hybrid economy comprises a mix of customary and global social norms and values.

2.11 In considering the Māori economy as hybrid, there is acknowledgment that such an economy operates alongside and within the New Zealand economy and is therefore influenced and regulated by the same overarching institutional frameworks that govern the general economy’s operation. However, the hybrid concept recognises the way in which indigenous economic systems are embedded in social relations that take into account indigenous worldviews (Kuokkanen, 2011).

2.12 In recognising the Māori economy as a hybrid model, we highlight the distinctiveness of the indigenous economy as an economy underpinned by both indigenous and market norms and motivated by heterogeneous aspirations (Knox, 2011; Ruwhiu, 2009; Spiller, C. E., Erakovic, L., Henare, M., & Pio, E., 2011).

2.13 A key observation about a hybrid economy is that indigenous participation in the customary economy sits alongside the pursuit of commercial opportunities that are likely to generate local, regional and national benefits. Therefore, in a Māori economy there will be those who choose to privilege

a) customary approaches outside a market economy;

b) purely market approaches; or

c) a combination of both.
Depending on the culturally motivating factors at play, trying to apply a prescribed ‘innovation strategy’, let alone an R&D strategy, will only work for Māori individuals or groups with type b) or c) motivations. This is not to say that those in group a) will always remain in that category or that there would not be some general benefit for them in the application of science innovation. However, a general broad-brush approach on the part of potential R&D connecting agencies that does not recognise the varied motivations of Māori entities has the potential for not only disappointment but also lost effort, time and resources. Unfortunately, this has been the experience of many Māori groups who have experienced the (seemingly) well-meaning approaches of state research institutions only for the experience to leave both parties less than satisfied. [See below -Case Study 1: Taewa].

**CASE STUDY 1 – TAEWA**

At the end of the 1990s, research was undertaken by Dr Nick Roskruge of Massey University into the taewa (Māori potato) in collaboration with “small-scale commercial horticulturalists, ‘emergent’ growers bringing small parcels of whānau and hapū land back into production, and ‘interest’ gardeners” (Lambert, 2007). By the early 2000s, this group had formed a collective (Tahuri Whenua) and soon became involved with a number of research and innovation institutions, attracting $1 million in research funding. By 2009, the Riddet Centre had undertaken testing to develop potential ‘novel foods’ such as snacks. However, at a certain point, the Tahuri Whenua growers withdrew from the research collaborations for a variety of reasons.

The study started as ‘pure’ science research – the desire to learn more about the taewa. The research has led to a revival in indigenous plantings, a successful career for Nick Roskruge (he is now a world authority), and a number of research papers and books for Massy University. From a commercial perspective, it has not produced an R&D ‘lift’ nor a product (because taewa cannot be grown on a commercial scale).

Given that the Tahuri Whenua group withdraw from the research designed to ‘help’ them, what lessons might be learned about working in the hybrid economy and working with groups whose motivations were culturally dominant?

Our final macro-economic concept is the notion of the ‘catching-up’ economy which describes how small former East European economies like Estonia are placed vis-à-vis their entrance into the European Union. Specifically, catching-up economies are said to lack ‘frontier technological competencies’ because of their initial low level of development, inability to effectively absorb new technologies (termed as ‘absorptive capacity’) and the inability to use their own indigenous innovative capacity to modify technology for their own purposes (Veugelers & Mrak, 2009). Trying to apply policies that work for technologically advanced countries, like the Scandinavian countries, will not necessarily work without adapting them to the “economic, social, cultural and other frameworks” of the catching-up economy (Dyker, Varblane, & Tamm, 2007).
2.16 This leads us to consider the relationship of high-tech (HT) to the low-medium tech sectors (LMT). There is evidence that the most productive parts of the economy are in low-medium tech enterprises (Hirsch-Krensen, 2005) (Smith, 2006), with LMT having a “symbiotic relationship” with HT industries (Dyker et al., 2007). That is HT depends on LMT. Promoting only innovation or R&D at the HT level runs the risk of impeding knowledge generation and diffusion throughout the innovation chain. There is a strong argument for seeing LMT industries as being indispensable to a country’s HT R&D strategy.

2.17 If our preliminary consideration that the Māori economy might be considered a catching-up economy from an innovation and R&D perspective, then an exclusively HT focus might in some way overlook significant parts of the Māori economy, or at least not recognise where it is positioned in relation to the wider economy.

2.18 Therefore, policy approaches would need to differentiate between the part of the economy that aims to produce technologies and the part of the economy that needs to be encouraged to absorb technologies and find new areas of use for new technologies (Dyker et al., 2007). A blanket ‘high tech approach’ (for example, commercialisation of Intellectual Property (Ministry of Business, Innovation and Employment, 2012)) may be appropriate for those parts of the economy near or at the technology frontier, but not necessarily for significant parts of the Māori economy because of its phase in the ‘catching-up’ cycle. Instead, encouraging the adoption of already existing technology would significantly improve the Māori economy because it has more room to ‘grow’ vis-à-vis other parts of the economy. [See below - Case Study 2: The Māori Trustee].

11 We are mindful that such an observation is not a mainstream view. (See for example, Governor of the Reserve Bank Graham Wheeler’s comment that New Zealand doesn’t “have the luxury that many developing countries enjoy of relying on catch up technology to propel growth.” (Wheeler, 2013).
The conclusion from this observation is that, for the majority of Māori entities, any uptake of science innovation (R&D) is most likely going to be of the ‘catching-up’ sort in the first instance. Only larger collectively-owned enterprises have the firm size for the truly radical innovations that institutions like Callaghan Innovation have been set up to instigate. This reinforces our recommendation that there is further clarity about which types of innovation are for which types of Māori organisations.

Based on the above discussion of the macro-features of the Māori economy, we make the following recommendations:

- **Recommendation 5:** It would be useful to understand which elements of New Zealand’s innovation system are aimed at assisting the Māori economy to ‘catch-up’ or approach what is known as the ‘technology frontier’; and which elements of New Zealand’s innovation system in its form of R&D innovation (the role of Callaghan Innovation – but also other Crown-directed agencies) are about developing the truly radical high-tech parts of the Māori economy. This might best be done at a general level by organisations like Callaghan Innovation, which could establish a research informed Māori innovation policy framework.

- **Recommendation 6:** We have undertaken only a preliminary analysis into the innovation and R&D policies of catching-up economies and their potential as models of intervention for the Māori economy. We think there may be merit in further examination of this body of literature.\(^{12}\)

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\(^{12}\) We note that benchmarking the Māori economy against a country like Estonia is considered inappropriate for New Zealand as a whole (McCann, 2009, p. 308). However, from an R&D perspective, we argue that there may be validity. For example, Smith (2006, p.41) has argued that other countries such as Chile may be better innovation comparators than the Scandinavian countries.
In the final section of this report, we make suggestions about ways to develop more robust micro-level information about the Māori economy at the firm and organisational level.

3. **Micro-level Considerations**

3.1 Section Three showed the difficulty of getting information that would more accurately identify the nature of Māori enterprises (BERL’s data was a set of aggregated ‘guestimates’). Basic financial information (such as revenue growth, asset turnover, R&D expenditure, profitability) is difficult to determine because there is currently no way to match Statistics New Zealand ethnicity data from the census to business data collected in the IR10.

3.2 At the micro-level, such financial information would help to determine a firm’s productivity and growth drivers. Connecting this information to ethnicity is crucial to understanding the financial capacity and growth opportunities within Māori business and improves our understanding of the effects of cultural values on these relationships. To do so recognises that attitudes to entrepreneurship and innovation are different for different communities. While various government and non-government agencies have information about individual or collective Māori entities, it is piecemeal and typically not collated to present a coherent and comprehensive picture of Māori business.

3.3 Section Two discussed definitions of the Māori economy and that a Māori firm can be characterised by its products, services or organisational form and whether it chooses to consider purely commercial objectives, to combine commercial objectives with socio-cultural considerations or to focus solely on cultural objectives. Not all Māori enterprises will offer a culturally constituted product or service, nor will every Māori enterprise adopt Māori values in their governance, management and business practice. When it comes to decision-making regarding resource usage and innovative practices, the profitability and viability of the decision are important.

3.4 However, in relation to our definition, our understanding of a Māori enterprise is best aided if such enterprises are thought of as *existing on a continuum*, with firms locating themselves as operating purely within a Māori domain driven by customary approaches (Spiller, C. E., Erakovic, L., Henare, M., & Pio, E., 2011); others seeing themselves as a Māori organisation but with no connection to tradition; and yet others somewhere in between (Durie, 2003). This is also the insight of the discussion of the Māori economy as a hybrid economy with the observation that indigenous participation in a customary economy can work in conjunction with the pursuit of commercial opportunities.

3.5 Therefore, care needs to be taken in deciding which types of interventions need to be undertaken with which types of enterprises. Agents of innovation need to consider that both traditional and contemporary modes of exchange can be embedded within firm...
practices and that innovation products and services that are suited to one type of entity may not suit another because of where they operate on the customary-market continuum. As the OECD comments, “Innovation policies that do not take into account the heterogeneity of firms (italics added), risk missing their main targets. Those that ignore functional relationships that influence innovation at the firm level risk choosing the wrong target (e.g. subsidising R&D when the obstacle is market access)” (OECD, 2009, p. 13).

