



## Global value networks

How to succeed in business without worrying about scale,  
distance or thin networks

NZIER report to NZPECC

September 2015



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NZIER was established in 1958.

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# Key points

Our objective: build an understanding of global value networks in New Zealand

## Value networks: our conceptual framework

- In High Technology Businesses and Knowledge Intensive Services, the value creating system is better understood as a network than as a chain. Value networks differ from value chains in that there are more actors carrying out a broader variety of functions in a value network than in a value chain, where producer-distributor-consumer relationships predominate.
- Understanding the roles of the different actors in a value network allows participants to harvest value from the entire value-creating system, and to benefit from the activities of actors with whom they have no value chain or commercial relationship.
- Transacting frequently with the important actors in your network can overcome the disadvantages of distance. Value streams iterated over many years bind the actors in the network closer together, wherever they happen to be located.

## Value network success depends on offering a value stream to actors that cannot be easily imitated or substituted

- Participating in value networks requires the provision of value streams to actors. These can be monetised or free goods and services.
- Sustaining the presence of particular value streams in value networks is a competitive process in which the only sure recipe for success is offering the value network an element that cannot be substituted or easily imitated.
- Firms who wish to sustain their participation in value networks must therefore develop internal capabilities which are imperfectly imitable or non-substitutable.
- From the perspective of the individual firms, these capabilities confer competitive advantage: sustainable competitive advantage in the case of imperfectly imitable capabilities, and permanent competitive advantage in the case of non-substitutable capabilities.
- A firm's value proposition is the sum of its value streams. The strategic imperative for the firm is to deliver imperfectly imitable or non-substitutable capabilities into the network through the value proposition.

## Delivering value streams requires a clear understanding of consumers' changing desires

- The competitive advantage conferred by imperfectly imitable or non-substitutable capabilities only holds if the capability remains aligned to the value that end customers wish to extract from the value network. Changing customer preferences can strand a value stream, and render the underlying capability obsolete.

- Innovation paths in value networks are the outcome of the constant alignment and realignment of firms' capabilities with changing customer value preferences. It follows that most innovation is iterative rather than disruptive.
- Innovation paths determined by customer value are less risky than those that depend on the commercialisation of pure research.
- Changing customer preferences make market intelligence at a detailed level important, but this can be a challenge for small New Zealand firms.

### Case studies of Kiwi firms suggest many common global value network features

- The three New Zealand firms we used for our case studies differed widely in their capability profiles, but all had significant imperfectly imitable or non-substitutable capabilities in the category of immaterial (that is, intangible) assets.
- Examples of immaterial assets include intellectual property, processes that ensure high but constantly evolving quality, and trust relationships. It seems that developing immaterial assets is an effective strategy for New Zealand firms who wish to participate in global value networks (GVNs). The success of the firms studied depended more on this than any particular capacity for innovation or the number 8 wire mentality of popular discourse.
- For two of the case study firms, the role of associate or independent actors in their value networks is as important as their producer-consumer relationships.
- The New Zealand firms studied all pursued focus strategies, rather than cost leadership or product differentiation strategies. Focus strategies can neutralise scale, distance and thin markets. This is discussed more fully in Section 4.4.
- The New Zealand firms all maximised touchpoints with a variety of actors in their value networks. The strategies deployed to do this included intricate revenue models, highly iterative quality assurance and collaborative planning processes, and constant information sharing.
- Two of the firms studied did not build scale in New Zealand before entering the international market. The third had a long history in New Zealand before engaging internationally but did not feel that its international success depended on this history.
- All firms agreed that understanding the international value networks in which they participated was more important than building domestic scale.

### Thematic conclusions

- A shift in understanding from value chains to value networks could make a substantial contribution to improving the number and productivity of New Zealand's international connections, which the OECD has identified as a weakness.

- High technology business (HTB) is a small component of all developed countries' economies, but New Zealand's HTB sector is smaller than most, generating 0.7% of GDP in 2010 and employing 0.6% of the workforce. The sector is nevertheless one of the most export intensive in the economy, although less so than sectors such as Food & Beverage. It contributes 3% of total exports. HTB also underpins developments in other sectors of the New Zealand economy, so marginal productivity improvements in the HTB sector could lead to substantial improvements for the New Zealand economy as a whole.
- Value streams which embody immaterial assets (such as IP) are an effective means through which New Zealand firms can participate in global value networks.
- Value propositions should be designed to track and capture desired customer value. There is some tension between this conclusion and the view which sees the market introduction process as one of commercialising research.
- When designing value propositions, firms should offer more than just the good or service being paid for. Successful GVN firms bundle up consumer-focused free services and information to maintain their competitive advantage.
- Iterative innovation is better aligned to customer value dynamics and therefore lower risk than disruptive innovation. In the ideal case, firms should develop operating models that enable iterative transactions between the bearers of customer value and the bearers of firms' capabilities. In such a case, these transactions become the R&D process for the firm.
- New Zealand firms should seek to understand the role all actors within the network play. This entails broader and more comprehensive focus than the emphasis given to producer-consumer relationships inherent in value chain analysis.
- New Zealand firms should create commercial and operating models which increase the number, quality and variety of touchpoints with network actors and end-customers.
- Agile, well-educated human capital is critically important to the ability of firms to continue to harvest value from networks, as it allows resources to be constantly re-configured to address changing customer value.

### Policy implications

- Generic policies directed at enhancing knowledge diffusion, upgrading human capital and promoting organisational change will all support value creation and value capture in value networks.
- Almost all current government policy is designed to support a particular mode of innovation: collaborative R&D, science based. However the innovation mode exemplified by the firms studied is R&D product/client oriented. These innovation networks receive scant attention or policy support, and so could benefit from appropriate policy initiatives.

- Attention should be devoted to policies which support iterative business concept innovation within value networks.
- Government intervention can be usefully directed to the early stages of network creation, in particular by:
  - developing awareness of networking possibilities
  - searching for partners, and
  - building trust and a shared knowledge base between network participants.
- A set of possible interventions are set out in Section 9.4. They include:
  - encouraging New Zealand trade bodies to track customer value dynamics and disseminate the information to New Zealand firms. The MFAT and NZTE sustainability market intelligence reporting network could provide a useful template.
  - increasing the sophistication of New Zealand firms' understanding of focus strategies and dynamic capabilities. Business schools and industry bodies could take the lead in disseminating this information more widely.
  - generalising an understanding of the effectiveness of immaterial assets in sustaining business for New Zealand. Again, business schools and industry bodies could be effective in promoting this understanding.
  - focusing trade missions around generating specific relational assets, and setting up actor relationships within potential networks.
  - building common platforms for knowledge-sharing and information-exchange in specific networks.
- It is clearly in New Zealand's national interest to preserve and extend its success in creating immaterial assets, including intellectual property (IP). The effect of protecting IP by patent is to transform it into a tradeable good. Trading IP could have the effect of making a capability that was formerly imperfectly imitable or non-substitutable into one that is merely valuable, thereby weakening New Zealand's competitive position within value networks.
- Similar concerns apply to treating New Zealand IP as a commons. This could create opportunities for other industry actors to appropriate value created by New Zealand firms.
- IP policy should not be exclusively focused on promoting formal IP protection. Measures taken to support the preservation of business secrets maybe more effective in protecting the immaterial assets which are such an important element in New Zealand's participation in global value networks.

### Suggestions for further research

- Global value networks differ in their innovation mode, so policies that will affect one type of GVN may not support another. Which policy levers support success in each type of network?
- It would be useful to develop a richer understanding of the factors that inhibit the participation of New Zealand firms in global value networks. A

potentially fruitful approach under the resource-based view could be to examine the role of transaction costs, which may increase with the distance from key network actors.

- Does New Zealand enjoy any particular advantage with respect to the creation of immaterial assets? If we do, how do we nurture, enhance and extend it?
- We have proceeded on the assumption that firms include free elements within value propositions deliberately, in order to extract value from networks. An alternative explanation is that the free elements reflect asymmetries in market power between actors within the network. It may be that both explanations are true, but apply in different circumstances: there could be a world of difference between the abundance of free elements within Google's value proposition and the position of a firm who is obliged to offer free elements just to stay in the market. It would be useful to understand the trade-offs and system dynamics involved in optimising the position of free elements within value propositions.
- Do free elements exist within value propositions because a firm has not been able to work out a means of monetising these value streams? For instance, a firm may not have access to the skills needed for the effective licensing of immaterial assets. If this explanation is valid, it would be useful to know how prevalent the problem is, and whether it is particularly acute for New Zealand firms.
- The conclusions presented in this report are derived from an analysis of New Zealand firms. A logical next step would be to conduct international comparisons with a view to identifying whether some conclusions are more relevant to New Zealand firms than others. Touchpoints provide a good illustration: are there New Zealand-specific constraints (scale, distance, market organisation) which hamper the ability of New Zealand firms to create models which increase the number, quality and variety of touchpoints?



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# 1. Introduction

## The challenge

In recent years, global value chains and the role of New Zealand firms within them have attracted a great deal of interest from policy, academic and commercial communities. The interest is well merited: developing and deepening our understanding in this area is clearly important to maintaining and improving New Zealand's position in a world which is both increasingly networked and increasingly competitive. Effective participation in global value chains underwrites our national prosperity, and safeguards our economic future.

NZIER was therefore very pleased to be able to respond to a request from the New Zealand Pacific Economic Cooperation Council (NZPECC) for case studies of High Technology Business and Knowledge Intensive Services: two sectors with significant trade potential. NZPECC was seeking a strong empirical focus. It posed the question how are value chains and New Zealand firms' roles in them actually configured?

## Our approach

To answer this empirical question, NZIER has conducted case studies using the value network concept rather than the value chain concept. Under the value network concept the focus is on the entire value-producing system, and a broader range of actor relationships are considered within the system than is the case for traditional value chain analysis, which focuses on producer-distributor-consumer relationships.

The value network concept supplies a framework for analysis which acknowledges the realities of modern international trade, as identified by Professor Gary Hawke in an earlier paper for NZPECC (Hawke 2014):

*"The reality for some time is that countries are economically interdependent, and notions of a country producing finished goods for export to another are outdated."*

We selected three firms – two High Technology Businesses and one Knowledge Intensive Service firm – with impressive records of participation in value networks sustained over many years. We have mapped the value networks in which these firms participate, identified the actors within the networks, their roles and how they interact with the value streams which make up the network. This analysis answers the empirical question posed by NZPECC: how are the value networks and New Zealand firms' roles within them actually configured?

To explain the sustained presence of New Zealand firms within the networks and to identify the innovation paths they can use to remain enfolded within these networks we have applied Barney's work on dynamic capabilities to the analysis described above (Barney 1991). An important finding (and one suggestive of further research) is that the participation of New Zealand firms is more heavily dependent on their immaterial assets – intellectual property, quality, trust relationships – than any particular capacity for innovation or the number 8 wire mentality of popular discourse.

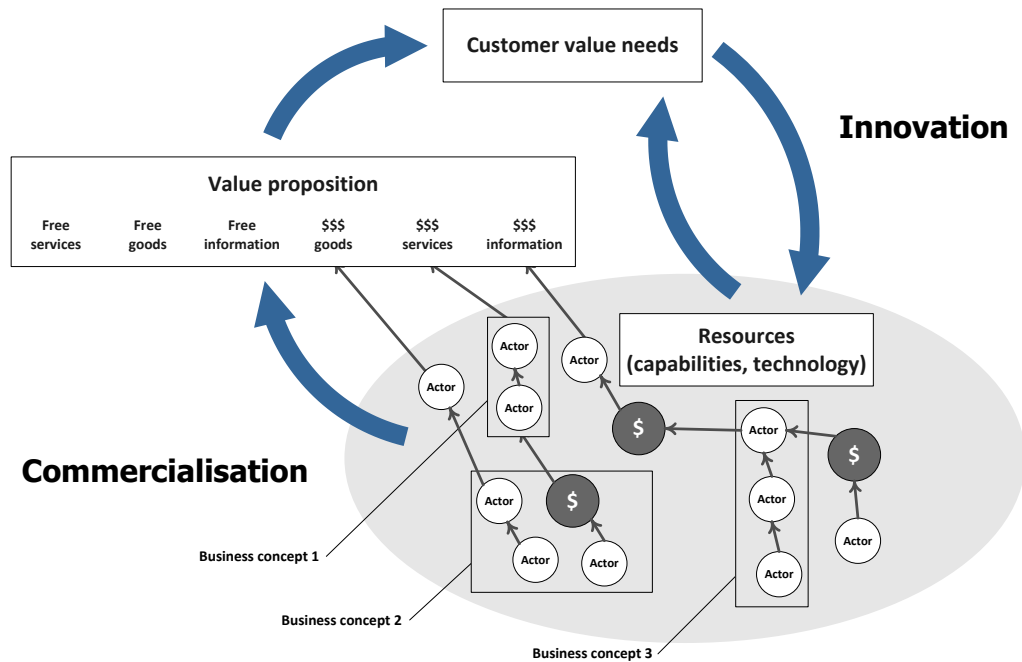
We conducted our primary research for the case studies through a series of interviews with C-level executives in each of the case study firms. We have edited their assessments of their dynamic capabilities and the way their value networks operate with the lightest of hands. All found the frameworks we brought them – the value network, value streams, actors, dynamic capabilities – valid and a useful way of analysing the reality of the environments in which they operated.

We hope that other firms may find our approach fruitful, and that our study may contribute to greater New Zealand understanding of, and participation in, global value networks in the years to come.

## 2. The value-creation cycle

The focus of value network analysis is not the company or even the industry but the value-creating system itself, within which different economic actors – suppliers, business partners, allies, consumers – work together to co-produce value (Normann and Ramirez, 1993). Figure 1 summarises the value network framework applied for this research.

**Figure 1 The value cycle**



**Source: NZIER**

Customers extract value from the value-creating system by consuming the **value propositions** of the various firms acting within the network. Not every element in a value proposition is monetised, that is, the customer does not pay directly for each element they consume, so we classify the elements of value propositions into paid products, services, and information and free products, services, and information.

Within each of these categories, a number of individual value streams are typically found. A **value stream** is similar to a value chain: it is a combination of business concepts organised to extract value from the system by being consumed by another actor in the system.

**Business concepts** are the basic building blocks of the entire system. A business concept is a collection of transactions between actors within the system that can be combined to form value streams which address customer needs and opportunities. Changes in business concepts are often enabled by changes in technology. Some transactions are monetised, others are not.

The **actors** within the system are the resources – people, technologies, capabilities – which carry out the transactions that create value within the system. For the purposes of this study, we have considered the actors within the case study firm as bearers of particular capabilities inherent within the firm, and considered the actors outside the case firm in terms of their functional relationship to the case firm – associate, independent, supplier, and so forth.

Business concepts are also important when considering innovation. **Innovation** is an attempt to create new customer value or to capture customer value as it evolves. In both cases, the transactions that generate innovation are those between the resources and capabilities of the innovating firm and the changing value dynamics. These do not need to be transactions between the innovating firm and the end-customers themselves, but the changing customer value preferences, however mediated through the value network, should in effect become the R&D process for the firm (Ulaga and Chacour 2001).

Innovation is realised and commercialised by changing the business concepts within the value streams, or by creating new value streams based on new business concepts, which then capture value from the network through the value propositions of the actors within the network.

The object of value network analysis is to connect value realised to the resources used to create it, recognising all the relevant relationships between the actors in the network.

### Customer value dynamics

It is important to draw the distinction between customer value and customer satisfaction. A perfectly satisfied customer can shift to a competing offering if it provides significantly greater value (Hamel, 2002). It is not customer satisfaction that creates real (voluntary) customer lock-in (Hamel, 2002) but the overall value of an offering (Gardner, 2001).

Customer value is composed of two elements: customer desired value and customer received value.

Flint and Woodruff (2001) define **customer desired value** as:

*“a bundle of product attributes and resulting consequences, both positive and negative, and monetary and non-monetary, that the customer wants to happen.”*

**Customer received value** is the value that the customer actually gets from a given product or service. Firms active within the value network deliver received value to customers through the value streams within their value proposition.

As in life, what is desired and what is received are rarely perfectly synchronised. Customer value is highly dynamic, customers' preferences change, and by the time a value network has organised its resources to deliver a particular received value, desired value will often have changed.

The dynamic relationship between desired value and received value is the driving force for change in the value network. It is these value dynamics which determine the innovation paths within the network, as resources need to be regularly (re)organised to fit value creation or value capture.