3.6 As well as considering the customary-market continuum, innovation agents also need to consider the firm size of Māori entities. About 90% of New Zealand businesses are ‘micro’, employing less than 6 people, which is seen as a barrier to innovation. Having said this, it is unknown the extent to which micro-firms use or access R&D, as Statistics New Zealand excludes firms employing less than six staff in its biennial survey (Statistics New Zealand, 2009). New Zealand is unusual internationally in that 50% of the total business R&D in New Zealand is accounted for by firms of less than 50 employees, compared to Australia where it is 25%, the US where it is 10%, and Sweden where it is 5% (McCann, 2009).

3.7 Why is small size a barrier to innovation? In their survey of 1,553 New Zealand SMEs, Battisti, Deakins and Roxas (2010) suggest that smaller sized firms, especially micro rural firms are constrained from undertaking innovation. Although there are market opportunities, many smaller firms either do not have the resources or the time to develop new products or new markets, or to undertake new organisational methods. The research supports a view that helping micro-businesses grow into at least a small business will greatly support productive growth by reducing barriers to finance, qualified and skilled staff and the costs of undertaking innovation. Although micro-businesses by themselves are the least likely to take-up R&D that does not necessarily mean they are not innovative in their product or service development, or technology utilisation.

3.8 We would therefore suggest that, a priori, particular types of R&D solutions will for the most part only be taken up and implemented by medium-to-large Māori firms. However, if Māori business entities – only a few of whom might be considered medium-sized enterprises (and internationally most would be considered ‘small’) – are to be brought into the innovation and R&D arena as envisioned in the BERL Science and Innovation report (BERL Economics, 2011a), then strategies that support Māori firms to grow would seem both theoretically and practically warranted. This can be done by encouraging micro firms to grow as individual entities as well as by some type of aggregation strategy such as clustering.

3.9 Business clusters can be defined as “concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (e.g., universities, standards agencies, trade associations) in a particular field that compete but also cooperate” (Porter, 2000, p. 16). The value of strategic relationships and partnerships in innovation is discussed extensively in the literature, with the
interdependence of firms in networks of external relationships with other organisations seen as a driver of firm performance (Dyer & Hatch, 2006) (Jimene & Junquera, 2010).

3.10 New Zealand has been down - and withdrawn from - the regional cluster facilitation pathway before (Ffowcs Williams, 2005), however clustering continues to be an instrument of government support for particular kinds of business R&D intervention. For example:

- Kiwinet, a consortium of research Universities, Crown and private research organisations is being funded to collaborate to support early (‘pre-seed’) technologies or discoveries to take to market commercialisation (Kiwinet, 2013).
- The government funded Health Innovation Hub aims to commercialise health technologies from four District Health Boards (Heatlh Innovation Hub, 2013).
- An innovation precinct is being set up in Christchurch, using the argument that “clustering and collaboration of firms and researchers in a single, physical location is shown internationally to generate economic benefits by creating scale, providing an attractive environment for skilled workers and encouraging knowledge sharing” (Joyce, 2013).

3.11 Care needs to be taken that any cluster policy should not be about ‘picking winners’, thus creating a ‘market distortion’ (Descrochers & Sautet, 2004), or artificially setting up clusters where none has existed before. For example, innovation clusters set up through government intervention in mature economies like the US and Canada have not succeeded (Descrochers & Sautet, 2004), although there is some evidence in ‘catching-up’ economies that a centralised approach can increase innovation at the regional level (Kare, Poledníková, & Staníčková, 2012). Recent efforts in picking particular Māori firms for R&D and cluster development have met with mixed results (Te Puni Kōkiri, 2010).

3.12 As discussed in Section Two, iwi organisations have been a particular focus in public policy, and we would argue that this is rightly so. However, while these organisations have a high profile, most Māori businesses are SMEs, some that share a similar ethos as traditional Māori collective entities and some that do not. For those SMEs that do share a Māori-infused ethos, other types of collective or aggregated voice have arisen such as Poutama Trust and the Federation of Māori authorities. Te Puni Kōkiri has also supported Māori regional SME aggregation which it might be argued is an appropriate intervention in light of the needs of a hybrid economy that has innovation features of “catching up” economies.

3.13 Such recognition of innovation cluster potential is not new. For example, in 2007 the University of Auckland Business School, in conjunction with NIWA, proposed a tribal innovation cluster for the North Island fishing industry (Henare, 2007). That this was not been picked up as envisioned is not necessarily evidence that the concept was not worthy. A similar research-led approach was accepted by Māori landowners to become bee farmers on their own land (New Zealand Herald, 2011).
3.14 We would posit that in the Māori sphere at least, hapū, iwi and those other groups that are bound by a Māori ethos (some of which have been co-ordinated through State intervention) have a culturally embedded tendency towards increased size from the individual to the collective through clustering in order to achieve particular types of political, social or economic outcomes. While economists argue that firms need to be larger to compete in the market, in particular types of circumstance Māori groups are already successfully employing firm-aggregation strategies.

3.15 We would argue that there is the potential to use this inherent tendency to further support Māori entities to develop a competitive advantage in their specific industrial sector and that one strategy might be a more conscious cluster facilitation approach. We doubt that this particular potential of the ‘iwi model’ - that is, firm aggregation - has been fully theorised from an innovation and productivity perspective, although there is some recognition that traditional aggregated structures and economic innovation can be mutually self-reinforcing (Knox, 2011).

3.16 Therefore, it would make sense to support iwi, hapū, regional or national groups that are interested or might have a focus on supporting their own and potentially other SMEs. Māori collectives that are not hapū or iwi linked, for example, the Federation of Māori Authorities, Poutama Trust, and some of the regional business collectives such as Te Awe in Wellington or Te Kupeka Umaka Māori ki Araiteuru (KUMA) in Otago-Southland, already function as ‘nodes’ or connectors within the value chain, although not necessarily within the science innovation or R&D element. Additionally, they tend not to be focussed on a particular industry, but act as meeting, funding or advice points for Māori SMEs.

3.17 There is potential for these types of collectives to be more conscious about industry-specific innovation. For example, Poutama has made statements about clustering and networking within specific industries such as Food & Beverage, Film & Television, Information & Communications Technology, Tourism and the Primary sectors (Poutama Trust, 2013); and the KUMA collective has recently developed its tourism ‘App’ (Dunedin Scoop, 2012). [See below – Case Studies 3 & 4: Poutama Trust and KUMA]. Our limited review of New Zealand case-studies has shown that where science and innovation becomes part of the network there is more likely to be innovation uptake.
3.18 A measure of the success of such an innovation cluster approach would be the extent to which science systems become part of the orbit of Māori firm network worlds and vice-versa. As discussed in Section Two, New Zealand can be seen to be attempting to shift its innovation system from a science ‘push’ to a market ‘pull’. However, this is not merely a matter of ‘connecting’ the STI approach to the DUI system.

CASE STUDY 3 – POUTAMA TRUST

Poutama is an independent charitable trust established in 1988 to provide business development services to Māori such as business advice and information, clustering and networking and global business development. These services interlink with central government business service provided through Te Puni Kōkiri, New Zealand Trade and Enterprise and Tourism New Zealand.

Our analysis of the Poutama Database shows that the R&D data it collects on its businesses is often not filled out and that most clients are seeking funding (hence that will be their objective, rather than seeking any R&D solution). However, this does not mean that the wider innovation landscape is not being thought about. For example, while there has been much focus in the past on business fundamentals (for example, basic bookkeeping), Poutama has entered the whole of the innovation chain, particularly in relation to its global marketing strategy of developing ‘beach-heads’ for SME Māori businesses in places like Hong Kong, rather than trying to directly enter mainland China.

Poutama is looking to develop clusters and networks in New Zealand in sectors such as Food & Beverage, Film & Television, Information & Communications Technology, Tourism and the Primary sectors. We would identify both of these types of activities as part of the innovation chain with the clustering strategy around specific industry sectors as the potential R&D intervention points.

CASE STUDY 4 – TE KUPEKA UMAKA MĀORI KI ARAITEURU (KUMA)

KUMA is a Te Puni Kōkiri-supported Māori business network for Otago-Southland. It has been a valuable resource to reinforce social and cultural identity and to source information about generic firm issues (e.g. accounting, marketing, financing, governance) and to identify wider business information. It has also begun to develop an industry-specific focus (tourism and the arts).

KUMA has 78 members with a mixture of micro-businesses (consultants, advisors, service providers such as motel owners), government organisations, business consultants and tertiary institutes. In most cases, R&D would not be seen as relevant to them – although developing a tourism ‘App’ with the local Polytechnic will have raised the potential of engaging in an R&D solution around branding and marketing.

The lesson from the ‘App’ development is that there are opportunities for innovation (and potentially R&D) as long as it is industrial sector specific. The KUMA experience is a good example of the DUI model and how a ‘knowledge transformer’ (the Polytechnic) was able to use already embodied technology (the ‘App’) to transfer to the collective to, it is hoped, increase sales. The ‘App’s’ evaluation from a commercial perspective is unknown.

3.19 For Māori, and we suspect for most SMEs, this means supporting firms to understand more clearly what is actually meant by R&D and innovation beyond the types of exercise undertaken by statistics collectors in their annual surveys. Having the appropriate
capabilities, networks and drive to commercialise innovation is also a significant consideration. Innovations are only worth what they can be exploited for in the market. As we have shown, not all Māori entities will have such motivations.

3.20 To stimulate such a desire requires that R&D solutions are viewed as ‘noa’ or ‘ordinary’ and that come from within the Māori cluster world. For this to occur, science agents need to be attuned to not only industrial needs but also to Māori cultural needs to recognise how, when and what type of innovation to apply within the Māori context. This might be an R&D solution or some other type of intervention within the broader innovation process.

3.21 In light of the preceding discussion, the final set of recommendations relates to some ways that innovation agents can interact with Māori entities at the firm level.

- **Recommendation 7.** Statistics New Zealand should quickly complete its analysis of Māori collective entities as outlined in the *Tatauranga Umanga Māori* document as this will confirm the more objective characteristics of these entities and their need for, use of and potential for innovation.

- **Recommendation 8.** Following on from this, Māori collective entities with the requisite characteristics might be encouraged to consider their ability to provide an industry-specific innovation co-ordination function for either their own or other SMEs. This might be done as an extension to or refocus of initiatives already being undertaken by innovation agencies in conjunction with such collective entities.

- **Recommendation 9.** Depending on the appetite of Māori collectives to act as R&D facilitators or co-ordinators, there may still be a case for regional and national government-led cluster facilitation to support Māori SMEs to develop stronger innovation networks within their industry sectors. Research with already existing clusters that are government supported would provide evidence of whether such an approach might have potential. Such an approach is in keeping with current national and local government emphasis on local economic growth.

- **Recommendation 10.** There is a need for innovation agents like Callaghan Innovation to consider the suitability of their products and services for Māori entities. As they develop their Māori innovation policy frameworks, such agents should give consideration to factors such as firm size and firm cultural motivation.
4. **Summary**

4.1 In this section we have focussed on some of the macro-level and micro-level considerations that may help to better inform innovation interventions for the Māori economy. The analysis in Section Three highlighted the need to better gather objective data about the drivers of firm performance that may then help decide which additional interventions may be needed. In lieu of whole of Māori economy data, we have suggested better connectivity between government and non-government data, as well as the potential to gather survey data in the way that BERL has been doing for regions.

4.2 We have considered macro-economic concepts that may have the most salience for innovation interventions and in particular R&D interventions. From the analysis, we have focussed on the notions of the ‘hybrid’ economy and the ‘catching-up’ economy. The first draws attention to the inter-connectedness of the Māori economy to the general economy, but also notes its difference. From this observation we conclude that only some parts of the Māori economy will be amenable to the types of products or services that innovation agents like Callaghan Innovation are offering. Innovation agencies should therefore consider such factors as they develop their Māori innovation policies.

4.3 If the Māori economy might be considered as a catching-up economy, then from an innovation and R&D perspective, a focus on high-tech disruptive products and services may not be the first place to start and may, in fact, miss the opportunities to embed already-existing technologies. For example, as noted by BERL in Section Three, regional communities have anecdotally noted that they are benefitting from the roll-out of broadband.

4.4 We have focused also on micro-level considerations that might help innovation agents to better link with Māori entities, either individually or collectively. We argue that such enterprises can be thought of as being on a continuum, with some choosing to operate purely within a Māori domain driven by customary approaches; others seeing themselves as a Māori organisation but with no connection to tradition; and yet others somewhere in between.

4.5 Whether or not such a strategy is considered, Māori entities need to be approached from their perspective with an understanding of how innovation works at the firm level. This is not merely a matter of ‘connecting’ the ‘push’ approach from science providers out to Māori firms. It is about science systems becoming part of the orbit of firm network worlds and vice-versa. Science institutions can play a role when they are attuned to a particular industry and recognise how, when and what type of innovation
to apply, whether that is in the form of an R&D solution or some other type of process that makes up the broader innovation process.

4.6 If a goal is to embed innovation knowledge within Māori industry networks, innovation agents like Callaghan Innovation or other science agents need to approach potential clustering organisations from their perspective. Typical SME innovation messengers are suppliers, agents, customers, accountants, banks, whānau or friends, and, possibly for Māori SMEs, tribal and collective entities. Innovation institutions therefore will make their biggest inroads when they are part of this network of industry associates. This is a concept that provides a foundation for indigenous innovation that not only increases the capacity of cluster participants for innovation and productivity growth, but also allows focus on capacity sharing, collaboration and working with Māori enterprise to achieve better outcomes.
SECTION FIVE: HE KUPU WHAKATEPE - CONCLUSION

1. In the contemporary global economy, the uptake of science and innovation is one of the ways that both the Māori and the wider economy can grow. This review has provided a brief overview of key issues for Māori connecting to innovation systems in general and R&D systems in particular.

2. Critically, trying to gather some of the more formal characteristics of the Māori economy from objective macro-level sources such as Statistics New Zealand has proven to be a complex task. There are no databases that we have examined – public, private or commercial - that are able to give such a picture. It would therefore seem crucial that the recommendations in He Kai Kei Aku Ringa in relation to improved data gathering about the various components of the Māori economy are progressed rapidly. Databases held by both private and public institutions are currently the best sources of information about firms. It would make sense to develop a shared understanding of these for purposes of identifying some of the characteristics of Māori firms – and particularly SME Māori firms.

3. When we consider how such insights might apply to the Māori economy, we are cognisant of the fact that iwi and hapū are inherently aggregation models, as is the tendency of a number of non-iwi Māori collectives. We caution that social or cultural aggregation is not the same as aggregation for industrial competitive advantage. However, we suggest that there is value in recognising that iwi, hapū and other Māori collectives have the scale to undertake innovation themselves, assuming they are in the business of commercialisation, or might become innovation nodes or facilitators for their own or other SMEs.

4. Like others before us, this has been an exercise in theory informed by experience from our own research fields and by those to whom we talked to in order to collect various types of information. While we have made some observations and recommendations, these need to be tested against practitioners in the field and would require further development. Hence, we acknowledge the input of our informants and suggest that a more formal approach to them to discuss this report would be valuable.

5. In conclusion, we believe that the investigation of technological innovation as it intersects with indigenous world-views is an area of emerging theoretical and practical interest from a global perspective. An indigenous perspective of innovation has yet to be fully investigated in the literature. However, we are drawn to the notion of zìzhǔ chuàngxīn which is frequently used by the Chinese government, academics and businesses to describe the recent Chinese technological-led economic transformation. The term zìzhǔ (‘self-governed’ or ‘self-determined’) (Prud’homme, 2012) has connotations of independence, almost akin to a declaration of sovereignty and self-governance. Zi (自) refers to self and zhu (主) means master, hence, “We are masters of our destiny”. Chuàngxīn (innovation) is used to capture
the idea of self-driven ‘unique’ scientific and technological capabilities, knowledge and intellectual properties.

6. This resonated for us in relation to how Māori knowledge and innovation is captured in documents such as Vision Mātauranga (Ministry of Research, Science and Technology, 2007). One of its four research themes - indigenous Innovation: Contributing to Economic Growth through Distinctive R&D - concerns the development of distinctive products, processes, systems and services from Māori knowledge, resources and people that not only contribute to Māori developmental aspirations, but would also be distinctive in the marketplace. So defined, innovation makes it possible, although by no means inevitable, to improve the economic, social and cultural conditions of many different groups of people who participate in the economy, including Māori.

7. To conclude, we suspect that developing a national innovation system that is comprehensive, flexible and capable of responding to an indigenous economy is ground-breaking from an international perspective and are unaware of any other jurisdiction that has attempted such an approach. We believe that we are likely to be world-leaders in this field. Such a supposition is worthy of further research.
**Glossary of Terms**

**Absorptive Capacity** – the ability of a firm to recognise the value of new, external information, assimilate it, and apply it to commercial ends.

**Callaghan Innovation** – a Crown entity established under its own act in 2012. The former CRI, Industrial Research Limited, has become a subsidiary.

**Collectively Managed Assets (CMA)** – defined by Statistics New Zealand as a Māori authority or a commercial business that supports the Māori authority’s business and social activities, and sustains or builds a Māori authority’s asset base.

**Crown Research Institutes (CRI)** – Crown-owned companies that carry out scientific research.

**Doing, Using and Interacting (DUI)** – (or market ‘pull’) approach whereby a solution is sought for an immediate problem from amongst a firm’s network of known associates which in turn leads to innovation.

**Dupont Analysis** – a method of analysis that breaks down the Return on Equity (ROE) figure into several drivers of profitability. These drivers help understand the key reasons for the ROE figure.

**Frascati Manual** - international methodology for collecting and using R&D statistics.

**Generally Accepted Accounting Principles (GAAP)** – accounting standards or principles used in a given jurisdiction. New Zealand adopted international financial reporting standards (IFRS) from 2007.

**Gross domestic product (GDP)** - income earned from production in New Zealand.


**High Value Manufacturing and Services (HVMS)** – there is no single definition but can include high-tech and ‘high value’ non-high-tech sectors.

**Innovation agents** - Universities, Crown Research Institutes (CRIs) and other government research funded agencies.

**Integrated Data Infrastructure (IDI)** - accumulates data across government agencies, including the Ministry of Education and the Tertiary Education Commission, for a given person across time. Contains ethnicity information for all people under 30.
Integrated Longitudinal Employment and Education Data (ILEED) - links data from all employees to data from employers and businesses. Because it links to the IDI dataset, Māori employees can be matched to individual businesses.

Māori Enterprise – organisation with Māori-oriented characteristics, whether as a function of their organisational structure (such as iwi or hapū), their firm offering or their preferred mode of association.

Martin Jenkins Report – 2012 report commissioned by MSI to help identify key characteristics of New Zealand’s HVMS sector.

Ministry of Business, Innovation, and Employment (MBIE) - central government agency that integrates the functions of four former agencies, including MSI, to deliver policy, services, advice and regulation to support business.

Ministry of Science & Innovation (MSI) – formerly, a stand-alone central government agency; now part of MBIE. Focusses on science, research and innovation policy and funding.

North American Industry Classification System (NAICS) - U.S. standard of classifying businesses.

R&D – creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications (Frascati Manual).