This reorganisation takes place through innovation of the business concepts which underlie the value streams. Such innovation creates (internally) competing alternatives to the existing business concept. It is the basic tool to change the business model to better fit changed customer needs, and therefore address desired value.

### Dynamic capabilities

The transactions that make up the business concepts are carried out by actors who represent the firm-specific resources within the value network. In this study, we have construed these firm-specific resources as capabilities (see Section 5.1.1 below) which we have then examined under the dynamic capabilities framework (VRIN) proposed by Barney (1991).

The nature of these firm-specific resources determine the competitive advantage of the firm and therefore safeguard the firm's position within the value network, as long as the capability remains aligned to the value dynamics described above.

Barney's VRIN criteria assert that for a capability to confer competitive advantage it must be:

- **Valuable** (enables the firm to implement efficiency or effectiveness strategies)
- **Rare**
- **Imperfectly imitable** (keeps firm ahead of competition), or
- **Non-substitutable** (no other resource is capable of a strategically equivalent outcome).

The sustainability of the firm's competitive advantage increases as it passes through the criteria from V to N. It follows that the value streams which embody these criteria – especially I and N – are those which explain the sustained presence of a given firm in the value network.

The master strategy of a firm wishing to capture value from a value network is therefore to develop imperfectly imitable or non-substitutable capabilities which address customer desired value, and to deliver these capabilities to the value network by embedding them in value streams. The firm does not have to transact directly with end-customers for this strategy to be effective; the key point is that its capabilities stay aligned with the value dynamics within the network.

The master strategy has far-reaching implications for innovation. We stated above:

*“Innovation is realised and commercialised by changing the business concepts within the value streams, or by creating new value streams based on new business concepts, which then capture value from the network through the value propositions of the actors within the network.”*

The optimal innovation strategy is therefore two-pronged:

- (1) Use the iterative nature of the innovation process to increase the influence of a dynamic capability within the system (extracting more value), or
- (2) Reconfigure or jettison capabilities which no longer track customer desired value (cutting losses).

Our case study firms produced examples of both approaches.

## 3. Research method

### 3.1. Requirement

The New Zealand Pacific Economic Cooperation Council (NZPECC) asked NZIER to analyse value chains or value networks in the High Technology Business (HTB) and Knowledge Intensive Services (KIS) based on case studies.

The analysis of case studies is to show the value network dynamics such that:

- the full breadth of the value-creating system is clear
- the position of the New Zealand firms in the value-creating system relative to the position of other participants is apparent
- the way in which New Zealand firms participate in the value-creating system is identified
- evolutionary elements are exposed
- the environmental dynamics that lead firms to participate in the value-creating system are examined
- we can identify the value captured by New Zealand firms
- value constraints and strategies to address them are identified, including policy implications
- factors that are common to many firms or the sector as a whole are distinguished from those that are specific to a firm or particular value-creating system.

### 3.2. Case study analysis

We selected two High Technology Businesses (HTB):

- Company A
- Company C

and one firm from the Knowledge Intensive Services (KIS) sector:

- Company B.

All three case study firms have been successfully participating in global value networks for more than a decade. All have achieved significant scale (the combined average annual revenue of the three firms is over \$200m for the last five years) and all have plans for further growth. The three firms are headquartered in different parts of New Zealand, on both the North and South Islands.

We used value network analysis techniques to analyse the position of these New Zealand businesses in global value networks. A value network is a collection of complementary and substitutive resources (such as information or intangible capability) possessed by different firms (Kothsandaraman and Wilson, 2001). Actors within these networks are in a variety of relationships and perform different transactions with each other to achieve their own goals and advance those of the network.

This analysis approach is better suited to HTB and KIS firms than traditional value chain analysis, as success in these sectors is less dependent on the transformation of physical inputs into physical products. Success in HTB and KIS stems from the creation and maintenance of capability-based resources (which are often intangible or knowledge-

based) linked to interdependencies within the value creating system itself (value network analysis).

Because of complex interdependencies within the value creation system, the earning logic is not always clear. Markets are multi-sided, information and intangibles can be more important than finance flows, and technology markets are dynamic and adapt rapidly to customer value.

In short, value network analysis simultaneously:

- addresses the entire value-creating system
- focuses on competitive dynamics within the system
- identifies the roles and relationships of the actors within the system
- assumes a dynamic, not static, system at all levels of analysis
- examines the value appropriated by transactions within the system.

### 3.3. Our approach

NZIER conducted a series of interviews with C-level representatives at the case study firms to identify the value dynamics which affect them and how they interact with the wider value-creating system.

We used the value network framework to examine the business models of the case study firms and their position within the global value networks in which they operate. The approach used for each interview comprised of three phases.

#### Phase one: Value proposition

In phase one, we decomposed the commercial offering of each case study firm into discrete business models. We use Osterwalder's Business Model (Osterwalder, 2014) taxonomy to make comparisons between the firms, and examine the relationship between the business models identified and customer value dynamics.

#### Phase two: Customer needs

In phase two, we analysed the value streams within the business models and the value networks within which the firms operate. We identified the actors and transactions within the value-creating system (i.e. both inside and outside the case study firms) and associated the actors to the transactions as either producers or consumers. We identified the commercial flows and specified the functional relationships of actors outside the case study firm.

#### Phase three: Resources

In phase three, we examined the business concepts underlying the value system using the resource-based concept of the firm. We used the VRIN (Valuable; Rare; Imperfectly Imitable; Non-substitutable) criteria to examine any competitive advantage possessed by the case study firms, or the HTB and KIS sectors in New Zealand. We examined the relationship between the resources and customer value dynamics to develop a robust view of the case study firms' ability to innovate in dynamic global markets.

We then compared the case studies and draw conclusions from the analysis to derive policy relevant insights from the exercise and outline key policy-relevant findings.

A table which shows the alignment between the research requirement and the findings in this report will be found at Appendix A.



# 4. Case study profiles

## 4.1. Company A

### 4.1.1. Profile

Company A has been in existence for more than 50 years, but its international expansion dates from the 1970s. Its expertise lies in manufacturing equipment tailored exactly to individual industrial processes and circumstances, ranging from large industrial automation systems, which are significant capital items for their customers, through industrial robots and specialist equipment, to low-value contract manufacturing for appliance manufacturers.

Company A's annual revenues are greater than \$50M, 90% of which are generated overseas.

Company A has operations in Australia, China, Chile, Italy, and the United States, as well as several locations in New Zealand.

**Table 1 Company A's profile**

Profile	Overall	International	New Zealand
Revenue	\$50M +	90%	10%
Main sectors	Mining sample preparation equipment (40%) Appliance manufacturing (30%) Industrial automation (27%) Super conducting magnets (3%)		Industrial automation (100%)
Growth rate		15% CAGR	15% CAGR

Source: Company A

### 4.1.2. Global value network participation

#### Organic international growth

Company A's initial foray into international markets was opportunistic, and the result of a demand pull. Company A built equipment for a domestic customer which was seen by an Australian visitor, who eventually recommended Company A for the construction of a similar system in Australia. This in turn was seen by an American visitor to Australia, at which point Company A began to think that building an international presence in industrial automation could be more than a happy accident.

Company A therefore started to send representatives to the United States in the 1980s, which resulted in a contract with General Electric who wanted access to Company A's unique industrial tooling design and manufacturing capabilities. At the same time Company A's innovations in the design of hydraulic presses attracted interest, and eventually orders, from China and Europe. These contracts provided the beachheads from which Company A was later able to expand.

## Growth drivers

Company A entered the international market through natural growth and acquisitions, as described above.

The principal internal drivers of international growth are:

- a constant focus on research and development
- increasing their human capital in New Zealand and Australia (Company A has doubled the number of PhD holders in the business over the last three years)
- increasing their intellectual property, which it protects via patents and trademarks.

Externally, growth has come through the acquisition of general manufacturing capability in China and robotic manufacturing in the United States. The company's sample preparation business also benefits from fluctuations in commodity prices and cycles in the mining and meat processing industries. The diversity of the sectors in which Company A operates means that an adverse cycle in one sector is likely to be balanced by a positive one in another cycle.

## Extent to which Government enables Company A's participation in global value network (GVNs)

The New Zealand Government has contributed a total of \$4 million in 2013 and 2014 for research and development. Industry bodies in Australia are Company A's main source of funding not linked to a particular sale.

## GVN participation threats

Customers' access to capital is a persistent problem for the industrial automation business. Industrial automation systems are usually significant capital items, often have long lead times and Company A is often in the position of being required to commit significant resource (quoting design and consultancy, prototyping) without the certainty of a sale.

Company A uses a number of strategies to overcome these problems. One of the most striking things about Company A is the sophistication of its revenue model. Osterwalder gives the following inventory of possible revenue models:

- Selling
- Lending ('try before you buy')
- Licensing
- Transaction cut
- Advertising
- Fixed pricing
- Differential pricing (based on volume, throughput, or some other characteristic of the solution provided)
- Market pricing (negotiated, take – or pay).

Company A applies every one of these revenue models to its industrial automation business, and often applies different models to different stages of the interaction. The outcome is more touchpoints and therefore more intensive relationship building during the planning and design phase.

Access to capital is a particularly acute problem in New Zealand, and goes a long way towards explaining Company A's low profile in the New Zealand market. New Zealand firms often have short budgeting cycles (six months is not unusual in some sectors)

and a preference for scaling labour supply against demand fluctuations. These features combine to make it less likely that New Zealand firms will invest in a large capital item even if it leads to a lower average cost of production. Hiring casual labour to respond to demand feels less risky to many New Zealand firms than financing a long term investment.

In the appliance manufacturing sector gains are lost to the cost of producing. For the few large international appliance manufacturers who dominate this space, performance and reliability matter much less than low cost. The usefulness to Company A is that it makes use of manufacturing capability that would otherwise be standing idle, an unavoidable consequence of manufacturing highly customised industrial automation systems. Even so, Company A is assessing whether it really is worth its while to be engaging in what is essentially a commodity business.

**Table 2 Company A’s GVN participation**

Profile	Generic	Government	Firm specific
Take the business international	Demand pull		Sought after for unique tooling expertise
Growth drivers	Commodity prices and commodity cycles		Investment in R&D, IP, and human capital
GVN participation enablers		Little support from the New Zealand Government Stronger support from Australia	Unique capabilities (IP, practices)
GVN participation threats	Loss of innovative design Aggressive competitors in appliance manufacturing People not replacing appliances as frequently Customer’s access to capital		

Source: Company A

### 4.1.3. Cost base

The major items in Company A’s New Zealand cost base are raw materials and labour costs. Recently, labour costs have increased due to Company A’s drive to increase human capital. Manufacturing capacity, including labour, is prone to inefficient utilisation because of the high degree of fluctuation in demand from Company A’s own customers.

Because of this, Company A has adopted two-way subcontracting to manage peaks and troughs between different businesses, and uses slack manufacturing capacity to produce equipment for international appliances manufacturers during quiet periods. Company A also produces standard products (Sample Testing Equipment) to flatten/smooth the cyclical demand curves.

Outside New Zealand, Company A incurs manufacturing, sales and service costs which are significantly smaller than its New Zealand costs. The largest item is manufacturing cost, but the vast bulk of Company A’s manufacturing activity takes place in New Zealand. The Australian manufacturing operation is relatively small, and the Chinese one is at present only used to manufacture one particular product. Company A also buys small quantities of standard products (robots, and 3D cameras) that would be included within the raw materials figure for New Zealand.

**Table 3 Company A's cost base**

Base	Firm	Goods	Services
New Zealand	Internal	Raw materials (63% of revenues) Human capital (33% of revenues)	Equipment Maintenance and Service
	External		2-way subcontracting
International	Internal	Australia – Manufacturing China – Manufacturing Italy – Sales and service Chile – Sales and service US/Ohio – Manufacturing, Sales and service US/Texas – Sales only	
	External	Robots, 3-D cameras	

Source: Company A

#### 4.1.4. Business model

Company A's business model is collaborative. Their goal is to develop niche products which address customers' specific needs. Company A utilises simultaneous engineering which enables them to develop the product on one side as is it being engineered on the other. As noted above, Company A makes use of every one of the revenue models identified by Osterwalder.

**Table 4 Company A's business model (adapted from Osterwalder)**

Pillar	Building block	Company A
Product	Value proposition	Understand client needs
Customer interface	Distribution channel	<b>Awareness</b> Maintaining relationships through human contact <b>Evaluation</b> Cross matrix on competitors' products Cost-benefit analysis <b>Purchase</b> Multiple purchase options <b>After-sale</b> Service, maintenance, warranty, upgrades, modifications
Financial aspects	Revenue model	All of them

Source: Company A

## 4.2. Company B

### 4.2.1. Profile

Company B has been producing digital visual effects for more than 10 years. Annual revenues exceed \$30m, and are all from the United States, its only market.

Company B is the smallest in their cohort of digital visual effects producers, but being based in New Zealand is no barrier for them, and they have no plans to move overseas.

The unit of production is the shot: digitally encoded and rendered content that runs for between 2 seconds and 1 minute. Company B contracts to supply a certain number of shots to their customers.

**Table 5 Company B's profile**

Profile	Overall	International	New Zealand
Revenue	\$ 30m +	100%	0%
Main sectors	Digital visual effects (100%)		NA
Growth rate	15% per annum for the past 7 years		

Source: Company B

## 4.2.2. GVN participation

### Organic growth drivers

Digital visual effects have become increasingly common in films, video games and online media, and the demand shows no sign of slackening.

### Growth drivers

Consumers are demanding increased realism and sophistication in their digital content. Company B is well placed to capture value from this trend because:

1. It has created proprietary IP which is superior to the industry standard
2. It has organised its production processes in such a way that rapid improvements in realism and sophistication are automatic. Company B believes that it is the only company that behaves in this way.

Because of this organisational emphasis on constantly improving quality, Company B does not wish to extend its scale beyond a certain level of organic growth. By remaining boutique and focused it believes its international reputation for outstanding quality, technical sophistication and constant innovation will be preserved and enhanced.

Company B often leads expectations in its sphere, that is, it is often able to show what its technology can do before the market has made any such demand.

### GVN participation enablers

The Government does offer incentive schemes (rebates) to have films produced in New Zealand. If the incentive scheme was removed, Company B may have to supply at a lower cost.

### GVN participation threats

Company B identified three principal risks:

- currency fluctuations
- a physical or natural disaster (Company B maintains its own ICT capability in an earthquake-prone zone of New Zealand; it could take months to recover from a shock of this sort)
- succession risk. The health of Company B's business is heavily dependent upon the Quality Gatekeeper, who is of particularly high repute throughout the

industry. If he were to leave, Company B may have to expend more effort in securing new contracts.

**Table 6 Company B’s GVN participation**

Profile	Generic	Government	Firm specific
Take the business international	Demand pull		Demand pull
Growth drivers	State of the art digital visual effects		Constant development of specific visual effects technologies
GVN participation enablers		Incentive schemes such as tax breaks	
GVN participation threats	New Zealand dollar skyrockets Physical or natural disaster Loss of a reputable employee		

Source: Company B

### 4.2.3. Cost base

Company B incurs all of its costs in New Zealand. Eighty percent of costs are labour related, 15% goes on the ICT system (mostly hardware), and 5% is property related overheads.

## 4.3. Company C

### 4.3.1. Profile

Company C provides solutions in the transport and logistics industries. Its particular expertise in hardware solutions, automation controls and smart in-house software solutions has driven Company C’s success as supplier of choice to industrial customers, airports, airlines, and freight companies around the world Australasia and around the world.

Company C employs over 300 staff at locations in New Zealand and 7 other countries. Company C was founded in the early 1990s and has always had an international presence. Company C generates annual revenue greater than \$50m which is almost all from overseas contracts. It has three main revenue streams: courier services, baggage handling services and automatic bag drop at airports.

Company C’s main markets are Australasia (70%) and Asia (10%). Markets in the Middle East and Africa are small but expanding. Company C experienced strong growth in recent years, but expects this to slow down in the next few years due to industry cycles in the airport industry. To address this shortfall, it is considering entering other airport-related markets such as warehousing.