R&D Intensity - R&D expenditure as a percentage of GDP.

Return on Equity (ROE) – a commonly used metric of financial performance. Defined as profit available to common shareholders, divided by the equity they have contributed or retained in the company.

Small-to-Medium-Sized Enterprises (SMEs) – defined in New Zealand as enterprises having 19 or fewer employees. The European Union defines a small enterprise as employing up to 250 people.

Science, Technology and Innovation system (STI) – (‘push’ or linear) system that assumes innovations result from R&D activities undertaken through formalised R&D mechanisms. Such systems have a focus on ‘radical’ technologies.

Statistical Classification of Economic Activities in the European Community (NACE) - pan-European classification system which groups organisations according to their business activities.

Tatuaranga Umanga Māori – a consultation paper describing the work that Statistics New Zealand has been doing to respond to the need for statistics about Māori businesses.
Technology Frontier – country and industry leaders in a technology development and implementation. Countries or industries can ‘catch-up’ to the technology frontier by increasing both R&D intensity and absorptive capacity.

Vision Mātauranga - a Government policy framework intended to unlock the innovation potential of Māori knowledge, resources and people to assist New Zealanders to create a better future.
APPENDICES

Appendix A – NZ.Stat Data

Ethnic Group and Occupation (ANZSCO Major Group) by Sex, 2006 Census\(^{13}\): This table contains information about where Māori are located by geographical region, and links to their occupation. Occupations include the following levels: Managers, Professionals, Technicians and Trades Workers, Community and Personal Service Workers, Clerical and Administrative Workers, Sales Workers, Machinery Operators and Drivers, Labourers, and Others.

Ethnic Group and Qualification (Highest) by Sex, 2006 Census\(^{14}\): This table contains information about where Māori are located by geographical region, and links to their highest education qualification. Education includes the following levels: NZQA levels 1 to 6, Bachelor Degree, Master’s Degree, Doctorate, and Others.

Industry (ANZSIC96 V4.1 Division) and Ethnic Group (Grouped Total Responses) by Sex, for the Employed Census Usually Resident Population Count Aged 15 Years and Over, 2001 and 2006\(^{15}\): This table contains information about where Māori are located by geographical region, and links to the industry that they are involved in. Industries includes the following levels: Agriculture, Forestry and Fishing (AFF), Mining, Manufacturing, Electricity, Gas and Water Supply (EGW), Construction, Wholesale Trade, Retail Trade, Accommodation, Cafes and Restaurants (ACR), Transport and Storage, Communication Services, Finance and Insurance, Property and Business Services, Government Administration and Defence, Education, Health and Community Services, Cultural and Recreational Services, and Personal and Other Services.


Appendix B: Selected financial variables captured by the 2012 IR10 form\textsuperscript{16}.

Note: Inland Revenue has changed the format of the IR10 form starting from April 2013\textsuperscript{17}; however, the financial variables collected are substantially the same as those in the 2012 form.

- Gross income from sales and/or services
- Cost of goods sold
- Gross profit
- Total income
- Depreciation expense
- Salaries and wages expense
- Research and development
- Total assets
- Current assets
- Fixed assets, including plant and machinery

\textsuperscript{16} Retrieved from https://www.ird.govt.nz/resources/b/f/bf21e5004bbe475bb5f5f5bc87554a30/ir10.pdf
\textsuperscript{17} http://www.ird.govt.nz/forms-guides/title/forms-a/ir010-form-financial-statements-summary.html
## Appendix C: Entry survey from MBFS

### Business Information

<table>
<thead>
<tr>
<th>Business Name (if currently trading)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Registered Address: (if business is a registered legal entity)</td>
<td>Website (Business):</td>
</tr>
<tr>
<td>Telephone (Business):</td>
<td>Fax (Business):</td>
</tr>
</tbody>
</table>

1. **Is your business:**
   - [ ] New / Start-up
   - [ ] Existing (currently trading)
   - (If selected, GO TO QUESTION 7)

2. **If currently trading, please estimate the date you started trading**
   - [ ]

3. **If currently trading, what is the current annual turnover?**
   - $[

4. **If in business, please provide an estimate of the number of employees (excluding the owner):**
   - [ ] Part-time (under 30 hrs/week)
   - [ ] Full-time (over 30 hrs/week)
   - [ ] 0
   - [ ] 1-5
   - [ ] 6-10
   - [ ] 11-20
   - [ ] 21-30
   - [ ] 30+

5. **If in business, do you have the following:**
   - [ ] Business bank account
   - [ ] Accountant
   - [ ] Advisor
   - [ ] Lawyer

6. **If in business, are you GST registered?**
   - [ ] Yes
   - [ ] No

7. **What was your primary motivation to go into business?**
   - [ ] Necessity (e.g., made redundant, couldn’t find suitable employment)
   - [ ] Opportunity (e.g., identified an opportunity or gap in the market)

8. **What is your core business (i.e., the main economic activity of the business)?**
   - [ ] Agriculture, Forestry, Fishing
   - [ ] Mining
   - [ ] Manufacturing
   - [ ] Electricity, Gas, Water and Waste Services
   - [ ] Construction
   - [ ] Wholesale Trade
   - [ ] Retail Trade
   - [ ] Accommodation and Food Services
   - [ ] Transport, Postal and Warehousing
   - [ ] Information Media and Telecommunications
   - [ ] Financial and Insurance Services
   - [ ] Rental, Hiring and Real Estate Services
   - [ ] Professional, Scientific and Technical Services
   - [ ] Administrative and Support Services
   - [ ] Public Administration and Safety
   - [ ] Education and Training
   - [ ] Health Care and Social Assistance
   - [ ] Arts and Recreation Services
   - [ ] Other Services

## Appendix D: Financial and non-financial variables collected by the Māori Business Facilitation Service to monitor client progress.
Financial variables:

- Total assets
- Total liabilities
- Net assets
- Current assets
- Current liabilities
- Current ratio
- Annual turnover
- Annual expenditure
- Net profit after tax (NPAT)

Non-financial variables:

- Number of employees
- New products or services developed
- New domestic/export markets developed
- Adoption of sustainable business practices

Appendix E: Non-inclusive list of engagements between Ministry of Primary Industries (MPI) and Māori entities.
Waikato River co-governance accords

1. Te Arawa (2012);
2. Raukawa (2012); and

Fisheries Protocols

1. Ngāti Manawa (2012);
2. Ngāti Whare (2012);
3. Ngai Tamanuhiri (2012);
4. Rongowhakata (2012);
5. Affiliate Te Arawa iwi Te Upoku o Te Ika (2009);
6. Taranaki Whanui ki Te Upoko o Te Ika (2009);
7. Te Roroa (2008);
8. Ngāti Mutunga (2006);
9. Te Arawa Lakes (2006);
10. Ngāti Awa (2005);
11. Ngaa Rauru Kiitahi (2005);
12. Ngāti Tuwharetoa ki Bay of Plenty (2005);
13. Ngāti Tama (2003);
14. Te Uri o Hau (2002); and

Fisheries rights of first refusal

1. Ngāti Manawa;
2. Ngāti Whare;
3. Te Uri o Hau;
4. Ngaa Rauru Kiitahi;
5. Ngāti Mutunga; and
6. Te Roroa.

Advisory Committee Roles

1. Ngāti Whatua o Orakei;
2. Ngāti Manawa;
3. Ngāti Whare;
4. Waikato-Tainui;
5. Ngāti Apa;
6. Ngāti Tama;
7. Te Uri o Hau;
8. Ngāti Mutunga;
9. Ngaa Rauru Kiitahi;
10. Ngāti Ruanui;
11. Te Roroa; and

Fisheries forums

Customary fishing rights are expressed as the Crown, as a Treaty partner, having ongoing obligations to iwi. Those obligations are provided for by ongoing engagement with hapū and/or iwi by the Ministry for Primary Industries and the development of Iwi Fisheries Plans and Forum Fisheries Plans to enable iwi to identify and prioritise their fisheries management aspirations. The Ministry for Primary Industries has a role in the development of Iwi Fisheries Plans and Forum Fisheries Plans to enable iwi to identify and prioritise their fisheries management aspirations. A Forum Fisheries Plan is the main tool for Māori to influence national fisheries management sustainability decisions. There are presently five fisheries forums:

1. Mai I Ngā Kuri a Wharei Ki Tihirau Fisheries Forum;
2. Te Taihauauru Iwi Fisheries Forum;
3. Chatham Islands Fisheries Forum;
4. Te Hiku o Te Ika Fisheries Forum; and
5. Te Waka a Maui me Ona Toka Forum.

Appendix F: Ethnic Group by Age, 2006 Census

<table>
<thead>
<tr>
<th>Māori</th>
<th>Percentage</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Population</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 10 Years</td>
<td>133,197</td>
<td>23.6%</td>
</tr>
<tr>
<td>10-19 Years</td>
<td>125,259</td>
<td>22.2%</td>
</tr>
<tr>
<td>20-29 Years</td>
<td>80,880</td>
<td>14.3%</td>
</tr>
<tr>
<td>30-39 Years</td>
<td>78,057</td>
<td>13.8%</td>
</tr>
<tr>
<td>40-49 Years</td>
<td>69,177</td>
<td>12.2%</td>
</tr>
<tr>
<td>50-59 Years</td>
<td>42,819</td>
<td>7.6%</td>
</tr>
<tr>
<td>60-69 Years</td>
<td>22,971</td>
<td>4.1%</td>
</tr>
<tr>
<td>70-79 Years</td>
<td>10,317</td>
<td>1.8%</td>
</tr>
<tr>
<td>80 Years and Over</td>
<td>2,652</td>
<td>0.5%</td>
</tr>
<tr>
<td>Total Age Group</td>
<td>565,326</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
Appendix G: Analysis of Concentration of Capacity in the Māori Economy

1) This analysis of excess capacity attempts to address two questions. Firstly, where are HVMS firms located geographically, and how does this relate to the distribution of Māori who are employed in the same industries that HVMS firms operate in? Secondly, where are Māori with high educational qualifications located geographically, and how does this relate to the distribution of HVMS firms?