**Table 7 Company C’s profile**

Profile	Overall	International	New Zealand
Revenue	\$ 50M +	99%	1%
Main sectors	Courier services (70%) Baggage handling services (25%) Self-service bag drop check in / aviation-courier (5%)		Not a major market - too small
Growth rate	>20% pa over last 4-5 years (slow down to 5% more recently)		

Source: Company C

## 4.3.2. GVN participation

### Take the business international

The main reason for Company C to take its business international was market and product diversification. Company C's initial market was Australia (99% of revenue in the early 2000s) and therefore Company C addressed the need for diversification by entering more international markets. At the same time, Company C was developing a courier services solution to offer alongside its leading baggage handling systems, so the 2000s were a time of solution diversification as well as geographic diversification.

### Growth drivers

The key generic growth driver for Company C at the moment is the rise of online shopping which generates substantial demand for courier and warehousing services.

Baggage handling activity is declining at present after a period of strong demand. However, this business is highly cyclical and lead times are very long, and Company C is engaged in the planning stage for the next, post-GFC set of projects. Demand from South East Asia is expected to be strong in the medium term, and demand increases are projected for both the United States and African markets a little further in the future.

The bag drop market is growing strongly from a low base (50% per annum). Warehousing is a new opportunity with potentially strong growth but is not a traditional market for Company C.

The key firm specific growth driver is opportunities in Asian markets. An Asian logistics company has recently taken a majority stake in Company C. This will provide access to capital to support faster global expansion, especially of the courier business.

Company C's success in capturing value from these growth drivers is crucially dependent on its engineering planning and design capability, which is located in New Zealand, and its market intelligence, which is located overseas.

### GVN participation enablers

Company C has benefited from a small number of Government-related growth enablers. Ambassadors or High Commissioners were useful sources of local contacts in target markets in the early stages of expansion, and the company has enjoyed a profitable relationship with Callaghan Innovation more recently.

Company C's key firm specific growth enabler is its increasingly global mindset, to encourage its people to engage internationally and diversify its business into different products and markets.

Its strategy is to project a widely respected internal culture that understands what drives the customer and be able to engage with different cultures around the world. To do so Company C encourages technical teams to travel with the marketing teams to understand different markets. Their approach is to take a client perspective and focus on how to work better with them.

Above all, Company C has taken pains to build relationships with its customers that are founded on a high degree of trust. The high degree of lock-in inherent in incorporating baggage handling or courier solutions in new airports is a risk factor for airports. It is very difficult to replace the company which designed and built an airport's baggage handling solution with another: the solutions are highly customised responses to individual circumstances, and the disruption occasioned by handing these functions over to another provider would be extremely difficult to justify in an industry which ultimately depends on high levels of throughput efficiently managed.

Company C’s competitors exploit these characteristics by imposing (and increasing) high charges for operational reporting and analytics. For Company C, these elements are free, and they make a significant contribution to sustaining a non-extractive relationship with the customer. Good news spreads, and Company C enjoys a high reputation for trust as a result.

### GVN participation threats

Company C’s key firm specific growth threat is its lack of commercial savviness and customer focus, which it perceives to be inherent in New Zealand culture.

New Zealand’s large pool of engineers is technically unimpeachable, and generally better than what is available from world markets, but more progress needs to be made in understanding what customers want and need, particularly in Asia. This is particularly important when dealing with an increasing number of clients and coordinating different contracts simultaneously. Generally, there is also a strong need to extend reach in terms of market knowledge and intelligence.

**Table 8 Company C’s GVN participation**

Profile	Generic	Government	Firm specific
Take the business international	Market and product diversification		Market and product diversification
Growth drivers	Baggage handling declining Bag drop market strong growth Warehousing new market Online shopping		Long term sustainability Market diversification Joint ventures
GVN participation enablers		Some support from Callaghan Innovation	Global mindset Commercial savviness Internal culture Client perspective
GVN participation threats	Knowledge – market intelligence Customer focus		

Source: Company C

### 4.3.3. Cost base

Company C carries out the design of the services it provides but subcontracts the manufacturing, largely to international manufacturers.

Company C’s cost base is approximately 40% labour (of which half is subcontracted) and 60% manufactured components, a large proportion of which it sources outside New Zealand. Aftersales operation and maintenance services have a very high labour content (80%).



**Table 9 Company C’s cost base**

Base	Firm	Goods	Services
New Zealand	Internal	<b>In house design</b> Labour (20%) Subcontract labour (20%) Hardware (60%) After sale services (high labour content on site, 80%)	NA
	External	Manufacturing subcontracted outside New Zealand >85%	NA
International	Internal	Intellectual property in New Zealand	NA
	External	Manufacturing subcontracted outside New Zealand >85%	NA

Source: Company C

Company C’s business model, particularly its selling strategy, relies largely on trust in long term relationships, particularly with consultants that provide integrated solutions for airports and for which Company C provides a part of the solution to the full integrated system. Generally Company C’s strategy is to rely as little as possible on open tenders.

Company C does not provide free services extensively in order to win contracts but its aftersales business strengthens its links with clients and is a potential growth area for the business, particularly around data analytics.

**Table 10 Company C’s business model**

Pillar	Building block	Company C
Product	Value proposition	Understand client needs
Customer interface	Distribution channel	<b>Awareness</b> Contract sale (through consultants based in Europe and North America) <b>Evaluation</b> Evaluation process is an iterative process between Company C and the client <b>Purchase</b> Trust and confidence built over time Baggage: Proof of concept in self-service (Avoid open tendering services) Courier: Contract negotiation <b>After-sale</b> Intensive effort in after-sales. Use to upscale or cross sell

Source: Company C

## 4.4. Discussion

Although the three case study firms are active in very different market segments, they exhibit a number of common features.

### Differentiation focus strategies

In his influential book, *Competitive Strategy* (Porter, 1980) Michael Porter identified three generic strategies: cost leadership, differentiation, and focus, and demonstrated that a company’s internal resources were most efficiently used when only one strategy was pursued.

The focus strategy is interesting in that it is, in a sense, a hybrid of the cost leadership and differentiation strategies. A firm pursuing a focus strategy limits its competitive scope to a few market segments. If its strategic objective is to offer a lower cost within its competitive scope, it is pursuing a cost focus strategy, if its objective is to compete within its competitive scope on attributes other than price, it is pursuing a differentiation focus strategy.

All of the case firms are pursuing differentiation focus strategies.

- Company A limits its competitive scope to highly-specific segments where it can link its value capture directly to its imperfectly imitable or non-substitutable capability (see next chapter), but within that scope it differentiates strongly by creating highly customised systems for large customers and highly specialised systems for smaller customers.
- Company B follows a similar strategy, but organises its internal process in such a way that it can differentiate itself from competitors through high and constantly improving quality, aligned closely to customer desired value as it changes.
- Company C differentiates within its competitive scope by progressively entering new markets segments consumed by essentially the same customer group.

These considerations prompt the question: why are pure cost leadership or pure product differentiation strategies not pursued by these firms? We have not carried out the analysis which provides evidence in support of answers to this question, but we can venture some tentative suggestions.

Pure cost leadership is unlikely to be a sound strategy for the delivery of physical products to international markets unless the products are outputs of an industry where the scale is sufficiently efficient to offset the extra costs incurred by New Zealand's relative distance from international production networks. If a New Zealand firm is not delivering a non-substitutable or imperfectly imitable element to the network, it needs a substantial scale economy to offset the disadvantages of distance.

The same argument counts against pure differentiation as a strategy for New Zealand firms – physical product still needs to be delivered to global customers – but scope economies would need to be considered as well to offset the disadvantage of not being near large concentrations of potential customers. However, information technology has been closing this particular gap for the last few decades, and it may be that pure differentiation is becoming a realistic strategy for New Zealand firms at efficient scale. Against this background, the differentiation focus we observed in the New Zealand case study firms makes good sense, and could be achieved by more New Zealand firms.

### Low level of participation in domestic markets

None of the case study firms have any substantial market presence in New Zealand, nor did they devote much internal energy to building market share in New Zealand. The New Zealand market was felt to be a tough market, characterised by high levels of incumbency and low competitive pressure. Thin established markets at home make thicker more dynamic markets abroad look more attractive.

### The Rutherford effect

Despite a limited market presence in New Zealand, all three firms were adamant that their important human capital – intellectual grunt, inventive capacity – would continue to be located in New Zealand. Reasons given centred upon New Zealanders' innate capacity as problem solvers and trouble-shooters. It is difficult to resist calling to mind Ernest Rutherford's remark

*“We haven’t the money, so we have to think.”*

New Zealanders, it seems, have a particular aptitude for thinking, for solving by experiment, an aptitude which transcends any technical limitation or want of commercial acumen. Again, we resort to Rutherford’s words:

*“We are rather like children, who must take a watch to pieces to see how it works.”*



Is the Rutherford effect the same as the number 8 fencing wire mentality of song and story? The number 8 mentality is usually used to describe the ability to mend or make things using whatever scrap material is at hand. The things made or mended are usually makeshifts, substitutes for spare parts or replacements which, thanks to New Zealand’s geographical isolation, are not readily available.

Many nations try to identify something distinctive in the national psyche by such phases, whether they be canny Scots, Aussie battlers or *lagom* Swedes; and American know-how couldn’t be more different from French *savoir faire*. Frontier communities throughout human history have had to make the best of what they had, but New Zealand is the one that has chosen to describe itself in this particular way. This one is ours.

The Rutherford effect runs deeper than the number 8 wire mentality. It refers to a natural disposition for trouble-shooting and problem solving which can find expression in the number 8 mentality (and often does), but may find other means of expression as well. The number 8 mentality reacts to a lack of something by producing makeshifts, temporary fixes that will only serve until something better (‘a real one’) comes along. None of the companies studied are interested in makeshifts or temporary fixes, instead they rely on the Rutherford effect to deliver sustained innovation capable of

leading markets and customers. This function is essentially creative, not reactive. New Zealand may have reason to be grateful to number 9 wire for the patches, ties and bodes necessitated by its isolated past, but number 8 wire does not appear to have been a productive raw material for sustained innovation.

The Rutherford effect, then, is an attempt to describe the fundamental capacity on which the number 8 wire mentality depends. It is not a purely reactive capacity, but an inherently creative capacity to troubleshoot, solve problems, and take watches apart to see how they work. Companies that succeed in aligning the Rutherford effect to customer value dynamics and project it into the value networks through value streams are likely to succeed.

### Lack of government-funded research and development

New Zealand Government funding for research and development (R&D) does not play a significant role for any of the case study firms. Their internal R&D capability is focused on continuing to extract value from changing customer value dynamics (iterative innovation).

## 5. Resource-based view of the firm

This study uses the resource-based view (RBV) of the firm to examine the case study companies. We have adopted this approach as the RBV starts from the assumption that it is the resources at the firm's disposal which determine its sustainable competitive advantage.

We have observed earlier in this report that sustainable competitive advantage is derived from the firm's ability to continually capture customer value as it evolves. Under the RBV, this ability is conferred by the specific nature and configuration of the firm's resources, and by the closest possible integration of the firm's resources with the customer's value dynamics.

For these reasons, and in particular because combining the RBV with the understanding of value creation outlined above can shed light on the innovation cycle, the RBV is the most fruitful analytical construct for examining the participation of New Zealand firms in global value networks.

Rumelt (1984) gives a useful working definition of the firm under the resource-based view. According to Rumelt a firm is:

*“a bundle of unique resources and relationships. The task of general management is to adjust and renew these resources and relationships as time, competition and change erode their value.”*

The firm enjoys a competitive advantage to the extent that its resources cannot easily be substituted for by other market participants. Each firm has a unique resource profile; if they did not, there would be no relative competitive advantage.<sup>1</sup>

### 5.1. Resources and capabilities

The RBV literature exhibits a certain looseness of terminology. “Resources” are often used interchangeable with “capabilities” and the reader will already have observed the tangle of “relationships” and “resources” in the quote from Rumelt above.

In this study, we have rebuilt the Tower of Babel by adopting the suggestion of Amit and Schoemaker (1993), which has been accepted by much of the subsequent literature. Amit and Schoemaker suggest that resources are tradable and not-specific to the firm, whereas capabilities denote the firm specific practices of combining, adjusting, renewing, relinquishing and transferring knowledge between resources in response to changing customer value dynamics. Under this view:

*“...capabilities can be viewed as bundles of tangible and intangible assets, including a firm's management skills, its organizational processes and routines, and the information and knowledge it controls.”* (Barney et al, 2001)

In this report, we therefore examine the role of capabilities in capturing value, and how these capabilities are configured through the value streams which together make up the value network. This type of analysis is somewhat different from forms of

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<sup>1</sup> Bowman and Ambrosnin (2000) found that firms with similar resources produce identical products and tend towards perfect competition.

organisational analysis which stress the roles of revenue-generating assets in creating value, nonetheless it is well suited to the rapidly changing and dynamic world of knowledge intensive manufacturing and to the services sector generally.<sup>2</sup>

When carrying out this type of analysis it is not usually necessary to examine every capability within a network. It is preferable to focus on key capabilities, in particular the so-called dynamic capabilities which have the greatest potential to affect value-capture in dynamic markets.

### 5.1.1. Capabilities and competitive advantage

Not all dynamic capabilities have the same potential for creating sustainable competitive advantage. Barney (1991) has proposed a useful taxonomy for assessing the potential within capabilities for creating sustainable competitive advantage. Barney's<sup>3</sup> four categories are shown in Table 11.

**Table 11 VRIN capabilities**

Capability (VRIN)	Description
Valuable (V)	Corrects for an internal weakness or confers ability to outperform rivals
Rare (R)	Access to the capability is restricted
Imperfectly imitable (I)	Competitors are not able to replicate the capability easily. Very often imperfectly imitable capabilities derive from information asymmetries within the network. Knowledge- or relationship-based resources are often imperfectly imitable
Non-substitutable (N)	No other capability is capable of a strategically equivalent outcome. The goose that lays the golden eggs.

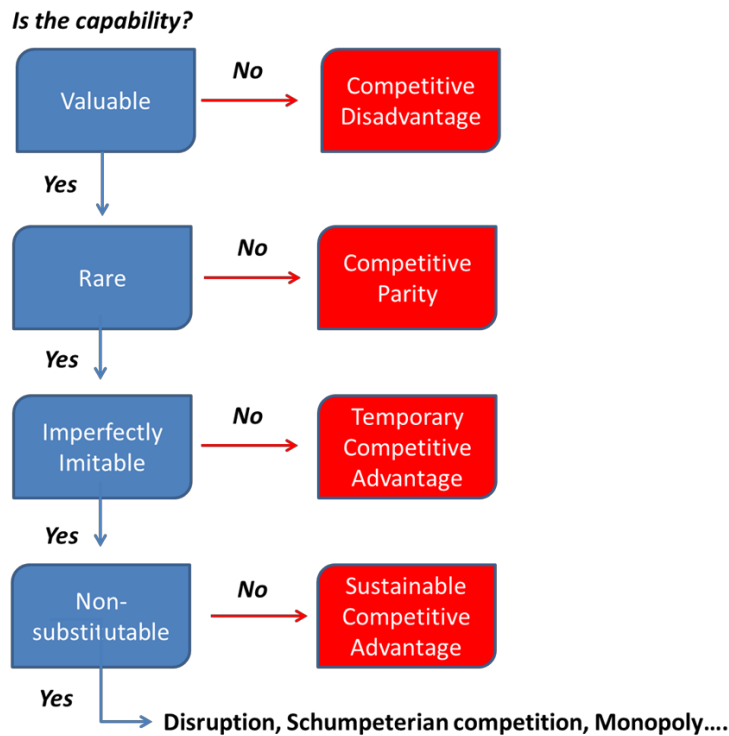
Source: NZIER

The VRIN characteristics determine the firm's competitive position within the network as follows.

<sup>2</sup> Some researchers (for example Ludwig and Pemberton(2011) draw a distinction between the resource-based view and the dynamic-capabilities in that the former addresses competitive advantage while the latter addresses competitive survival. We acknowledge that the distinction may have some validity for firms in traditional markets, but both knowledge-intensive services and high-technology businesses are high-velocity markets, perhaps even increasing-velocity markets, in which competition is often Schumpeterian. This being the case, we have assumed coherence between the resource-based view and the dynamic-capabilities view, and that competing and surviving resolve to the same imperative for New Zealand firms participating in global value networks .

<sup>3</sup> Barney later (2010) replaced the N (Non-substitutable) capability with O (Organised to capture value). Adopting this revision would introduce a tautology into our analysis, so we stick with VRIN in this study.

**Figure 2 VRIN characteristics**



Source: NZIER

The capabilities are cumulative in nature: the potential for sustainable competitive advantage increases as one progresses from valuable to non-substitutable. If the fortunate possessors of non-substitutable capabilities are able to align these capabilities to customer-desired value they have the potential to introduce disruptive innovation to markets or indeed to create new markets in which the winner takes all.

This is an important consideration when we reflect the innovation process through the prism of the resource-based view.

### 5.1.2. Capabilities and innovation

Under the resource-based view, innovation is typically at the level of the business concept. The process is essentially agonistic: business concept innovations create competing alternatives to the existing business concept and, by extension to the existing business model (Hamel 2002). It follows that business concept innovation is the essential tool for adapting the current business model to changing market conditions and changes in the customer's perceived value.

More ink than light has been shed on the innovation process by the literature, which bristles with conflicting analytical concepts and inconsistent nomenclature for describing the concepts. In this study, we have adopted the typology of Garcia and Calantone (2002) who, following a comprehensive review of the innovation, positioned innovations along two axes: radical and incremental, and open (collaborative) and closed.

Despite the emphasis placed upon radical innovation in popular discourse – everyone wants to be the next Facebook – incremental innovation is in most cases a sounder strategy. Supply may precede demand, but it does not necessarily stimulate demand in new markets, and so radical innovation is inherent risky.

By contrast, incremental innovation is essentially the constant reconfiguration of business concepts which are already known to capture value and to better align them to the customer's desired value as it changes. The iterative nature of the process provides a vital feedback loop that ensures that the firm's resources and the customer value dynamics remain in close alignment, and can itself lead to radical innovation.

The best companies recognise this by organising themselves so that their key capabilities – in particular those at the IN end of the VRIN continuum – are as closely connected with the customers' value dynamics as possible by ensuring that the individual transactions between the firm's capabilities and the customers are as iterative as can be arranged.

Value capture is most efficiently managed when transactions effectively enfold the customer's value perception within the capabilities of the firm: that is to say, the innovation cycle consists of a series of iterated transaction between customer and the firm's capabilities.

This understanding differs somewhat from the more traditional view of innovation: that it depends on investment in research and development, often conceptualised as a discrete function or a separate department within a firm, which produces specific outputs which then need to be commercialised in the hope of finding a market.

Using the resource-based view, innovation is an inherent property of the system, a feature of the competitive landscape and an objective around which firm's resources can be organised to maximise the potential for value capture.

Value networks are essentially systems in which the customer's perceived value is not created by a single actor, so transactions between actors, in particular information shared between organisations can also give rise to open (collaborative) innovation.

## 5.2. Dynamic capabilities framework for high technology businesses and knowledge intensive services

In this study, we have adopted the dynamic capabilities framework developed for the ICT sector by Mikko Pynnönen in a series of publications (Pynnönen 2008). Pynnönen classifies the resources of ICT firms into seven capabilities:

- Software development capabilities
- Service capabilities
- Technological capabilities (including manufacturing capability)
- Information
- ICT systems and technologies
- Immaterial assets<sup>4</sup>
- Contracts and partnerships.

The dynamic capabilities of the case study firms are set out in the Tables 13 to 15.

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<sup>4</sup> Immaterial assets are often called intangible assets in the literature. We have followed Pynnönen's usage as the term 'intangible assets' has been used to cover a very wide field of reference, from all capabilities to clusters of capabilities such as software development capabilities combined with ICT systems. Pynnönen's definition is the most narrowly focused, so it is his usage we have adopted in this study.



## 5.3. Dynamic capabilities: Company A

**Table 12 Dynamic capabilities: Company A**

Category	Capability	VRIN	Description	Notes
<i>Software development capabilities</i>				
	Vision and imaging analytics	I	Internally developed code	Mostly based in New Zealand, some in Australia, limited in USA Maintaining skill base is a challenge
	Machine control code	V	Bought from market	
<i>Service capabilities</i>				
	Warranty	I	Contractual	
	Maintenance	V	Contractual	
	Preventative maintenance	I	Uses remote analytics	
	Breakdown maintenance	I	Includes component replacement	
	Upgrades	V	Includes consumables	
	Cross sale	V	In QDC Value Stream*	
	Design	R	In QDC Value Stream*	
	Proof of concept	V/R	In QDC Value Stream*	V for mining, R for meat processing
<i>Technological capabilities</i>				
	Robotic visioning and advanced sensing	I	Integrating robots and cameras bought from market with internal visioning and analytics code	Identified by respondent as a key technology New Zealand capability, although robots and cameras come from Germany and Switzerland
	Manufacturing and assembly capability	V	Decision to manufacture internally or outsource depends on transaction costs and capacity	Mostly New Zealand, some Australia, scaling up in China Subcontractors international
	Design capability	V	Independent of QDC*	
<i>Information</i>				
	Designs and concepts	V/R	Company's library of designs and concepts	R for Company A's own products
	Customers and customers products	V	Industry, customer and product knowledge	
	Factory information	I	Industrial automation design to fit specific factories	
	Product information	I	Own product knowledge	
	Process information	I	Knowledge of customer processes	
	Process monitoring	I	Monitoring of customer processes	
<i>ICT systems and technologies</i>				

Category	Capability	VRIN	Description	Notes
	No dynamic capability		Firm has same supporting ICT as rest of industry	
<i>Immaterial assets</i>				
	Experience of applying technology to industrial processes	R		
	Know-how (no formal IP)	R	Kiwi ingenuity plus experience	
	Reputation	V		
	Patents on x-ray technologies	N	Important for meat processing automation	Key driver of success
	Patents on robotic milking technology	N		Key driver of success
	IP on crushing technology (for mining)	I	This pulverising/crushing is now often required by labs/mining companies	Patent has recently expired, IP is now a trademark
<i>Contracts and partnerships</i>				
	Customer relationships (main)	V	Trend identification, idea verification	Ensures company's products fulfil real, not perceived, needs
	Australia industry association	I	Aggregated sector information	
	Suppliers	V	Critical relationships: 3D camera and robot suppliers	
	Relationship with industry experts/consultants	I	Mineral testing standards are usually generally accepted rather than official	There a few (roughly 6) industry experts/consults who advise mining companies and labs on standards, which are then generally accepted and applied

\*QDC = Quoting, Designing, Consulting

Source: NZIER

Company A's IN capabilities are widely spread, perhaps reflecting the many years it has been in business, but many are connected with its proprietary IP in x-ray technology, robotic milking and pulverising. Others are linked to its design and manufacture of large industrial automation systems, which are custom-built for a specific process in a specific location for a specific customer.

In these circumstances it is not surprising that it should enjoy an advantage in the after-care for these systems (maintenance and information capabilities). Company A's partnerships with industry associations and consultants are also noteworthy: when we examine the value network maps for the company we shall see that these play a particularly important role in sustaining Company A's position within its value network.

## Intellectual property

Company A patents or trademarks its IP in New Zealand, and then in Australia, the United States, Chile, Canada, the United Kingdom, and Europe or wherever the markets are for its products. Sometimes Company A elects not to patent if it feels they could lose by disclosing too early.

The patent on Company A's sample testing equipment has now expired, but during the time the patent was enforce the name of the technology patented became the normal way of referring to this particular type of equipment within the industry. Company A has therefore registered that name as a trademark in the markets in which it sells these products.

## 5.4. Dynamic capabilities: Company B

**Table 13 Dynamic capabilities: Company B**

Category	Capability	VRIN	Description	Notes
<i>Software development capabilities</i>				
	Digital visual effects code	V	Internally developed code	Internal talent, but all based in New Zealand
	Performance capture code	V	Internally developed code	Internal talent, but all based in New Zealand
<i>Service capabilities</i>				
	Location-based consultancy	V	People observing filming before digital visual effects are produced	
<i>Technological capabilities</i>				
	Digital effects	V	Integration of visual effects code with footage	Uses company's internal code rather than code available from market
	Performance capture	I	Sensing and coding an actor's performance	Uses company's internal code rather than code available from market
	Action capture	I	Sensing and coding an actors movements	Uses company's internal code rather than code available from market
	Logistics	V	Production planning	
<i>Information</i>				
	Nothing significant			
<i>ICT Systems and Technologies</i>				
	Render farm	I	Large collection of servers capable of running a large number of processes simultaneously	In New Zealand Similar to a data centre or server farm but designed for digital rendering
<i>Immaterial assets</i>				
	Brand	V		Downside: perception that company is attached to only a few industry participants
	Reputation	V	Known to be specialised and experienced	

Category	Capability	VRIN	Description	Notes
	Intellectual Property	I	Company's unique code (NB this is the code itself, not the capability to develop it)	Unpatented. Competing code is available from the market
	Cultural practice of constant improvement	R	Shots are iterated until either time or budget is exhausted	This is not standard industry practice
	Quality	I	Linked to above Quality is the imperative	Privately owned, does not have to focus on profit at expense of quality
	Kiwiness	N	Anchoring factor	Distance is often a barrier for recruits until they actually visit New Zealand and experience the campus atmosphere
<i>Contracts and partnerships</i>				
	Personal relationships between executives	R	Executive interaction is restricted to a very small group	Overcomes the tyranny of distance
	One technical relationship	R	Technical director of enormous reputation who controls quality	Could be I, but could be replaced, or quality could be industrialised, hence R.

Source: NZIER

Company B exhibits a set of IN capabilities that is both more restricted in range and more concentrated than Company A's. Immaterial assets are particularly important. The company uses the 'dailies'<sup>5</sup> system to ensure that a very high standard of quality is maintained and regularly exceeded, and the Kiwiness of the organisation ensures low staff churn which supports the culture of constant improvement.

It has its own processing capacity on site (the Render farm) underpinning its ability to iterate shots until the required quality is exceeded. The company has also evolved technological capabilities – motion and performance capture – which are difficult for competitors to imitate. It has its own IP which is not protected by patent or licence and is therefore in effect a business secret.

<sup>5</sup> The latest versions of the shots are bundled together and sent to the director at the end of each day (New Zealand time). These bundles are called 'dailies'. The director reviews the dailies overnight and sends them back to New Zealand in time for the next day's coding and rendering in New Zealand.

## 5.5. Dynamic capabilities: Company C

**Table 14 Dynamic capabilities: Company C**

Category	Capability	VRIN	Description	Notes
<i>Software development capabilities</i>				
	Code development	V	Ability to code	
<i>Service capabilities</i>				
	Solution experience	I	Rival companies lack the experience of developing the system, are ill placed to deliver service	
<i>Technological capabilities</i>				
	Manufacturing	V	Manufacture of system elements	Outsourced
	Assembly/integration	V	Final assembly and integration	In-house
<i>Information</i>				
	Analytics	I	Analytic capability integrated into solution design	Enables client to be more efficient
<i>ICT Systems and technologies</i>				
	Data management	V		
	ICT infrastructure	V	Clients data is managed on company's infrastructure	An important way of becoming entrenched with clients
<i>Immaterial assets</i>				
	Knowledge of individual offshore markets	R		
	Knowledge of individual offshore clients	N		
	Trust	N	Reputation, brand	
	Kiwiness of company's people	R	Innate engineering, problem solving and trouble-shooting capability	An innate property of New Zealanders
	Innovative IP	N	Technical skills to respond quickly to changing customer requirements	A technical skill of the workforce based in New Zealand
<i>Contracts and partnerships</i>				
	Partnership with materials handling company	R	Capital injection, increases potential sales channels	Japan
	Suppliers	V	Suppliers of system elements	Global
	IT companies	V	Extends reach	Global, important in the self service area
	Clients	R	Relationship is essentially collaborative	Global

Source: NZIER

Company C shows the smallest set of dynamic capabilities, most of which fall within the immaterial assets category. Company C resembles Company A in that a degree of customer lock-in is inherent within its value proposition. In Company C's case, we see this reflected in the importance of its solution experience and information capabilities.

Company C resembles Company B in that it has not sought legal protection for its IP, which is in effect a business secret.

## 5.6. Common Success Factors

All of the case study firms have imperfectly imitable or non-substitutable capability in the immaterial assets category, indeed the CEOs interviewed often referred to immaterial assets as the fundamental source of the market success of their companies.

Within the immaterial assets category all three firms had imperfectly imitable or non-substitutable capability embodied intellectual property. However, the only company which patents or trademarks its IP is company A.

The other dynamic capabilities that are common across the firms are linked to the focus strategies pursued by the firms. All three firms focus their important value streams on portions of the value network which are characterised by a high degree of customer lock-in. This occurs because of the highly specialised nature of the products involved (sample testing equipment), the risk characteristics of the transaction itself (bespoke industrial automation systems and baggage handling-systems in airports are both large capital items with long paybacks) or because the value streams are targeted at an oligopsonistic segment of the market (Company B).

In these circumstances, it is not surprising that firms should organise the transactions which embed customer lock-in into imperfectly imitable or non-substitutable capabilities.

The two HTB companies (A and C) use these lock-in related capabilities to provide after-sales service. This increases the touchpoints with the customer and creates on-sell and up-sell opportunities. The two HTB companies are also united in the importance of information capabilities to their business. Information capabilities are used to make customers stickier and to provide the feedstock for internal innovation.

## 6. Value networks

### 6.1. Introduction

We now examine how the case study firms participate in global value networks. To do this we have set out for each of the case study firms:

1. A table of the value proposition of the firm. The value proposition of the firm is the sum of all the value streams within the firms, which we have classified as paid products, paid services, paid information, free products, free services and free information.
2. A table which associates the I and N (imperfectly imitable and non-substitutable) dynamic capabilities identified in the previous chapter of the study with the value streams which embody these capabilities and enable them to transact with the value network.
3. A table which identifies the actors within the network and identifies the case study firm's value streams with which they transact. This study has produced several instances of organisations transacting in several different ways with the case study firm and therefore, they are standing in several different actor-relationships with them. For example, we have instances of an associate body also functioning as a consumer and investor in the case study firm.
4. Value network maps which set out the main features of the value networks, the actors involved and how the case study firm transacts with the actors in the network through the value proposition. We have not attempted to set out every transaction that takes place in the value networks, merely the most significant and those which are most illustrative of how the case study firm is engaged with their value networks, as identified by the respondents themselves.

### 6.2. Company A

#### 6.2.1. Customer value

In this study, we have examined three of Company A's constituent businesses: Industrial Automation Systems, Sample Testing Systems, and Appliances. The superconducting magnet business accounts for somewhat less than 5% of the revenues of the company and so has been disregarded. The value dynamics, and therefore the value networks for each of these businesses are quite distinct, so we have produced three different maps, one for each.

In general terms, the desired value addressed by Company A is the application of technology to industrial processes. Customers receive this value through the high-performing and reliable systems and equipment designed and assembled by Company A, together with the associated service and maintenance processes, information flows and the interaction with Company A's experts.

Future desired value for the different value networks are described below, but generic dynamics are unsurprisingly focused around continuous improvements in performance, reliability, analytics, functionality and operating costs.

The innovation path identified by Company A in response to these pressures centres upon:

- more flexible manufacturing and assembly processes – moving from large production lines producing near-complete assemblies to small production cells producing modules capable of reconfiguration within larger assemblies
- the use of soft-tooling for prototype and spare parts<sup>6</sup>
- increasing use of analytics and information flows. Not all of these streams are monetised at the moment, but this may change in the future.

## Industrial Automation Systems

The customer desired value for Industrial Automation Systems is the application of technology to the customer's unique processes and physical setting. Each customer needs a system that works uniquely for them, and differences in factory size, configuration and processes mean that Industrial Automation Systems are not always easily transferred between customers, or even between different sites operated by the same customer.

Company A does also produce more standard pieces of industrial robotic equipment suitable for smaller customers or lower throughput, but its value streams are organised to target the larger customers, for whom purchasing a large industrial automation system is a significant capital item with strong lock-in characteristics.

The future desired value is centred around increasing the degree, scope and sophistication of automation within the systems, allowing customers to replace labour with capital and improve the efficiency and effectiveness of industrial processes. There is also a growing desire for greater flexibility within the automation systems, for example through the use of reprogrammable robots.

The customer's received value is through the manufactured equipment which automates as much of a given process as possible, and which incorporates technology which optimises the process in some significant way. A good example is Company A's meat processing equipment which uses x-ray technology to direct cutting blades so that the barest minimum of saleable meat is wasted in the process. The important associated value streams are the front-end QDC services which optimises the system for its circumstances, and various maintenance, analytic and information streams.

## Sample Testing Systems

Sample Testing Systems have demanding customers: mining companies, and laboratories which service the mining industry. These organisations need the sample testing process to yield data that are consistent, reliable and of high quality. This desired value is stable and the future desired value trajectory is centred around the generic features, such as performance, reliability, analytics, functionality and operating cost.