2) Table 6.1.1 shows the distribution of HVMS firms across geographical regions. Statistics New Zealand’s NZ.Stat tool provides a geographical distribution of firms, which can be further filtered according to ANZSIC 06 industry codes. By matching against known HVMS ANZSIC 06 codes from Table 6.1.4, a distribution of HVMS firms across New Zealand is generated. For convenience, Table 6.1.1 displays HVMS firms as aggregated by ANZSIC Major Industry.

3) Further analysis was undertaken on Table 6.1.1 to pinpoint concentrations of HVMS firms geographically. For each Major Industry group, the top 5 concentrations are highlighted in blue. For example, in the Mining sector, HVMS firms are concentrated in Wellington (31%), Taranaki (30%), Auckland (18%), Canterbury (8%), and Otago (5%).

4) Table 6.1.2 shows the distribution of Māori employees across the general industries. Because it is not possible to link employees to specific HVMS subsectors, Table 6.1.2 displays the number of employees working in the general industry. Nevertheless, assuming that industry experience is transferable across industry subsectors, Table 6.1.2 can loosely be construed as a map of within-industry Māori experience. A similar analysis is conducted on Table 6.1.2, with the top 5 concentrations of industry workers highlighted in green. For example, in the Mining sector, Māori employees are concentrated in Waikato (34%), Taranaki (12%), Auckland (11%), Northland (7%), and the West Coast (7%).

5) By merging Table 6.1.1 and Table 6.1.2, it is possible to derive a rough indicator of where there may exist excess Māori industry experience in HVMS sectors. These are the cells in Table 6.1.1 that are highlighted in pink. For example, in the Mining sector, there are concentrations of Māori employees in Waikato, Northland, and the West Coast that do not have a corresponding concentration of HVMS firms in those regions. It is conceivable that these employees are able to apply their industry experience in creating new HVMS firms in those regions.

6) Table 6.1.3 is another way of examining where skills for starting up and operating new HVMS firms may exist in the Māori economy. In this table, Māori educational outcomes

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retrieved from NZ.Stat\(^2\) are scaled by NZQA qualification credits (New Zealand Qualifications Authority, 2013). NZQA credits are a rough gauge of how many years are needed to obtain that qualification, with each year worth 120 credits; for example, a 3-year Bachelor’s degree is worth 360 credits, while a Master’s degree takes an additional 2 years on top of the Bachelor’s degree, so it is worth 600 credits.

7) Table 6.1.3 shows that some regions have a higher concentration of highly qualified Māori. In particular, the top 5 regions are Auckland (27%), Wellington (13%), Waikato (13%), Bay of Plenty (10%), and Canterbury (7%). Assuming that higher qualifications are required for entry into the HVMS sector, Table 6.1.3 helps to identify regions that have relatively more highly educated Māori which can then support the growth of HVMS firms.

**Combining IDI-LEED data**

8) Examining the increase of absorptive capacity of the general Māori workforce linking education and Māori workforce data-sets. We see potential in using the IDI-LEED dataset, given that the 2006 census showed that 60% of the Māori population is under the age of 30 and this can then be a source of tracking Māori education capacity matched against workforce absorption. We have undertaken a preliminary analysis mapped regionally against the HVMS sector as identified in the Martin Jenkins report (2012). We acknowledge that an approach that links Māori capability to particular definitions of HVMS might be an arbitrary exercise as the relationship between the two is not linear. However, it would at least paint a regional picture which has some potential value to policy-makers.

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\(^2\) Available at http://nzdotstat.stats.govt.nz/wbos/Index.aspx?DataSetCode=TABLECODE1045
<table>
<thead>
<tr>
<th>Geographical Region</th>
<th>Mining</th>
<th>Manufacturing</th>
<th>Electricity, Gas, Water and Waste Services</th>
<th>Construction</th>
<th>Information Media and Telecommunications</th>
<th>Professional, Scientific and Technical Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northland Region</td>
<td>1 (0.57%)</td>
<td>740 (3.35%)</td>
<td>2 (1.41%)</td>
<td>56 (4.53%)</td>
<td>34 (1.01%)</td>
<td>367 (1.86%)</td>
</tr>
<tr>
<td>Auckland Region</td>
<td>32 (18.28%)</td>
<td>7771 (35.26%)</td>
<td>13 (9.21%)</td>
<td>393 (31.84%)</td>
<td>1810 (53.8%)</td>
<td>8675 (44.19%)</td>
</tr>
<tr>
<td>Waikato Region</td>
<td>4 (2.28%)</td>
<td>2104 (9.54%)</td>
<td>28 (19.85%)</td>
<td>135 (10.94%)</td>
<td>70 (2.08%)</td>
<td>1154 (5.87%)</td>
</tr>
<tr>
<td>Bay of Plenty Region</td>
<td>2 (1.14%)</td>
<td>1450 (6.57%)</td>
<td>9 (6.38%)</td>
<td>88 (7.13%)</td>
<td>59 (1.75%)</td>
<td>882 (4.49%)</td>
</tr>
<tr>
<td>Gisborne Region</td>
<td>0 (0%)</td>
<td>144 (0.65%)</td>
<td>2 (1.41%)</td>
<td>20 (1.62%)</td>
<td>5 (0.14%)</td>
<td>69 (0.35%)</td>
</tr>
<tr>
<td>Hawke's Bay Region</td>
<td>0 (0%)</td>
<td>827 (3.75%)</td>
<td>3 (2.12%)</td>
<td>35 (2.83%)</td>
<td>34 (1.01%)</td>
<td>389 (1.98%)</td>
</tr>
<tr>
<td>Taranaki Region</td>
<td>53 (30.28%)</td>
<td>567 (2.57%)</td>
<td>9 (6.38%)</td>
<td>37 (2.99%)</td>
<td>16 (0.47%)</td>
<td>348 (1.77%)</td>
</tr>
<tr>
<td>Manawatu-Wanganui Region</td>
<td>1 (0.57%)</td>
<td>1020 (4.62%)</td>
<td>13 (9.21%)</td>
<td>50 (4.05%)</td>
<td>22 (0.65%)</td>
<td>429 (2.18%)</td>
</tr>
<tr>
<td>Wellington Region</td>
<td>55 (31.42%)</td>
<td>1742 (7.9%)</td>
<td>13 (9.21%)</td>
<td>107 (8.67%)</td>
<td>1006 (29.9%)</td>
<td>3970 (20.22%)</td>
</tr>
<tr>
<td>Tasman Region</td>
<td>1 (0.57%)</td>
<td>318 (1.44%)</td>
<td>3 (2.12%)</td>
<td>16 (1.29%)</td>
<td>10 (0.29%)</td>
<td>159 (0.81%)</td>
</tr>
<tr>
<td>Nelson Region</td>
<td>0 (0%)</td>
<td>325 (1.47%)</td>
<td>1 (0.7%)</td>
<td>12 (0.97%)</td>
<td>15 (0.44%)</td>
<td>223 (1.13%)</td>
</tr>
<tr>
<td>Marlborough Region</td>
<td>0 (0%)</td>
<td>423 (1.91%)</td>
<td>6 (4.25%)</td>
<td>24 (1.94%)</td>
<td>4 (0.11%)</td>
<td>114 (0.58%)</td>
</tr>
<tr>
<td>West Coast Region</td>
<td>2 (1.14%)</td>
<td>165 (0.74%)</td>
<td>8 (5.67%)</td>
<td>24 (1.94%)</td>
<td>5 (0.14%)</td>
<td>62 (0.31%)</td>
</tr>
<tr>
<td>Canterbury Region</td>
<td>14 (8%)</td>
<td>3083 (13.98%)</td>
<td>12 (8.51%)</td>
<td>148 (11.99%)</td>
<td>149 (4.42%)</td>
<td>2026 (10.32%)</td>
</tr>
<tr>
<td>Otago Region</td>
<td>9 (5.14%)</td>
<td>904 (4.1%)</td>
<td>11 (7.8%)</td>
<td>61 (4.94%)</td>
<td>117 (3.47%)</td>
<td>639 (3.25%)</td>
</tr>
<tr>
<td>Southland Region</td>
<td>1 (0.57%)</td>
<td>448 (2.03%)</td>
<td>6 (4.25%)</td>
<td>27 (2.18%)</td>
<td>8 (0.23%)</td>
<td>122 (0.62%)</td>
</tr>
<tr>
<td>Area Outside Region</td>
<td>0 (0%)</td>
<td>8 (0.03%)</td>
<td>2 (1.41%)</td>
<td>1 (0.08%)</td>
<td>0 (0%)</td>
<td>1 (0%)</td>
</tr>
<tr>
<td>Total</td>
<td>175 (100%)</td>
<td>22039 (100%)</td>
<td>141 (100%)</td>
<td>1234 (100%)</td>
<td>3364 (100%)</td>
<td>19629 (100%)</td>
</tr>
</tbody>
</table>
Table 6.1.2 Māori Employed in General Industry