The customer's received value is a type of machine that may be described as a crusher or a pulveriser, which crushes the sample material in such a way that tests run on the samples have a particularly high level of accuracy, consistency and reliability.

The technology Company A uses to achieve these results was developed internally, is generally acknowledged to be world-leading, and was protected by a patent that has recently expired. The reputation of this technology is such that Company A has addressed the risk caused by the expiry of the patent by leveraging the technology into a specific brand under which it sells these machines.

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<sup>6</sup> Soft-tooling is the use of silicone or urethane moulds to produce parts or prototypes, as distinct from hard-tooling (injection moulding) which uses steel or aluminium. Silicone moulds wear out much sooner and the pieces take longer to cure, but they are much more economical, and are therefore suitable for lower quantities.



The most common use of these machines is to prepare samples for gold content analysis.

## Appliance Manufacturing

Company A also contracts with large international appliance manufacturers to supply equipment used to manufacture appliances and components for appliances. The value dynamics in this value network are quite different to those for industrial automation or sample testing. For international appliance manufacturers low-cost supply trumps performance or reliability. At least one of Company A's regular customers holds reverse auctions for suppliers.

The future desired value is for lower-cost supply. This is especially challenging for Company A which otherwise addresses customers who value Company A's high-performance high-quality capabilities.

The choice facing Company A is to adapt its manufacturing and assembling capability to fit the requirements of a commoditised segment of the market during the periods in which its internal manufacturing and assembly capacity is not employed in addressing the more exacting needs of its industrial automation and sample preparation customers, or to withdraw from the appliance manufacturing market.

### 6.2.2. Value proposition and value streams

Company A's value proposition is composed of the following value streams.

**Table 15 Company A: Value proposition**

Category		Value stream	Notes
1. Products	1.0	Meat processing systems	(Including separable standard products such as boning units)
	1.1	Robotic milking systems	
	1.2	Other industrial automation systems	Large capital items
	1.3	Manufactured components	Mix of in- and out-sourcing
	1.4	Industrial robots	E.g. Robotic welding units
	1.5	Crushers/pulverisers	
	1.6	Spare parts	
	1.7	Consumables	
	1.8	Appliances manufacturing systems	
	1.9	Magnets	
	1.10	Prototypes (paid)	
	1.11	Robots	Bought from market
	1.12	3D cameras	Bought from market
	1.13	Electrical supplies	Bought from market
	1.14	Engineering supplies	Bought from market
1.15	Dairy equipment supplies	Bought from market	
	2.0	Routine maintenance	
2. Services	2.1	Breakdown maintenance	

Category		Value stream	Notes
	3.0	Customer desired value information and funding	
3. Monetised information	3.1	Visioning technology	
	4.0	Prototypes (free)	Prototypes are usually free goods, but sometimes may be recovered within contract price
4. Free products	5.0	QDC (quoting, designing, consulting)	High-touch customer interaction. Scope concept and design of large capital items
5. Free services	5.1	Maintenance servicing	
	6.0	Process analytics	
6. Free information	6.1	Dynamic process feedback	Having the process responding in real time to analytics
	6.2	Remote control and diagnostics	
	6.3	Access to networks	
	6.4	Testing standards	
	6.5	Russian testing standards – general	
	6.6	Russian testing standards for gold	
	6.7	Endorsements	

Source: NZIER

The Company A respondent saw monetising some of the free information value streams (i.e. moving them from category 6 to category 3) as a key future development.

### 6.2.3. Use of dynamic capabilities in value streams

The two capabilities most important for sustaining competitive advantage, and therefore in explaining sustained participation in value networks are I and N (imperfectly imitable and non-substitutable). We therefore asked our respondents to map these capabilities to the value streams in which they are used.

**Table 16 Company A: Use of dynamic capabilities in value streams**

Category	Capability	V/I	1. Products	2. Services	3. Monetised information	4. Free products	5. Free services	6. Free information
<b>Software development</b>	Visioning and imaging analytics	I	1.2 Other industrial automation systems 1.4 Industrial robots 1.11 Prototypes 1.1 Robotic milking systems 1.5 Crushers/pulverisers		3.1 Visioning technology 1.5 Crushers/pulverisers	4.0 Prototypes	5.0 QDC	
<b>Service</b>	Warranty	I	1.0 Meat processing systems 1.1 Robotic milking systems 1.5 Crushers/pulverisers					
	Preventative maintenance	I	1.0 Meat processing systems 1.1 Robotic milking systems	2.0 Routine Maintenance	3.0 Customer desired information and funding			
	Breakdown maintenance	I	1.0 Meat processing systems 1.1 Robotic milking systems	2.1 Breakdown Maintenance	3.0 Customer desired information and funding			
<b>Technological</b>	Robotic visioning and advanced sensing	I	1.2 Other industrial automation systems 1.4 Industrial robots				5.0 QDC	
	Factory information	I					5.0 QDC	
	Product information	I	1.0 Meat processing system 1.1 Robotic milking systems 1.2 Other industrial automation systems 1.4 Industrial robots 1.5 Crushers/pulverisers				5.0 QDC	
	Process information	I	1.0 Meat processing systems				5.0 QDC	6.0 Process analytics

Category	Capability	V/I	1. Products	2. Services	3. Monetised information	4. Free products	5. Free services	6. Free information
			1.1 Robotic Milking Systems					
	Process monitoring	I	1.0 Meat processing systems 1.1 Robotic milking systems		3.0 Customer Desired Information and Funding		5.0 QDC	6.0 Process analytics
<b>Immaterial assets</b>	Patents on x-ray technologies	N	1.0 Meat processing systems 1.1 Robotic milking systems 4.0 Prototypes 1.5 Crushers/ pulverisers		3.0 Visioning Technology	4.0 Prototypes		
	Patents on robotic milking technologies	N	1.5 Robotic milking systems 4.0 Prototypes			4.0 Prototypes		
	IP on crushing/ pulverising technology	I	1.5 Crushers/ pulverisers					
<b>Contracts &amp; partnerships</b>	Australian industry bodies	I	1.0 Meat processing systems					6.3 Access to networks
	Relationships with industry experts	I	1.5 Crushers/pulverisers					6.4 Testing standards 6.7 Endorsements

Source: NZIER

Company A's dynamic capabilities are heavily concentrated in its paid product stream and one free service: QDC. The QDC service is a high-touch service which co-designs industrial automation systems with customers. As such it embodies the transactions which funnel information about customer value dynamics into Company A. For customers the QDC process represents a low-risk introduction to a high-risk investment, as it is in most cases a free service. Company A usually provides prototypes for free as well, and takes pains to ensure that the prototypes embody at least the imperfectly imitable vision and analytic capability, and ideally the non-substitutable x-ray or robotic milking IP. From the perspective of Company A, the QDC system provides the large number of touchpoints and highly iterative transactions which are important to maintaining Company A's presence in international networks. These features are reinforced by Company A's post-sale processes (maintenance, spare parts, consumables) which sustain the relationships developed by the QDC service, keep Company A abreast of value dynamics within the network, drive innovation and provide on-sell and up-sell opportunities.

## 6.2.4. Company A: Value network actor identification

**Table 17 Company A: Value network actor identification**

Actor roles	Title	Where?	Description	Main value streams affected
<b>Main actor</b>	Company A	NZ, Australia, USA, China, Europe, South America	The focal firm in the analysis. Particularly important are internal manufacturing/assembly and development investment functions	All
<b>Associates</b>	Indirect sales channels (Offshore)	International, Russia particularly important	Indirect sales channels are conduit both for product and information	1.5 Crushers/pulverisers 6.4 Testing standards
	Industry associations	Australia	Aggregate customer desired value information and fund product development	3.0 Customer desired value information and funding
	Joint venture partners	NZ and Australia	Collaborate on visioning technology	3.1 Visioning technology
<b>Consumers</b>	Appliance manufacturers	International	Award contracts	1.8 Appliances
	Dairy farmers	NZ and overseas		1.1 Robotic milking systems 4.0 Prototypes
	Dairy processors	NZ and overseas		1.1 Robotic milking systems 4.0 Prototypes
	Laboratories	International	Smaller laboratories deal with Company A via indirect sales; larger deal direct	6.5 Crushers/pulverisers 1.6 Spare parts 1.7 Consumables
	Large-scale meat processors	Developed nations throughout the world	High level of interaction through QDC value stream and post-sale maintenance	5.0 QDC 1.0 Meat processing systems 4.0 Prototypes 5.1 Maintenance servicing 2.0 Routine maintenance
	Manufacturers	International	High level of interaction through QDC value stream and post-sale maintenance	5.0 QDC 1.2 Other industrial automation systems 1.4 Industrial robots 4.0 Prototypes

Actor roles	Title	Where?	Description	Main value streams affected
				5.1 Maintenance servicing 2.0 Routine maintenance
	Mining companies	International , Russia particularly important	Smaller mining companies deal with Company via indirect sales; larger deal direct	6.5 Crushers/pulverisers 1.6 Spare parts 1.7 Consumables
<b>Independents</b>	Consultants/experts	International	A few individuals who interact who set generally accepted testing standards	1.5 Crushers/pulverisers 6.4 Testing standards 6.7 Endorsements
<b>Suppliers</b>	3D camera suppliers	Switzerland		1.0 Meat processing systems 1.1 Robotic milking systems 1.2 Other industrial automation systems 3.0 Visioning technology
	Dairy equipment manufacturers	NZ, International		1.1 Robotic milking systems
	Electrical component manufacturers	NZ, International		All manufactured items, including appliances
	Engineering component manufacturers	NZ, International		All manufactured items, including appliances
	External manufacturers	NZ, International	Company A's make or buy decision depends on transaction costs and capacity	All manufactured items, including appliances
	Robots	Germany, USA	Most usually motion control systems	1.0 Meat processing systems 1.1 Robotic milking systems 1.2 Other industrial automation system 1.4 Industrial robots 3.1 Robotic milking systems

Source: NZIER

Company A's relationships with associates are of particular importance within its value networks.

For the Industrial Automation value streams, the relationships with two industry associations in Australia are important. These associations aggregate customer desired value information and pass it to Company A as feedstock for business concept innovation, and in some cases the information is accompanied by funding for prototypes or new product development. Some large dairy farmers act in a similar way: they can be both investor in innovation and consumer of the output.

A similar situation exists for the Sample Preparation value network. Company A uses a direct sales model for many large business customers, but for smaller customers and large business customers with existing supply arrangements with distributors, the company uses equipment distributors as an indirect sales channel. These indirect sales channels also act as a conduit for customer value dynamics to Company A, thereby driving innovation and new product development.

The role of independents in the Sample Preparation value network is also worthy of comment. In most cases mineral testing standards are set or enforced by national bodies or by the industry itself. Industry participants derive the generally accepted best from the advice of a small group of industry experts and consultants (the independents in the table above). This advice does not enjoy any official status; it is merely accepted by the industry as normative. Company A enjoys good relationships with these independents, engages with them frequently, and uses the information they provide as the feedstock for business concept innovation within Company A.

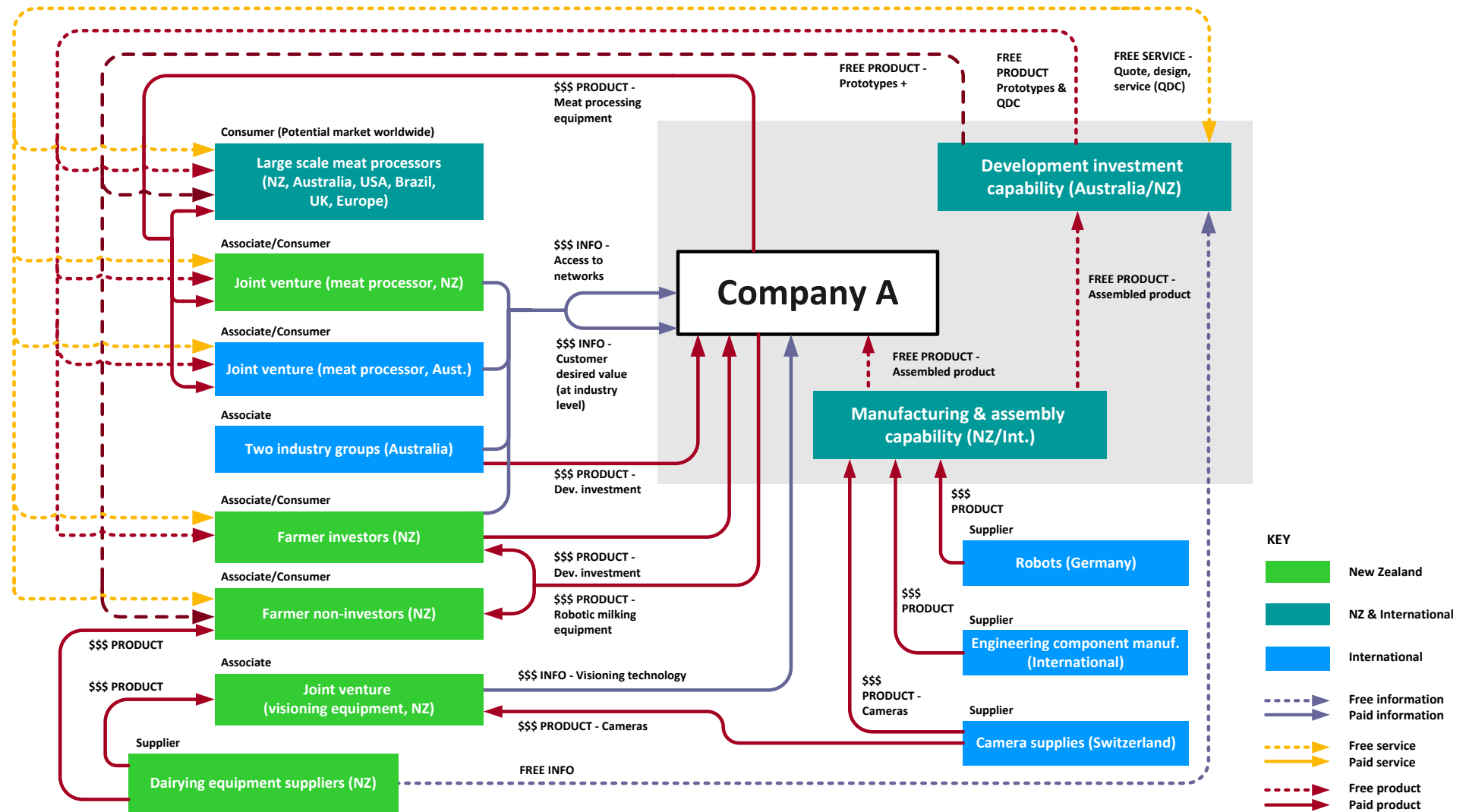
This table also attests to the central importance of the QDC free service within Company A's value network.

### 6.2.5. Company A Value network maps

Company A has a wide competitive scope and participates in several distinct value networks. We have decided to prepare separate value network maps for its three main value networks (Industrial Automation, Sample Preparation and Appliance Manufacturing) to avoid a proliferation of confusing detail. We have also elected not to show every value stream on the value map in the interests of clarity. Our intention has been to show the main features of the value network creating system as simply as possible.

## 6.2.6. Value network: Industrial automation

Figure 3 Value network: Company A, Industrial automation



Source: NZIER



## Notes

Company A's Industrial Automation business covers a spectrum of outputs ranging from substantial pieces of capital equipment designed for their specific use in a specific company in a specific location to more generic pieces of equipment that can be deployed independent by smaller operators. The business concepts involved however are identical at both ends of the scale continuum: Company A addresses customer desired value by combining 3D cameras, industrial robots (motion control systems) and other externally sourced components with its own proprietary visioning and remote sensing and analytics technologies. Company A has patents on these technologies.

From the standpoint of Company A, the main actor relationships within the network are with suppliers, associates and consumers. The supplier relationships are straightforward transactional relationships, but the relationships with consumers and associates are more complex. The interrelationship between paid products flows, free products and services (chiefly prototypes and QDC – quoting, designing and consulting) and information transactions are closely interwoven.

It is information transactions that are of particular importance in this value network. For the generic end of the continuum, the important actors are the offshore associates (two industry groups (Australia), Joint venture (meat processor, Australia)). These associates aggregate information about the customer desired value as it changes and pass the information to Company A. Company A uses this information to produce prototypes, and eventually generic industrial automation systems for sale to both the joint venture partner and to other customers. In some cases the information flow is accompanied by development investment. Some of these actors are thus simultaneously associate, consumer and investor.