<table>
<thead>
<tr>
<th>Geographical Region</th>
<th>Mining</th>
<th>Manufacturing</th>
<th>Electricity, Gas, Water and Waste Services</th>
<th>Construction</th>
<th>Information Media and Telecom- munications</th>
<th>Professional, Scientific and Technical Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northland Region</td>
<td>63 (7.69%)</td>
<td>1716 (4.85%)</td>
<td>168 (9.7%)</td>
<td>1626 (6.73%)</td>
<td>120 (2.88%)</td>
<td>585 (4.63%)</td>
</tr>
<tr>
<td>Auckland Region</td>
<td>93 (11.35%)</td>
<td>7884 (22.3%)</td>
<td>465 (26.86%)</td>
<td>7101 (29.4%)</td>
<td>1926 (46.32%)</td>
<td>4668 (37.02%)</td>
</tr>
<tr>
<td>Waikato Region</td>
<td>279 (34.06%)</td>
<td>5034 (14.24%)</td>
<td>300 (17.33%)</td>
<td>3291 (13.62%)</td>
<td>297 (7.14%)</td>
<td>1272 (10.08%)</td>
</tr>
<tr>
<td>Bay of Plenty Region</td>
<td>45 (5.49%)</td>
<td>3630 (10.27%)</td>
<td>168 (9.7%)</td>
<td>2622 (10.85%)</td>
<td>210 (5.05%)</td>
<td>1077 (8.54%)</td>
</tr>
<tr>
<td>Gisborne Region</td>
<td>15 (1.83%)</td>
<td>819 (2.31%)</td>
<td>36 (2.07%)</td>
<td>555 (2.29%)</td>
<td>72 (1.73%)</td>
<td>171 (1.35%)</td>
</tr>
<tr>
<td>Hawke's Bay Region</td>
<td>21 (2.56%)</td>
<td>3099 (8.76%)</td>
<td>66 (3.81%)</td>
<td>984 (4.07%)</td>
<td>105 (2.52%)</td>
<td>414 (3.28%)</td>
</tr>
<tr>
<td>Taranaki Region</td>
<td>102 (12.45%)</td>
<td>1530 (4.32%)</td>
<td>39 (2.25%)</td>
<td>522 (2.16%)</td>
<td>66 (1.58%)</td>
<td>285 (2.26%)</td>
</tr>
<tr>
<td>Manawatu-Wanganui Region</td>
<td>36 (4.39%)</td>
<td>2733 (7.73%)</td>
<td>108 (6.23%)</td>
<td>1371 (5.67%)</td>
<td>120 (2.88%)</td>
<td>495 (3.92%)</td>
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<tr>
<td>Wellington Region</td>
<td>36 (4.39%)</td>
<td>2241 (6.34%)</td>
<td>159 (9.18%)</td>
<td>2544 (10.53%)</td>
<td>693 (16.66%)</td>
<td>2034 (16.13%)</td>
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<tr>
<td>Tasman Region</td>
<td>0 (0%)</td>
<td>273 (0.77%)</td>
<td>9 (0.51%)</td>
<td>141 (0.58%)</td>
<td>15 (0.36%)</td>
<td>63 (0.49%)</td>
</tr>
<tr>
<td>Nelson Region</td>
<td>0 (0%)</td>
<td>315 (0.89%)</td>
<td>9 (0.51%)</td>
<td>165 (0.68%)</td>
<td>21 (0.5%)</td>
<td>87 (0.68%)</td>
</tr>
<tr>
<td>Marlborough Region</td>
<td>3 (0.36%)</td>
<td>372 (1.05%)</td>
<td>18 (1.03%)</td>
<td>225 (0.93%)</td>
<td>21 (0.5%)</td>
<td>66 (0.52%)</td>
</tr>
<tr>
<td>West Coast Region</td>
<td>60 (7.32%)</td>
<td>186 (0.52%)</td>
<td>6 (0.34%)</td>
<td>99 (0.4%)</td>
<td>6 (0.14%)</td>
<td>48 (0.38%)</td>
</tr>
<tr>
<td>Canterbury Region</td>
<td>12 (1.46%)</td>
<td>3276 (9.26%)</td>
<td>111 (6.41%)</td>
<td>1836 (7.6%)</td>
<td>333 (8%)</td>
<td>903 (7.16%)</td>
</tr>
<tr>
<td>Otago Region</td>
<td>36 (4.39%)</td>
<td>972 (2.75%)</td>
<td>57 (3.29%)</td>
<td>711 (2.94%)</td>
<td>99 (2.38%)</td>
<td>282 (2.23%)</td>
</tr>
<tr>
<td>Southland Region</td>
<td>18 (2.19%)</td>
<td>1248 (3.53%)</td>
<td>21 (1.21%)</td>
<td>345 (1.42%)</td>
<td>54 (1.29%)</td>
<td>156 (1.23%)</td>
</tr>
<tr>
<td>Area Outside Region</td>
<td>0 (0%)</td>
<td>15 (0.04%)</td>
<td>3 (0.17%)</td>
<td>9 (0.03%)</td>
<td>0 (0%)</td>
<td>3 (0.02%)</td>
</tr>
<tr>
<td>Total</td>
<td>819 (100%)</td>
<td>35340 (100%)</td>
<td>1731 (100%)</td>
<td>24153 (100%)</td>
<td>4158 (100%)</td>
<td>12609 (100%)</td>
</tr>
</tbody>
</table>
Table 6.1.3 Māori Highest Qualifications

<table>
<thead>
<tr>
<th>Geographical Region</th>
<th>Doctorate Degree (960 credits)</th>
<th>Masters Degree (600 credits)</th>
<th>Post-Graduate and Honours Degree (480 credits)</th>
<th>Bachelor Degree and Level 7 Qualifications (360 credits)</th>
<th>Level 6 Diploma (240 credits)</th>
<th>Level 5 Diploma (120 credits)</th>
<th>Total geographical credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northland</td>
<td>11520</td>
<td>52200</td>
<td>70560</td>
<td>309960</td>
<td>209520</td>
<td>74880</td>
<td>728640</td>
</tr>
<tr>
<td>Auckland</td>
<td>138240</td>
<td>410400</td>
<td>305280</td>
<td>1807920</td>
<td>563760</td>
<td>308520</td>
<td>3534120</td>
</tr>
<tr>
<td>Waikato</td>
<td>37440</td>
<td>180000</td>
<td>154080</td>
<td>853200</td>
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<td>1641600</td>
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<tr>
<td>Bay of Plenty</td>
<td>20160</td>
<td>111600</td>
<td>99360</td>
<td>680400</td>
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</tr>
<tr>
<td>Gisborne</td>
<td>5760</td>
<td>25200</td>
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<td>123120</td>
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<td>390600</td>
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</tr>
<tr>
<td>Hawke’s Bay</td>
<td>2880</td>
<td>36000</td>
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<td>136800</td>
<td>52920</td>
<td>3534120</td>
<td>3534120</td>
</tr>
<tr>
<td>Taranaki</td>
<td>0</td>
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<td>24480</td>
<td>308160</td>
<td>124360</td>
<td>252360</td>
<td>252360</td>
</tr>
<tr>
<td>Manawatu-Wanganui</td>
<td>23040</td>
<td>86400</td>
<td>70560</td>
<td>175680</td>
<td>78840</td>
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</tr>
<tr>
<td>Wellington</td>
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<td>268200</td>
<td>211680</td>
<td>973080</td>
<td>254880</td>
<td>1906920</td>
<td>1906920</td>
</tr>
<tr>
<td>Tasman</td>
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<td>5400</td>
<td>5760</td>
<td>302400</td>
<td>124360</td>
<td>66600</td>
<td>66600</td>
</tr>
<tr>
<td>Nelson</td>
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<td>302400</td>
<td>124360</td>
<td>66600</td>
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</tr>
<tr>
<td>Marlborough</td>
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<td>86400</td>
<td>140400</td>
<td>79200</td>
<td>741600</td>
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<tr>
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<td>104000</td>
<td>57600</td>
<td>41400</td>
<td>41400</td>
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<td>91800</td>
<td>106560</td>
<td>438480</td>
<td>171360</td>
<td>929160</td>
<td>929160</td>
</tr>
<tr>
<td>Otago</td>
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<td>51840</td>
<td>223560</td>
<td>52560</td>
<td>419760</td>
<td>419760</td>
</tr>
<tr>
<td>Southland</td>
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<td>14400</td>
<td>96120</td>
<td>37440</td>
<td>172800</td>
<td>172800</td>
</tr>
<tr>
<td>Total</td>
<td>371520</td>
<td>1342800</td>
<td>1215360</td>
<td>6443280</td>
<td>2424960</td>
<td>1133640</td>
<td>12931560</td>
</tr>
</tbody>
</table>

Māori Highest Qualifications

- Māori Highest Qualifications, Auckland, 3534120, 27%
- Māori Highest Qualifications, Wellington, 1906920, 15%
- Māori Highest Qualifications, Waikato, 1641600, 13%
- Māori Highest Qualifications, Bay of Plenty, 1346760, 10%
- Māori Highest Qualifications, Canterbury, 929160, 7%
- Māori Highest Qualifications, Taranaki, 728640, 6%
- Māori Highest Qualifications, Nelson, 66600, 1%
- Māori Highest Qualifications, Marlborough, 74160, 1%
- Māori Highest Qualifications, Southland, 534960, 4%
- Māori Highest Qualifications, Otago, 419760, 3%
- Māori Highest Qualifications, Gisborne, 390600, 3%
- Māori Highest Qualifications, Tasman, 24480, 0%
Appendix H: Benchmarking of HVMS sectors in New Zealand

1) In this section, HVMS sectors\(^\text{21}\) in New Zealand are benchmarked against similar industry sectors in other countries. This analysis attempts to answer two questions. Firstly, what are the components of financial performance for New Zealand HVMS companies, and how do they compare to HVMS companies from other countries? Secondly, what other financial and non-financial factors exist that drive performance of HVMS companies, and how do New Zealand companies compare to HVMS companies from other countries?

2) This analysis focusses on the Return on Equity (ROE) figure, which is a traditional metric used to measure financial performance, by relating the earnings for that year to the amount of shareholder equity invested in the business. Alternatively, ROE represents the amount of earnings that are generated by the business every year as a percentage of the total dollar value of capital that is invested by its owners\(^\text{22}\).

3) The use of DuPont analysis is to determine the factors influencing financial performance by decompositing the Return on Equity (ROE) figure into its composite components. The ROE figure is determined by profit available to common shareholders, divided by the equity they have contributed or retained in the company. This ratio is affected by a number of factors or drivers and this is what is at the heart of a Du Pont analysis. These “drivers” of profitability help understand the key reasons for the ROCE and any changes by integrating elements of the profit and loss statement and the balance sheet. Many different versions of DuPont analysis exist, as there are many different ways to decompose the ROE figure. The version that we have adopted in this analysis is as follows:

\[
\text{ROE} = \frac{\text{EBIT}}{\text{Total Sales} \times \text{Avg.Total Assets} \times \text{Equity} \times \text{NPAT}}
\]

4) A brief explanation of the terms used in the decomposition is as follows:

---


\(^{22}\) For example, if a business owner initially invested $100,000 of capital into a new business, and that business earned $1,000, $5,500, and $11,700 in its first, second, and third year respectively, then the corresponding ROEs would be 1.0% (=1,000/100,000), 5.5% (=5,500/100,000) and 11.7% (=11,700/100,000). These ROEs would be in the absence of any further capital invested into the business. If in the fourth year, the owner invested a further $50,000 into the business, her total investment would be $150,000; subsequently, if the business earned $13,500 in the fourth year, its ROE would be 9.0% (=13,500/150,000). Importantly, even though the business earned more in the fourth year compared to the third ($13,500 versus $11,700), its ROE went down from 11.7% to 9.0% because of the additional investment. Hence, ROE is an intuitive measure of financial ‘bang for buck’ that can be used to compare businesses, even if they do not operate in the same sector or industry.
5) Return on Sales represents the ratio of earnings before interest and taxes (EBIT) to total sales\(^\text{23}\). It can be used as a guide to benchmarking a company’s efficiency in translating sales to operating profits.

6) Asset Turnover represents the ratio of total sales to average total assets\(^\text{24}\).

7) Leverage represents the ratio of total assets to equity. Leverage is a financing concept that deals with the amount of debt or loans used by a firm in financing its asset base\(^\text{25}\).

8) Fixed Charge Burden represents the ratio of net profit after tax (NPAT) to EBIT. EBIT, as explained above, can be thought of as a firm’s ability to generate operating profits independent of interest or tax considerations. NPAT is the figure that is arrived at after deducting interest charges and tax from EBIT. Hence, Fixed Charge Burden can be thought of as a percentage that represents how much of a firm’s operating profits is eventually retained as net profits, after interest charges and tax have been accounted for.

9) This analysis was done with data from BvD Orbis, the database described in Section 3.4.1. The countries chosen as a benchmark were Denmark and Australia. Denmark was chosen because of its similarities to New Zealand in terms of population size, demographics, and sector composition (Ministry of Business, Innovation, and Employment, 2012). Australia was chosen as it represents New Zealand’s second largest science and technology partner, with close links to New Zealand’s research community (Ministry of Business, Innovation, and Employment, 2013).

10) Because Orbis classifies companies under a different industry code as compared to the Martin Jenkins (2012) report\(^\text{26}\), matching and conversion was undertaken to preserve intra-industry comparability across the three countries: New Zealand, Australia, and

\(^{23}\) For example, a business that generated $1,000 of EBIT (also known as operating profit) from $10,000 of sales would have a 10% (=1,000/10,000) return on sales. EBIT is used in this ratio so as to maintain comparability between companies that have different financing structures, because EBIT excludes interest charges and taxes from the calculation. To elaborate, if two companies had identical sales and expenses figures except for their financing structure, their EBIT would remain the same, while their net profit would be affected by the difference in interest charges. Hence, Return on Sales represents a ‘before interest and taxes’ rate of profitability on sales.

\(^{24}\) For example, a business that generated $10,000 of sales from $200,000 of total assets would have a 5% (=10,000/200,000) asset turnover. It can be used as a guide to benchmarking a company’s efficiency in generating sales from the amount of assets employed in the business.

\(^{25}\) For example, if a company had $200,000 of total assets, and had only $80,000 of shareholder equity (owner’s investment), then it would have a leverage ratio of 250% (=200,000/80,000). Increasing leverage (using more debt) generally will enhance a firm’s financial performance, but too much leverage can have deleterious effects on the firm if the firm cannot pay interest charges or repay the loan principal when they come due.

\(^{26}\) Orbis offers NACE rev. 2 industry coding, which can be converted with minimum loss of detail to ISIC rev. 4. ISIC rev. 4 can then be converted to ANZSIC 2006, which is the coding standard used by MartinJenkins and Statistics New Zealand.
Denmark. This was done by using the ANZSIC-ISIC conversion table provided by the Australian Bureau of Statistics\(^\text{27}\).

11) Table 6.2.1 shows a comparative DuPont analysis of companies across New Zealand, Australia, and Denmark. HVMS companies have been grouped according to their industry classification; however, the construction sector ‘E’ was left out of the comparison due to insufficient data. The data from Orbis covers the years from 2009 to 2012.

12) Some important comments regarding Table 6.2.1 are as follows. Clearly, the number of Danish companies in our sample exceeds that of Australia or New Zealand; this may not reflect the real proportion of companies, as the Orbis database does not have complete data on many companies. Additionally, in 2012, the number of companies that are included in the sample differs significantly from prior years; this is because the Orbis database for 2012 does not have complete data for companies that have not ended their financial year. Hence, the number of companies from 2009-2012 are calculated as the average of the four years, multiplied by an adjusting factor of 1.142 (=4.0/3.5 years), in order to arrive at an adjusted estimate of the number of companies across the four years. Finally, the Return on Sales and Asset Turnover percentages from Denmark’s professional, technical, and scientific services sector ‘M’ appear to be overstated and understated respectively. This may be due to differences in reporting standards between the countries. However, this will not affect the final Return on Equity figure as any possible overstatement and understatement will cancel each other out due to common denominator and numerator\(^\text{28}\).

13) Several cells are highlighted in Table 6.2.1. Those cells highlighted in purple represent the highest ROE for that HVMS sector in a particular year. For example, in 2009, New Zealand had the highest ROE (23.5%) for the Professional, Scientific, and Technical Services sector ‘M’; Australia had the highest ROE (22.1%) for sector ‘J’. Similarly, those cells highlighted in orange represent the highest combined ROE between the three countries for that year. For example, in 2010, Denmark had the highest combined ROE (18.9%). Finally, the cells highlighted in green in the last row represent the highest combined sector ROE across the years from 2009 to 2012. For example, New Zealand had the highest ROE for the Professional, Scientific, and Technical Services for the years 2009 to 2012.

14) From this simple analysis, certain patterns emerge. Firstly, New Zealand appears to have a comparative advantage in sector ‘M’, Professional, Technical, and Scientific Services, as compared to the other two countries, with the highest ROE score in three out of four years


\(^{28}\) Return on Sales = EBIT/Sales; Asset Turnover = Sales/Total Assets. Hence, the ‘Sales’ term will cancel out when Return on Sales and Asset Turnover are multiplied together and provides a measure of Return on Assets (ROA). Two other components (drivers), Leverage and Fixed Charge Burden are then required to derive the final Return on Equity figure.
and the highest overall ROE across the four years. Secondly, Denmark appears to have a relatively stronger HVMS presence, with the highest combined sector ROE in two out of four sectors: ‘B’ and ‘C’, which are the Mining and Manufacturing sector respectively, and the highest combined ROE across the four years at 13.5% as compared to 11.6% for New Zealand and 7.6% for Australia.

15) Table 6.2.2 examines how several factors may affect the Return on Equity. In particular, we examine proxies for labour and capital productivity, liquidity, gross profit margin, and compare these against the Return on Equity performance.

16) *Productivity* is a measure of how well a business uses the resources available to it. In this analysis, we focus on the utilisation of employees and assets, which translate to labour and capital productivity. These measures of productivity are proxied for by examining the ratio of employees and assets employed against the level of sales. To elaborate, labour productivity is calculated by dividing Sales by Employees to give the amount of sales per employee, while capital productivity is calculated by dividing Sales by Total Assets, to give the amount of sales generated per dollar of assets employed by the business.

17) *Liquidity* is a measure of the solvency of the business, and is conceptualised as the ability of the business to meet its financial obligations as they come due. Liquidity is important because it represents the ability of the company to continue as a going-concern; that is, companies that have low liquidity ratios may suffer an increased chance of bankruptcy. Hence, liquidity ratios allow for the comparison of how financially ‘healthy’ the company is.