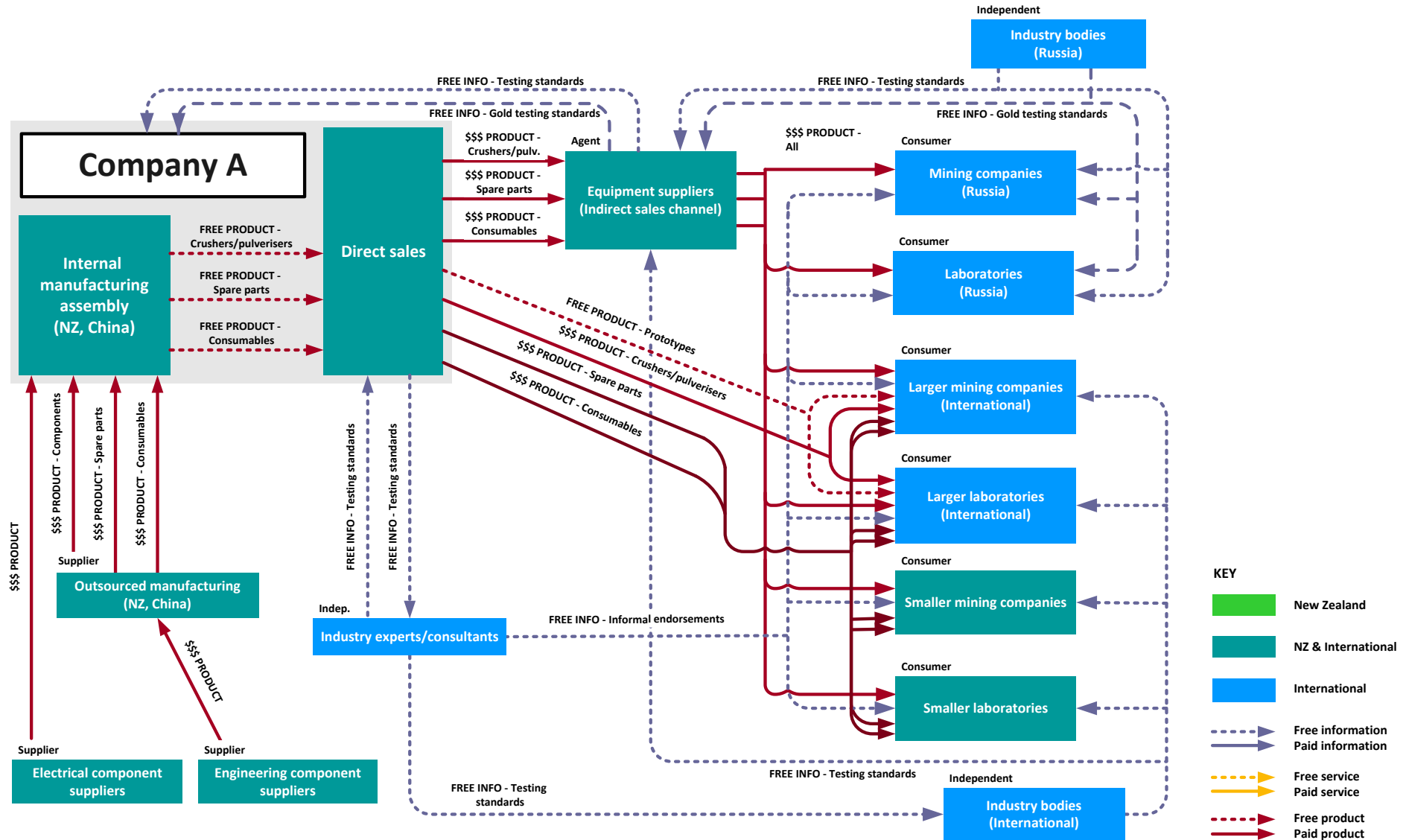
Larger farmer investors in New Zealand have a similarly complex relationship with Company A. They supply customer desired value information to Company A together with development capital, and eventually consume the outputs.

At the other end of the scale continuum – substantial pieces of capital equipment are designed for their specific use in a specific company in a specific location – is also critically dependent on information transactions. In this case the relevant business concept is Company A's QDC free service, which is part of Company A's development investment capability. The service consists of Company A working closely with the consumers to design and test the equipment as it is developed, and to work out the commercial model for purchase and use. Often free products – prototypes – are produced as part of these interactions which are intensive and time-consuming.

Both the QDC service and the information transactions between Company A and its associates within the network are highly iterative. These iterated information transactions effectively constitute the innovation system for the value network, and keep the company close to the end-customer value dynamics as they evolve. Post-sale value streams, such as maintenance, which are not shown on this diagram, also support the innovation system by providing further touchpoints and iterative transactions.

## 6.2.7. Value network: Sample testing

Figure 4 Value network: Company A, Sample testing



Source: NZIER

## Notes

Company A produces equipment that crushes or pulverises samples of rock so that they can be tested for mineral content, most usually gold. Company A has proprietary IP and enjoys a strong market reputation. Customer desired value in this network is embodied in mineral testing standards: constant improvements in accurate testing against more rigorous standards results in more productive prospecting and a higher recovery of commercial material from ores.

The key actors in this value network are the independents. These are a small group of international industry experts and consultants who advise mining companies and industrial laboratories on sample testing standards. Except for a few cases in which there are national bodies set and enforce standards (Russia is one such country), the standards do not have any official status, but are simply generally accepted by the laboratories and mining companies involved.

Company A's internal direct sales function engages in frequent information transactions with independents, using the information to make improvements to their sample testing equipment. The independents are able to endorse Company A's products when discussing sample preparation standards with industry bodies, laboratories, and mining companies. None of the information transactions are monetised.

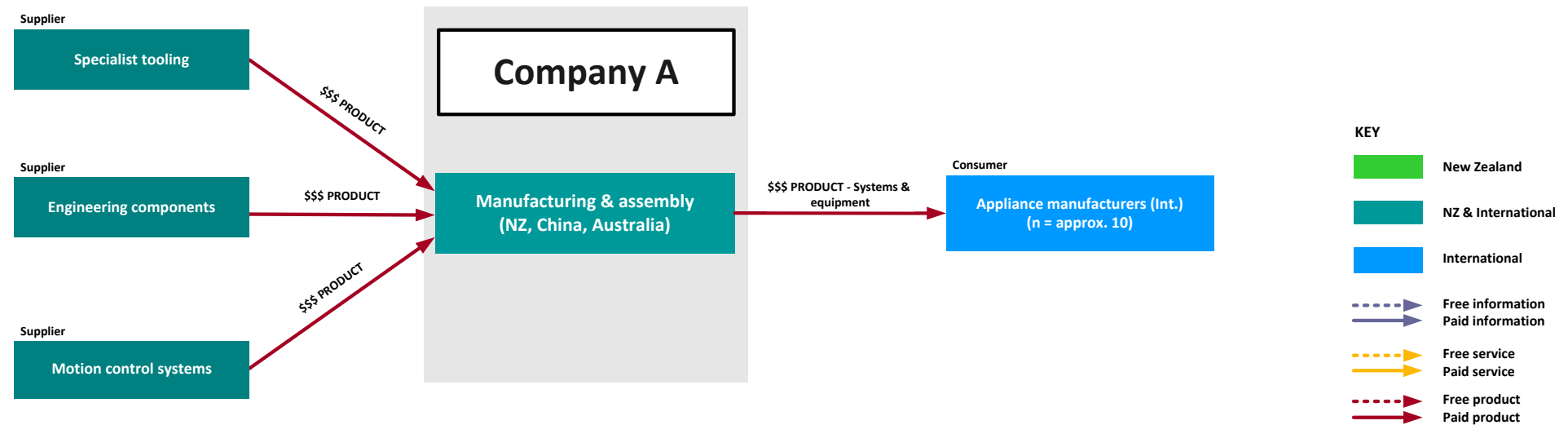
Company A normally sells its equipment directly to the large mining companies and laboratories. However, it also uses an indirect sales model through equipment suppliers to reach smaller mining companies and laboratories, larger customers who prefer to maintain existing supply relationships with the equipment suppliers and to achieve efficient distribution in large complex territories such as Russia. These equipment suppliers also act as aggregators of information on the development of supply standards which Company A uses in the same way as the information it gathers from the independent consultants.

The transactions which drive innovation are the information transactions identified: those between Company A and its associates (industry experts and equipment suppliers).

The use of an indirect sales model means that the sales process generates fewer touchpoints for Company A in this value network. Under these circumstances post-sale elements such as the supply of consumables and spare parts become an important means of keeping in touch with the customer base.

## 6.2.8. Value network: Appliance manufacturing

Figure 5 Value network: Company A, Appliance manufacturing



Source: NZIER

### Notes

This is the simplest of the Company A's three value maps. Appliance manufacturers let contracts for the manufacture of equipment, often through reverse auctions. When Company A wins such a contract it will either fulfil the contract itself or subcontract it to one of its suppliers. The lack of transactions which link Company A with customer value dynamics offer little scope for innovation. This segment of Company A's business looks most like a traditional supply chain.

## 6.3. Company B

### 6.3.1. Customer value

The customer desired value for Company B is the highest-quality digital visual effects at the lowest price.

Customers receive this value through the delivery of shots (digitally encoded and rendered content that runs for between 2 seconds and 1 minute). This delivery is a highly iterative process: individual shots are re-worked and submitted to the customers every day (internal company jargon refers to these submissions as 'dailies') until either time or budget is exhausted. In response to a direct question about whether it was more usual to exhaust time or budget, Company B's respondent replied that the constraint was rarely budget, usually time.

Future desired value is centred around the desire for increasing realism and sophistication in the shots. This is Company B's key innovation path, and its proprietary technology has now reached the point where it is possible to dispense with human performances without sacrificing realism.

This value dynamic is important not only to Company B, but to several other actors within the network. Both directors and studios maintain their individual competition within the network by continuing to attain and surpass consumers' desired value. A company which can deliver imperfectly imitable or non-substitutable capability aligned to this value dynamic, to directors and studios, is therefore of high importance to several significant actors within the network.

Company B is also in the fortunate position of being able to push desired value into the innovation path: customers often do not know what exists or what could be done until Company B reveals it. Control of the innovation path itself is less of a constraint for Company B than managing expectations around the time and budgets required to support the innovations.

### 6.3.2. Value proposition and value streams

Company B's value proposition is composed of the following value streams

**Table 18 Company B: Value proposition**

Category		Value stream	Notes
1. Products	1.0	Shots	
	1.1	Action capture shots	Shots incorporating movements captured from a live actor
	1.2	Performance capture shots	Shots incorporating performance elements (expressions, subtle gestures) captured from a live actor
	1.3	Raw content	Storylines, scripts &c
	1.4	Finished content	
	1.5	Licences	Content licensed to 3 <sup>rd</sup> party distributors
	1.6	Commissions	Received from 3 <sup>rd</sup> party distributors

Category		Value stream	Notes
	1.7	Financial proceeds	From studio distribution
	1.8	Investments in distributors	
2. Services	2.0	Creative labour	
	2.1	Location services	Company B staff on location gathering data to be used eventually in shots
3. Monetised information	3.0	Advocacy/rebates	
4. Free products	4.0	Code	Encoded images
	4.1	Rendered images	
	4.2	Shots	As above, but provided free to directors
	4.3	Action capture shots	As above, but provided free to directors
	4.4	Performance capture shots	As above, but provided free to directors
	4.5	Prototype shots	New technology developments
	4.6	Digital assets	Creatures, models, shaders, textures and environments held in stock
5. Free services	5.0	Creative labour	
	5.1	Actions	For use in action capture shots
	5.2	Performance	For use in performance capture shots
6. Free information	6.0	Feedback on dailies	
	6.1	Relationships	Between Company B and studios
	6.2	Contracts	Between Company B and studios

Source: NZIER

The unit of production is the shot, which is delivered to the network as both a paid product and a free product. The monetised stream is between Company B and the studios, but the free stream is between Company B and directors, who are important actors in the network. The high proportion of free products within this value network is therefore an outcome of the way in which Company B transacts with the value network.

### 6.3.3. Use of dynamic capabilities in value streams

The two capabilities most important in sustaining competitive advantage, and therefore in explaining sustained participation in value networks are I and N (imperfectly imitable and non-substitutable). We therefore asked our respondents to map these capabilities to the value streams in which they are used.

**Table 19 Company B: Use of dynamic capabilities in value streams**

Category	Capability	V/I	1.Products	2. Services	3. Monetised Information	4. Free products	5. Free services	6. Free information
Software development	None							
Service	None							
Technological	Action capture	I	1.1 Action capture shots (paid) 1.6 Finished content			4.3 Action capture shots (free)	5.1 Actions	
	Performance capture	I	1.2 Performance capture shots (paid) 1.6 Finished content			4.4 Performance capture shots (free)	5.2 Performances	
Information	None							
ICT systems and technologies	Render farm	I	1.0, 1.1, 1.2 All shots 1.6 Finished content			4.0 Code 4.1 Rendered images 4 All free shots		
Immaterial assets	Intellectual property	I	1.0, 1.1, 1.2 All shots 1.6 Finished content	6.0 Feedback on dailies		4.0 Code 4.1 Rendered images 4 All free shots 4.6 Digital assets		
	Quality	I	1.0, 1.1, 1.2 All shots 1.6 Finished content	6.0 Feedback on dailies		4.0 Code 4.1 Rendered images 4 All free shots		
	Kiwiness	N	1.0, 1.1, 1.2 All shots 1.6 Finished content			4.0 Code 4.1 Rendered images 4 All free shots		
Contracts & partnerships	None							

Source: NZIER

Company B’s operations are very lean. Dynamic capabilities are aligned very closely to products (shots) which exist in both paid and free variants. The shots are a critical component of the finished content delivered by directors to studios, so the quality of the individual content is very important. Shots must continually address customer value dynamics – the need for ever-increasing sophistication and realism – to maintain the reputation of individual dynamics and the competitive position of studios within the network.

## 6.3.4. Value network actor identification

**Table 20 Company B: Value network actor identification**

Actor roles	Title	Where?	Description	Main value streams affected
<b>Main actor</b>	Company B	NZ, USA	The focal firm in the analysis. Most supply is internal – see below	1.0, 1.1, 1.2 All shots (paid) 1.4 Finished content 4 All free shots 4.6 Digital assets
<b>Associates</b>	Government advocates	NZ	Lobby studios on behalf of national film industries in return for rebates	3.0 Advocacy/rebates 6.2 Contracts
<b>Consumers</b>	Company B Quality Gatekeeper	NZ	Manages dailies, iterates for quality until director signals time exhausted	1.0, 1.1, 1.2 All shots (paid) 1.4 Finished content 4 All free shots 4.6 Digital assets
	Company B Relationship Gatekeeper	NZ, USA	Manages relationships with studios, generates contracts for shots	6.1 Relationships 6.2 Contracts
	Directors	International	The most important actor in the system. Delivers finished content to studios	1.4 Finished content 4 All free shots 2.0 Creative Labour 2.1 Location services
	Studios	USA, International	Coordinates production and distribution of finished content. The financial centre of the system	1.0, 1.1, 1.2 All shots (paid) 1.4 Finished content 5.0 Creative labour 1.3 Raw content All flows related to distribution
	Studio distributors	International	Distributors in which studios have invested in return for proceeds	1.7 Financial proceeds 1.8 Investment in distribution 1.4 Finished content
	3 <sup>rd</sup> Party distributors	International	Independent distributions to whom studios licence content in return for commission	1.5 Licences 1.6 Commissions 1.4 Finished content
<b>Investors</b>	Studios	USA, International	Studios often invest in distribution channels in return for proceeds from distribution	1.7 Financial proceeds 1.8 Investment in distribution



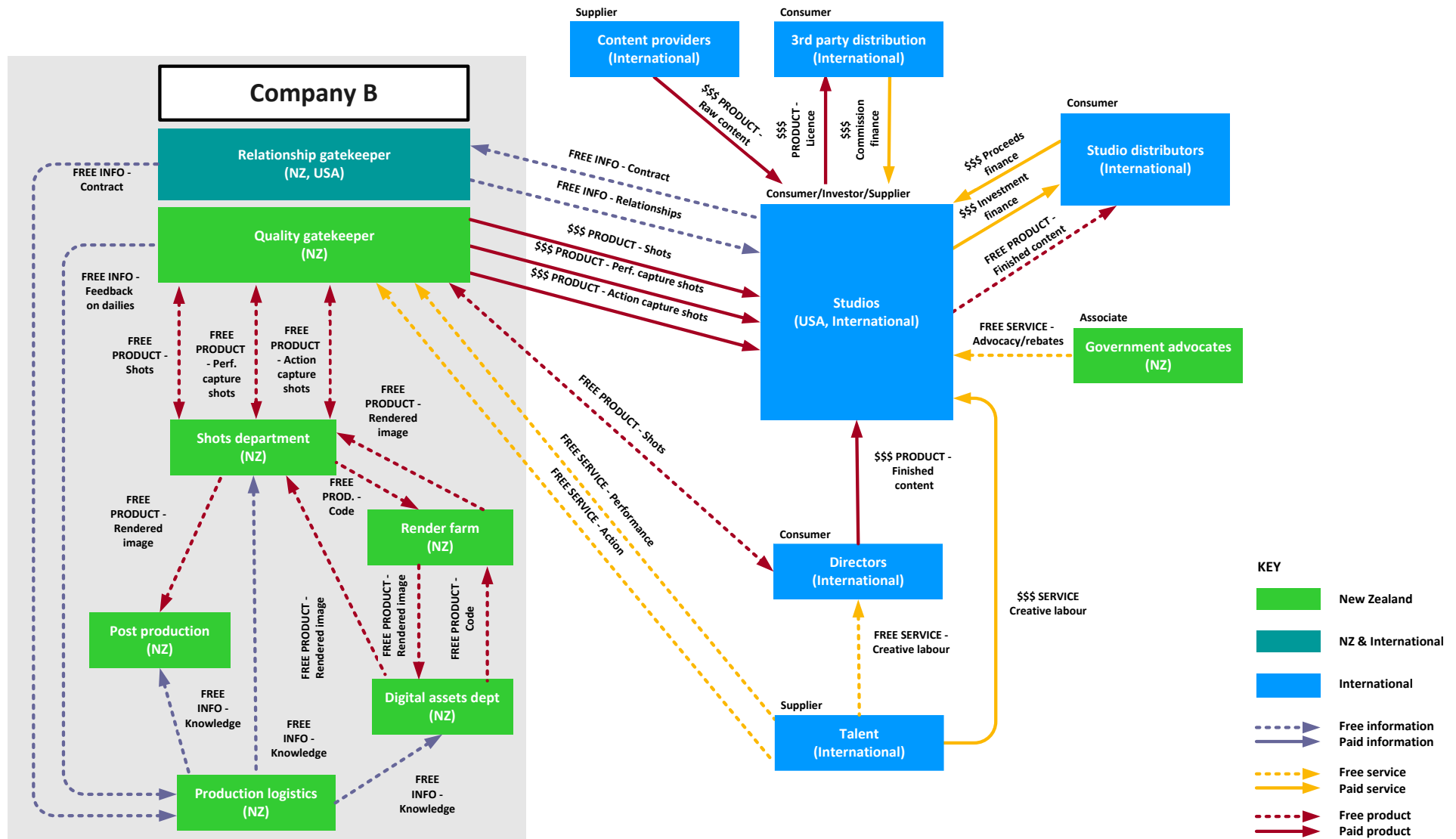
Actor roles	Title	Where?	Description	Main value streams affected
				1.4 Finished content
<b>Suppliers (External)</b>	Content providers	International	Supply raw content to studios	1.3 Raw content 1.4 Finished content
	Directors	International	Supply finished product to Studios	1.4 Finished content
	Studios	USA	Supply contracts for shots to company, talent, funding and logistical support to directors, and finished product to distributors	1.4 Finished content 2.0 Creative labour 6.2 Contracts
	Talent	International	Supply creative labour, include actions and performances to Directors, Company B and studios	2.0 Creative labour 5.0 Creative labour 5.1 Actions 5.2 Performances
<b>Suppliers (Internal)</b>	Digital assets department	NZ	Creatures, models, shaders, textures and environments held in stock	4.6 Digital assets 4 All free shots
	Postproduction department	NZ	Applies finishing touches to shots before release	4 All free shots 6.0 Feedback on dailies
	Production logistics department	NZ	Coordinates activities needed to produce shots on time and on budget	6.0 Feedback on dailies
	Render farm	NZ	Converts code into rendered images and shots	4.0 Code 4.1 Rendered images 4.6 Digital assets All free shots
	Shots department	NZ	Carries out animation, compositing, imaging, layout, painting and editing necessary to produce shots	.0 Code 4.1 Rendered images 4.6 Digital assets All free shots

Source: NZIER

The director is central to this network, although the financial centre is the studios. It is the director who supplies the finished content to the studio upon which his reputation and that of the studio depends. The transactions between Company B's quality gatekeeper and the director (shots bundled into dailies) are therefore of first importance. Otherwise, Company B is quite self-contained, and therefore better able to control quality and respond quickly to the director's requirements. Over the years, Company B has built up an impressive store of digital assets and it has its own rendering capability so it can iterate and improve quality rapidly.

## 6.3.5. Value network

Figure 6 Value network: Company B



Source: NZIER

## Notes

Company B contracts with studios to supply a certain number of shots through a director to a studio. These shots are produced and coded and rendered by Company B and released to the director once the quality gatekeeper, who organises the internal processes involved in producing shots, has approved their quality. The process is repeated (releases of shots are termed dailies) until the director is satisfied. This highly iterative process is of great value in sustaining Company B's position within the network.

Company B has its own internal processing and rendering capability – the render-farm – so it can also iterate shots internally quickly until the desired quality is achieved. It also maintains a library of digital assets – shots saved from previous contracts – which it can use to form the basis of new shots. For action and performance capture shots human performances can be supplied directly from within the network, or digital assets can be used and adapted.

In this value network, the finance flows are between Company B and the studios, but the most important product in the value proposition is a free product – the shots that are transacted between Company B and directors. Because of its proprietary IP, its systematic quality improvement processes and its control of on-demand processing capability, Company B is often able to lead customer desired value by offering directors shots containing a level of sophistication and realism beyond that expected by the eventual consumers. This supports Steve Jobs' dictum

*“It's really hard to design products by focus groups. A lot of times, people don't know what they want until you show it to them.”*

and illustrates the value that Company B delivers to the network. It is worth noting that this is still iterative, not disruptive, innovation. Customer desired value is understood by all significant market participants to be fairly stable – more spectacle, more realism, more sophistication. Company B's response to this desired value is to consistently exceed customers' received value expectations, not to disrupt the entire system.

## 6.4. Company C

### 6.4.1. Customer value

The value network we present for Company C has airports as the central actor. Airports' desired customer value is for baggage handling and courier services which meet operational requirements within the price points for that service dictated by the airports' individual cost structure.

Company C's customers receive this value through the design, manufacture, installation and servicing of baggage handling and courier services which integrate the physical operation of such services with ICT and digital technology. This minimises the human touchpoints needed to move items from one place to another with great accuracy at high volume, and carry out associated logistical and information-related tasks.

Operational performance is a stable part of the customer desired value but pressure to deliver equivalent or better operational performance at lower prices is mounting, driven chiefly by the increasing presence of budget airlines. Company C sees the innovation path these pressures generate as reliant on better use, management and commercialisation of data.

### 6.4.2. Value proposition and value streams

Company C's value proposition is composed of the following value streams.

**Table 21 Company C: Value Proposition**

Category		Value stream	Notes
1. Products	1.0	Baggage handling systems	Integrates physical components, digital components and service wrap
	1.1	Courier solutions	Integrates physical components, digital components and service wrap
	1.2	Automated bag drop	Integrates physical components, digital components and service wrap
	1.3	Manufacturing supplies	Steel-work support, manufactured conveyors
	1.4	Engineering components	
	1.5	Specialist components	Designed and produced with JV partner
	1.6	Flights	
2. Services	2.0	Site installation services	Company C contracts for installation, usually locally
	2.1	Planning and execution	Planning and Integration services of the whole offering, including integration of clients' products
	2.2	Ground handling services	Usually employed by airlines

Category		Value stream	Notes
	2.3	Specialist consulting services	Consultants advising new or upgrading airports on technical matters
3. Monetised information	3.0	Unique customer identifiers	Used to track baggage
4. Free products	4.0	Software	
5. Free services	5.0	Data analytics	Operational and efficiency reports offered by Company C to airlines
6. Free information	6.0	Unique customer identifiers	Used to track baggage
	6.1	Endorsements	Recommendations supplied by consultants to airports. A very important part of the system
	6.2	Specialist information	Consultants advising Company C or general contractors on specific aspects of airport design and construction
	6.3	Planning and execution information	
	6.4	Information on upcoming opportunities	From consultants

Source: NZIER

The value proposition is fairly evenly balanced between paid products, paid services and free information streams. Among the information streams, we can single out 6.4 and 6.1 as being of particular importance. Commercial opportunities for Company C arise when a new airport is being build or an old one upgraded: the transactions which embody these information flows are those which comprise value stream 6.4.

Airport construction exhibits risk characteristics similar to those of the large industrial automation system value network served by Company A: a substantial investment, long lead times and high-lock in. In such an environment endorsements from trusted industry insiders carry weight, so 6.1 is an important value stream.

The other aspect of the value proposition which merits consideration is 5.0. Company C offers this data analytic value stream to airlines as operational and efficiency reports which are operationally important to them. The fact that Company C, in contradistinction to competitors, offers this value stream free to airlines is an important ingredient in sustaining its reputation for trustworthiness within its network.

We have seen above that the risk characteristics of this particular value network are such that a reputation for trustworthiness is a true commercial advantage, and the presence of this element in the Company C's value proposition helps explain company C's successful engagement with its value network.

### 6.4.3. Use of dynamic capabilities in value streams

**Table 22 Company C: Use of dynamic capabilities in value streams**

Category	Capability	V/I	1. Products	2. Services	3. Monetised information	4. Free products	5. Free services	6. Free information
<b>Software development</b>	None							
<b>Service</b>	Solution experience	I	1.0 Baggage handling systems 1.1 Courier solutions 1.2 Automated bag drop	2.0 Site installation services 2.1 Planning and execution		4.0 Software	5.0 Data analytics	6.3 Planning and execution info
<b>Technological</b>	None							
<b>Information</b>	Analytics	I	1.0 Baggage handling systems 1.1 Courier solutions 1.2 Automated bag drop			4.0 Software	5.0 Data analytics	
<b>ICT systems and technologies</b>	None							
<b>Immaterial assets</b>	Knowledge of individual offshore clients	N	1.0 Baggage handling systems 1.1 Courier solutions 1.2 Automated bag drop	2.0 Site installation services 2.1 Planning and execution			5.0 Data analytics	
	Trust	N	1.0 Baggage handling systems 1.1 Courier solutions 1.2 Automated bag drop				5.0 Data Analytics	6.0 Endorsements 6.4 Information on upcoming opportunities
<b>Contracts &amp; partnerships</b>	None							

Source: NZIER

This table reveals the importance of Company C's data analytics value stream very clearly. Otherwise IN capabilities are kept very close to customers by monetised product streams.

## 6.4.4. Value network actor identification

**Table 23 Company C: Value network actor identification**

Actor roles	Title	Where?	Description	Main value streams affected
<b>Main actor</b>	Company C	NZ, Australia, Asia	The focal firm in the analysis	All monetised streams
<b>Associates</b>	Consultants	International	Advise on airport construction or upgrade. The central point of information aggregation in the value network is extremely influential	6.0 Endorsements 6.4 Information on upcoming opportunities 2.3 Specialist consulting services 2.1 Planning and execution
	General contractors	International, local delivery	Build airports	2.1 Planning and execution 6.2 Specialist information
<b>Consumers</b>	Airlines	International		1.2 Automated bag drop 5.0 Data analytics 1.6 Flights
	Airports	International, local delivery	The centre of this value network	1.0 Baggage handling systems 1.1 Courier solutions 1.2 Automated bag drop 2.1 Planning and execution 5.0 Data analytics 6.0 Endorsements
	Installers	International, local delivery	Company contracts locally for installation	1.0 Baggage handling systems 1.1 Courier Solutions 1.2 Automated bag drop
	Passengers	International, local delivery		1.0 Baggage handling systems 1.1 Courier solutions 1.2 Automated bag drop
<b>Independents</b>	Ground handling staff	International, local delivery	Employed by airlines	1.0 Baggage handling systems 1.1 courier solutions 1.2 Automated bag drop

Actor roles	Title	Where?	Description	Main value streams affected
	Security staff and systems	International, Local delivery	Employed by airports	1.0 Baggage handling systems 1.1 Courier solutions 1.2 Automated bag drop
<b>Suppliers</b>	Airport ICT companies	International, local delivery	Suppliers of ICT services to airports	6.0 Unique customer identifiers
	Engineering component manufacturers	International		1.4 Engineering components All products
	Joint Venture partners	International	Design and manufacture of specialist components	1.5 Specialist components All products
	Manufacturers	70% Malaysia, balance is China, NZ, Australia		1.3 Manufacturing supplies All products

Source: NZIER

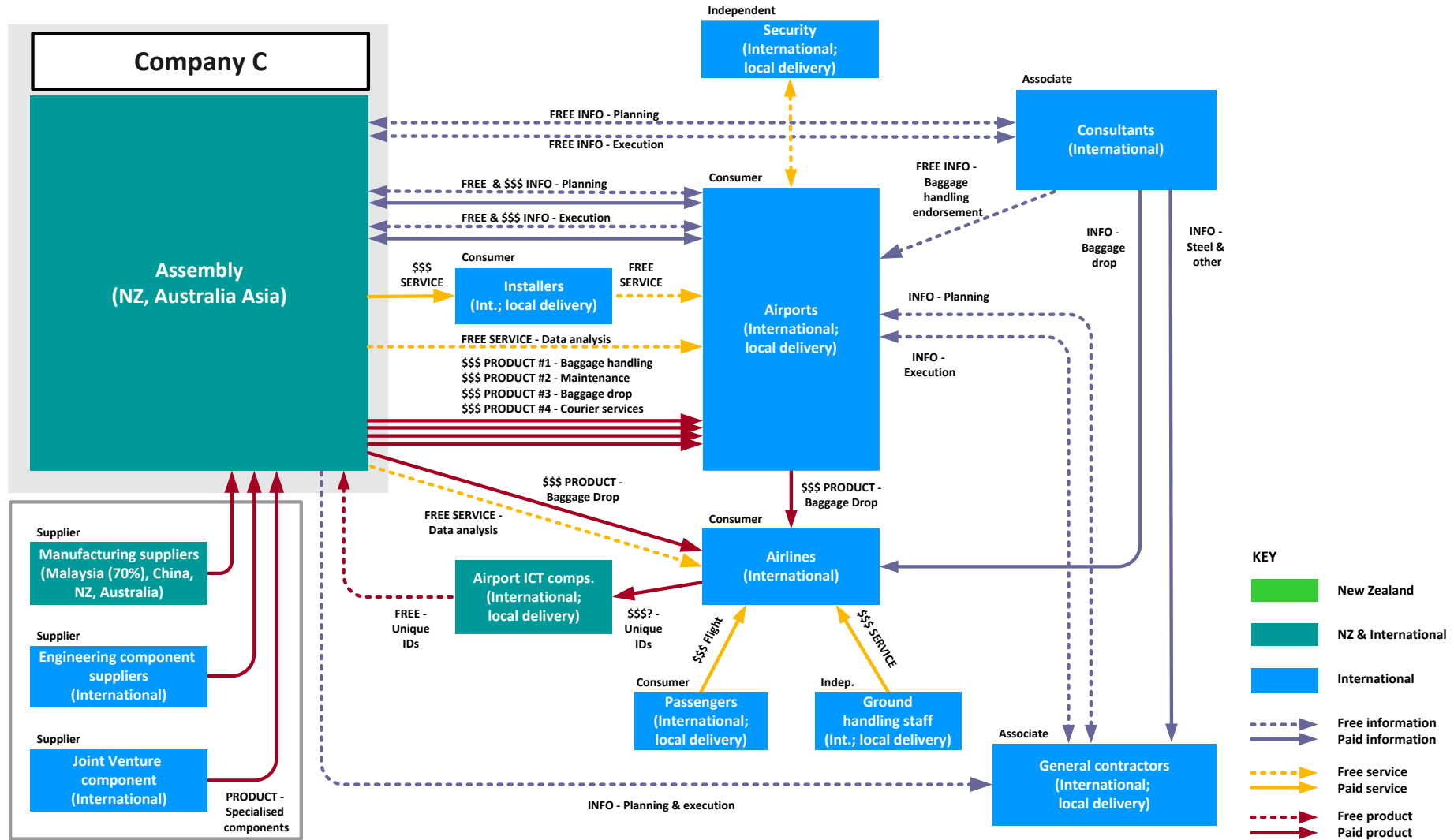
Airports are central to this value network. When a new airport is being built, it is usual to invite the participation of a fairly small group of international consultants who have particular expertise and experience in airport design and construction. From the standpoint of Company C, these consultants are associates and the transactions between them are not monetised. Nonetheless, they perform important functions within Company C's value network: they pass information to Company C about airports to be constructed or upgraded and they are able to endorse Company C's products and services.