18) The two liquidity ratios calculated here are the current ratio and the operating cash flow ratio. The current ratio is the ratio of current assets over current liabilities, where ‘current’ denotes liabilities or assets that are expected to be sold or due within one year, respectively. Current ratios below 100% are generally considered to be a warning sign that the company might face difficulties in paying its debts as they fall due; however, because the balance sheet may not reflect all types of financing available to the company, the current ratio should not be interpreted in a strict manner. The operating cash flow ratio is the ratio of cash flow from operations over current liabilities. The cash flow from operations is defined as the cash generated by usual business of the company, and represents a higher standard of liquidity as compared to current assets because cash can be readily employed for debt settlement, unlike current assets which need to be sold off first. Again, the operating cash flow ratio may be a warning sign if it is below 100%; however, the presence of off-balance sheet financing and other arrangements may invalidate any strict interpretation of the ratio.

19) *Gross profit margin* is a measure of the raw cost of manufacturing goods or services for sale without including selling, general, or administrative costs. It can be conceptualised as the amount that is left over after raw manufacturing costs have been deducted from
revenue. High value-added strategies tend to produce high gross profit margins, as the raw manufacturing costs per unit are low compared to the revenue earned from its sale. Hence, comparing gross profit margins can be a key indicator of the success of HVMS companies in that sector in pursuing a high-value added strategy.

20) Table 6.2.2 has several cells that are coloured, for easier identification. Firstly, the purple, orange, and green cells retain their meaning from Table 6.2.1; they represent the highest ROE for that HVMS sector in a particular year, the highest combined ROE between the three countries for a particular year, and the highest combined sector ROE across the years from 2009-2012. Next, an analysis using the proxies for productivity and gross margin is performed, with the highest ratios for each HVMS sector in a particular year shaded as blue. For example, for the Mining sector ‘B’ in 2010, Denmark had the highest labour productivity ($17918 per employee), as compared to New Zealand ($11470) and Australia ($3484). In contrast, for the Manufacturing sector ‘C’ in 2010, New Zealand had the highest capital productivity (193%), as compared to Denmark (101%) and Australia (53%). Finally, the cells shaded in grey denote the highest overall score amongst the three countries for that year; for example, in 2010, Denmark had the highest overall gross profit margin (46%), as compared to Australia (42%) and New Zealand (34%).

21) Some trends that pertain to New Zealand stand out in this analysis. Firstly, New Zealand appears to be comparatively stronger in the area of capital productivity, particularly in sectors the Manufacturing, Information Media and Telecommunications, and Professional, Scientific, and Technical Services sectors (B, C, and M), which implies that New Zealand HVMS companies are able to earn a higher rate of return per unit of asset used in their operation as compared to companies from Australia and Denmark. Next, employment numbers in New Zealand HVMS companies appear to be going down across the period of 2009 to 2012. This may be a significant trend caused by increased competition, or the inability for most HVMS companies to sustain employment numbers due to decreased demand for their goods. Alternatively, it could also be caused by increased labour productivity over time. However, the figures reported do not support the increased labour productivity hypothesis, as labour productivity numbers appear to be decreasing over time too. This could imply a shift across HVMS companies, from capital-intensive methods of production towards more labour-intensive methods of production. If such a trend exists, it would be important to find out the reasons for such a shift. Finally, in comparison to Denmark, New Zealand’s HVMS companies have a lower gross profit margin. It may prove to be useful to understand the determinants of the higher gross margin that Danish HVMS companies enjoy.

9) Finally, this is a preliminary analysis using sampled data and there are limitations to the validity of the conclusions that can be drawn. Further econometric analysis is required to tease out the strength of effects over time, and to lend support to the conclusions drawn.
### Table 6.2.1 Comparative DuPont Analysis of HVMS companies across New Zealand, Australia, and Denmark

<table>
<thead>
<tr>
<th>Industry</th>
<th>NZ</th>
<th>AU</th>
<th>DK</th>
<th>Yearly</th>
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<tr>
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<td>J</td>
<td>M</td>
</tr>
<tr>
<td>2009</td>
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</tr>
<tr>
<td>Number of companies</td>
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<td>55</td>
<td>15</td>
<td>24</td>
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<tr>
<td>Return on Sales</td>
<td>37.9%</td>
<td>4.6%</td>
<td>11.4%</td>
<td>9.1%</td>
</tr>
<tr>
<td>Asset Turnover</td>
<td>55.2%</td>
<td>88.8%</td>
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<td>171.1%</td>
</tr>
<tr>
<td>Total Assets-to-Equity</td>
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<td>241.5%</td>
<td>266.3%</td>
<td>214.7%</td>
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<tr>
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<td>86.3%</td>
<td>49.3%</td>
<td>70.5%</td>
</tr>
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<td>10.6%</td>
<td>23.5%</td>
</tr>
<tr>
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<td></td>
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<td>72</td>
<td>19</td>
<td>25</td>
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<td>14.8%</td>
</tr>
<tr>
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<td>68.3%</td>
<td>93.0%</td>
</tr>
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<td>211.6%</td>
<td>271.3%</td>
<td>189.4%</td>
</tr>
<tr>
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<td>62.2%</td>
<td>47.8%</td>
<td>72.7%</td>
</tr>
<tr>
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<td>10.7%</td>
<td>19.0%</td>
</tr>
<tr>
<td>2011</td>
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<td></td>
</tr>
<tr>
<td>Number of companies</td>
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<td>73</td>
<td>15</td>
<td>23</td>
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<td>5.9%</td>
<td>15.4%</td>
</tr>
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<td>102.8%</td>
<td>53.0%</td>
<td>85.3%</td>
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<tr>
<td>Fixed Charge Burden</td>
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<td>22.2%</td>
<td>67.8%</td>
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<td>1.9%</td>
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<tr>
<td>2012</td>
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<td></td>
</tr>
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</tr>
<tr>
<td>Asset Turnover</td>
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<td>59.8%</td>
<td>9.6%</td>
</tr>
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<td>83.2%</td>
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<th>DK</th>
<th>Yearly</th>
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<td>C</td>
<td>J</td>
<td>M</td>
</tr>
<tr>
<td>2009</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Gross Profit Margin</td>
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<td>40%</td>
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<td>16%</td>
<td>70%</td>
<td>34%</td>
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<tr>
<td>Capital Productivity</td>
<td>18%</td>
<td>152%</td>
<td>.16%</td>
<td>.12%</td>
<td>.13%</td>
<td>.32%</td>
<td>.128%</td>
<td>.58%</td>
<td>.106%</td>
<td>.66%</td>
<td>-</td>
<td>.45%</td>
<td>.29%</td>
<td>.19%</td>
<td>.30%</td>
<td>.42%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Ratio</td>
<td>620%</td>
<td>103%</td>
<td>.106%</td>
<td>.232%</td>
<td>.113%</td>
<td>.133%</td>
<td>.171%</td>
<td>.92%</td>
<td>.140%</td>
<td>.129%</td>
<td>-</td>
<td>.130%</td>
<td>.69%</td>
<td>.151%</td>
<td>.117%</td>
<td>.121%</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Operating Cash Flow Ratio</td>
<td>167%</td>
<td>19%</td>
<td>.66%</td>
<td>.266%</td>
<td>.49%</td>
<td>.67%</td>
<td>.27%</td>
<td>.76%</td>
<td>.26%</td>
<td>.57%</td>
<td>-</td>
<td>.18%</td>
<td>.77%</td>
<td>0%</td>
<td>.31%</td>
<td>.41%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gross Profit Margin</td>
<td>30%</td>
<td>12%</td>
<td>.43%</td>
<td>1%</td>
<td>.25%</td>
<td>.53%</td>
<td>.27%</td>
<td>.172%</td>
<td>.42%</td>
<td>.44%</td>
<td>-</td>
<td>.40%</td>
<td>.69%</td>
<td>.14%</td>
<td>.46%</td>
<td>.43%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Return on Equity</td>
<td>2.0%</td>
<td>4.4%</td>
<td>.32.2%</td>
<td>.6.3%</td>
<td>.14.6%</td>
<td>7.4%</td>
<td>-14.3%</td>
<td>.17.7%</td>
<td>.6.6%</td>
<td>.3.4%</td>
<td>-</td>
<td>.6.3%</td>
<td>.9.1%</td>
<td>.3.1%</td>
<td>.5.0%</td>
<td>.4.8%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

APPENDIX I: Directory of Key Personnel Consulted in Government and Non-Government Organisations

  - Karen Coutts, Principal Adviser Māori
    - Tel: (04)-931-4216
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    - Email: pollr@tpk.govt.nz
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    - Tel: 0800-520-001
    - Email: jamie.tehiwi@tpk.govt.nz

  - Reece Moors, Sector Manager: Māori Industry Development
    - Tel: (09)-920-3621
    - Email: reece.moors@callaghaninnovation.govt.nz
  - Rory Mitchell, Research Analyst
    - Email: rory.mitchell@callaghaninnovation.govt.nz

- Poutama Trust, http://www.poutama.co.nz/
  - Rawinia Kamau, Business Adviser
    - Email: rawinia@poutama.co.nz

- Federation of Māori Authorities, http://www.panui.co.nz/
  - Te Horipo Karaitiana, Chief Executive
    - Email: tehoripo@foma.co.nz

- Māori Trustee, http://www.maoritrustee.co.nz/
  - Mark Harris, Information Technology Manager
    - Tel: (04)-803-2800
  o Nuran Çinlar, Head of Science, Skills, and Innovation Research
    ▪ Tel: (04)-901-1499

  o May Downing, Policy Analyst
    ▪ Email: May.Downing@mpi.govt.nz

  o Phil Broughton, Past-President
    ▪ Email: philip.broughton@ph.co.nz

• Waikato University Management Research Centre, http://www.management.ac.nz/
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  o John Doorbar
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REFERENCE LIST


Schulze, H. Personal communication dated 16th May 2013.