Company C designs the systems it will deliver to the airport ecosystem in New Zealand, but sources the manufactured components internationally. It normally employs local contractors to carry out the actual installation.



## 6.4.5. Value network

Figure 7 Value network: Company C



Source: NZIER

## Notes

Commercial opportunities arise for Company C when a new airport is built or an old one upgraded. In these circumstances, the airports engage international consultants expert in the design and logistics of airport construction. The critical elements in Company C's value proposition are therefore the free information value streams between Company C and these consultants. Information about airport projects pass along these value streams, and the consultants are also in a position to endorse Company C's paid products to their eventual consumers at a stage when they can be incorporated into the design phase of the projects.

Each solution is designed specifically for the airport involved: in this sense each new airport represents both the outcome and an instance of an iterative innovation system. Lead times cover several years and necessitate the formation of close working relationships among all those involved. Building a new airport is a high lock-in business: those who supply the constituent parts will be likely to do so for many years to come.

Information transactions are also a more general characteristic of this value network, in particular highly iterative bi-directional flows of planning and execution information. Company C shares planning and execution information with:

- the general contractors who are responsible for the actual construction of the airports, who may then share it with the airport companies themselves
- the industry experts who advise on the planning and construction of airports
- the airport companies themselves.

Company C remains connected to customer value dynamics through its data analytics value stream, which is consumed by both airports and airlines.

## 6.5. Discussion

It is perhaps unsurprising that the two HTB firms (Companies A and C) should have more in common than the KIS firm (Company B). For the HTB firms, information flows are a key driver of innovation and competitive position, their engagement with their networks involved more points of contact with more actors through more value streams, and their supply chains were diverse and international.

In contrast, Company B stands out as being remarkably self-contained, strongly focused on the core offering within its value proposition, and well aware of its ability to lead value creation through its own capabilities rather than relying on demand pull from the market.

That said, the networks examined have many common features. In all of them we note the importance of non-monetised streams within the case study firms' value propositions which are used to develop or sustain relationships with important actors within the network, and to deliver information to the case study firm which can then be used for value creation or value capture.

In some cases the non-monetised value streams represent transactions between the case firms and associates. Associates are neither suppliers or customers of the case study firms, nonetheless the various functions they perform – aggregating customer desired value information, providing market intelligence, offering endorsements – is an important factor in establishing the case study firms within the value network and driving innovation.

All three case study firms organise their internal processes and seek ways to maximise the number of iterative transactions. This is a natural strategy for New Zealand firms seeking to engage with global networks from the edge of the world. Distance is less of a barrier if you are frequently transacting with the important actors in your network, and value streams iterated over many years bind the actors in the network closer together.

In all networks, the case study firms track customer desired value as closely as they can, whether it be through Company A's QDC service, Company B's constantly and improving quality processes, or Company C's involvement in the earliest stages of airport design. In many cases the transactions involved take place directly between the actors bearing the customer desired value and the capabilities of the case firms.

Intermediaries such as procurement functions, marketing departments or separate R&D functions do not feature prominently in these networks. The firms examined are each good examples of the principle stated by Ulaga and Chacour (2001): changing customer value preferences truly are the R&D function of these firms.

## 7. Analysis and comparisons

In this section we combine further analysis with observations made in earlier sections to draw out the main points of similarity and difference between the case study firms. We will group these comparisons under three main headings:

- company profiles
- capability or resources
- value proposition or value streams.

### 7.1. Company profiles

Four common features emerge very powerfully from a comparison of the company profiles:

1. Each company is pursuing a differentiation focus strategy
2. It is the innovation path which is the principal enabler of each company's presence in international markets.
3. Each company sees locating its important human capital in New Zealand as an important safeguard of future success
4. Each company is exclusively focused on international demand.

The differentiation focus strategies are discussed in Section 4.4. The point about innovation paths are probably best illustrated by Company B, for whom the same processes that allow it constantly innovate and improve quality beyond market expectation also allow it to become a cynosure within its network.

Both Company A and Company C are crucially dependent on information flows which comprise the innovation system, expressed in the QDC service for Company A and the co-design of bespoke systems for individual customers in the case of Company C.

The Rutherford effect also seems to be an important element in each firm's decision on where to locate and develop its human capital. Companies A and C have significant cost bases outside New Zealand, but both saw New Zealand as the natural source for their respective brains trusts, and both saw the Rutherford effect as a crucial element in the development and maintenance of their immaterial assets. Company B has no intention to site operations anywhere else.

None of the three firms have significant levels of domestic demand, nor do any of them seek it. All saw New Zealand as tough market with high levels of incumbency. Catching international trends such as online shopping or digital effects expose these companies to thicker markets, and is therefore seen as more profitable than engaging in difficult markets at home.

The companies saw the New Zealand innovation system as marginally important to their success. Their engagement ranged from nothing to a few small grants. It is likely that this is because the New Zealand Innovation system has been designed to support science-based collaborative R&D, whereas the dominant innovation mode in the firms studied is client or product oriented R&D (we shall consider this point and the differences between innovation modes more fully in Chapter 9 below). It should not be concluded that the New Zealand innovation system is ineffective, but that is only

addresses part of the opportunity set available to New Zealand firms. An innovation system oriented to GVCs and GVN could powerfully enhance the current productivity of New Zealand firms.

Threats and risk factors identified included access to capital, both for themselves and for their customers. Company A’s ingenious commercial arrangements , which used instances of every one of Osterwalder’s revenue models to overcome this barrier on behalf of their customers are worthy of a study in themselves, and lead one to wonder whether the lack of commercial acumen believed by Company C to be inherent within New Zealand culture is universal.

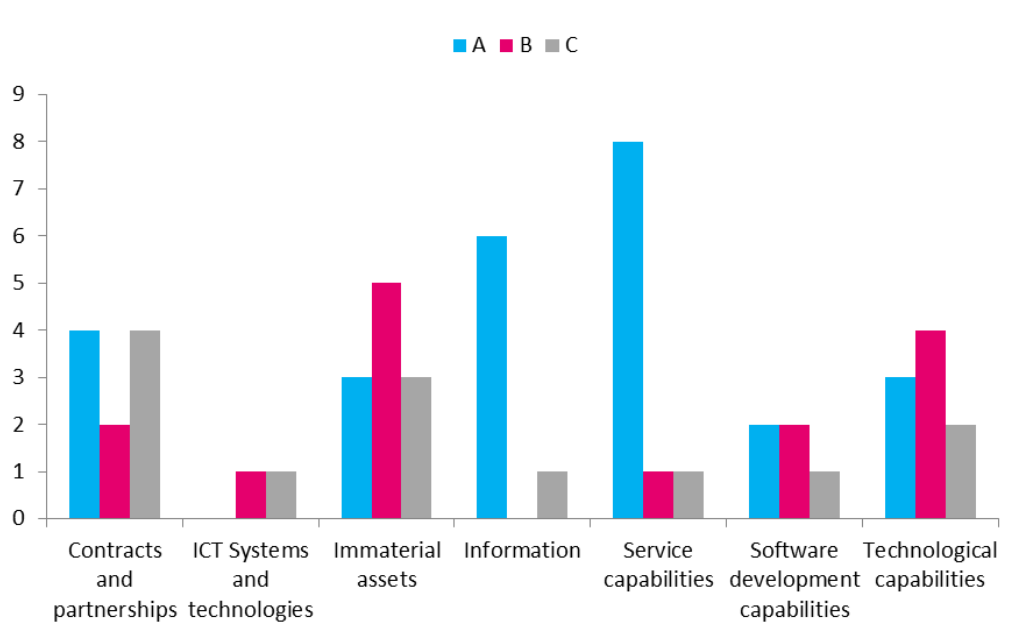
Currency risk and succession risk were risks identified and actively managed by all three companies; more difficult was developing an easy familiarity with markets far from these shores.

All recognised the crucial importance of understanding their immaterial assets, which brings us neatly to a consideration of their capabilities.

## 7.2. Capability

The three businesses surveyed have similar capability profiles.

**Figure 8 Capability category comparison**



Source: NZIER

Company A has the most copious set of capabilities, including a varied set of information and service capabilities. This could reflect the fact that it has been in business longer than the other two companies, but also the fact that it recognises after-sale services (service capabilities) as an important means of on-selling and up-selling.

Company B, the only KIS company in the sample, has the most copious set of immaterial assets, but a surprisingly low number of contracts and partnerships, perhaps reflecting its position as an innovation leader in its network.

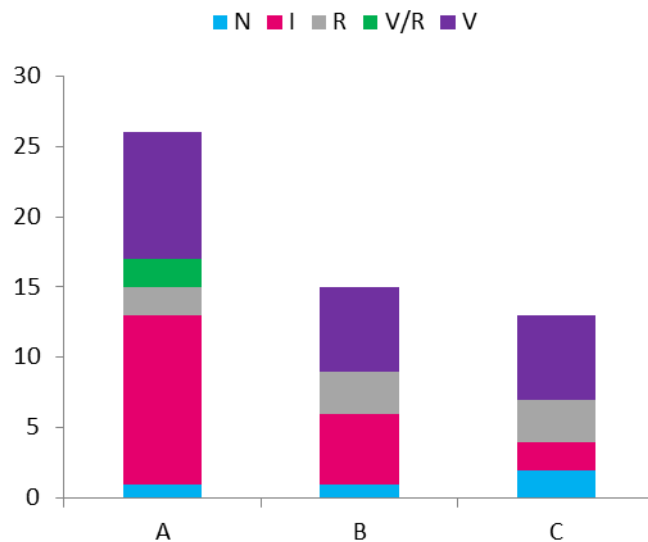
It is also interesting to note, in view of the emphasis given to software-based industries in public policy, that all three companies have more copious technology capability sets than pure software development capabilities. This remains true for Company B which is an intensive user of its own internally developed code. Perhaps the New Zealand genius is not so much for writing code, but for understanding where and how the code can interact with other technologies to create or harvest value. Could this be another instance of the Rutherford effect?

If we exclude information and service capabilities, which are only significant for Company A, the companies are fairly similar. Their largest capability sets, in diminishing order are

- immaterial assets
- technological capabilities
- contracts and partnerships
- software development.

In order to explain their successful participation in value networks, we have to focus on their dynamic capabilities, particularly their imperfectly imitable and non-substitutable capabilities.

**Figure 9 Capability VRIN comparison**



Source: NZIER

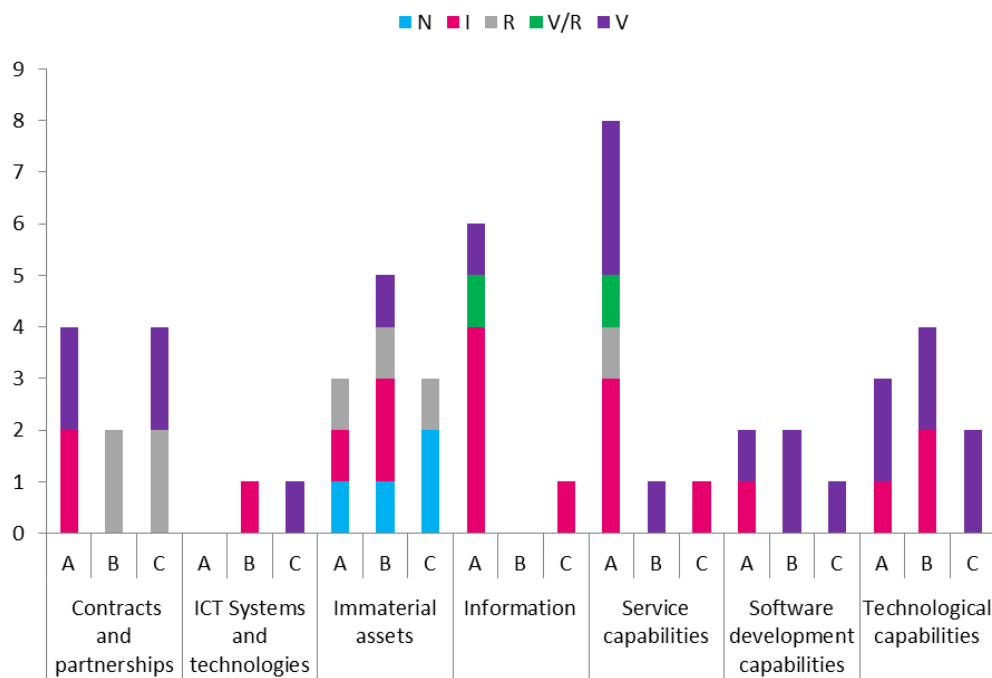
All of the businesses have similar valuable and rare capability, but they differ substantially at the IN end of the continuum. Unsurprisingly, imperfectly imitable capability is more common than non-substitutable capability. Companies A and C have roughly the same amount of non-substitutable capability. Company C has more non-

substitutable capability (and less imperfectly imitable capability) and relies on it more heavily, as its overall capability stack is lower.

It is also noteworthy that Company A’s IN capability stack is almost as high as Company C’s total stack. This is at least a partial explanation of Company A’s many years in business, and an indication of the path that Companies B and C are likely to take if their engagement with global value networks remains successful.

Imperfectly imitable capability is spread across all categories, but is strongly represented among the immaterial assets and technological capabilities. Non-substitutable capability is concentrated in immaterial assets. This is examined in more detail in the chart below.

**Figure 10 Capability category and VIRN comparison**



Source: NZIER

This analysis shows that it is immaterial assets more than anything else that explain the successful participation of New Zealand firms in the value network. The resources within this category range from IP, protected by patent in the case of Company A or preserved as a business secret in the case of Company B, and the systems and processes that ensure market-leading quality in the case of Company B, and the carefully nurtured trust relationships of Company C, which also has non-substitutable information and service capability.

All three companies have developed immaterial assets which they keep closely aligned to value dynamics, and the importance of this category to Companies A and B is further underscored by the fact that they have imperfectly imitable immaterial assets as well.

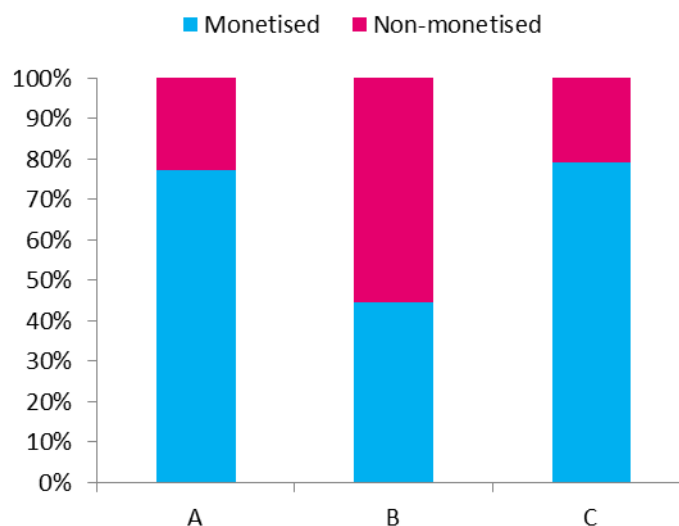
In second place are the technological capabilities, where two of the three case study firms have significant imperfectly imitable capability. Company A has surrounded its non-substitutable capability with a halo of imperfectly imitable capability covering most categories.

### 7.3. Value proposition

A firm’s value proposition is the aggregate of its value streams: the chains of transactions which deliver the firm’s capabilities to the network, classified into products, services and information. Value streams may be monetised or non-monetised. Most value streams are monetised, but all three case study firms use non-monetised value streams to build relationships and reputation within the network.

**Figure 11 Type of value streams by company**

Share of number of value streams, not by value; I and N



Source: NZIER

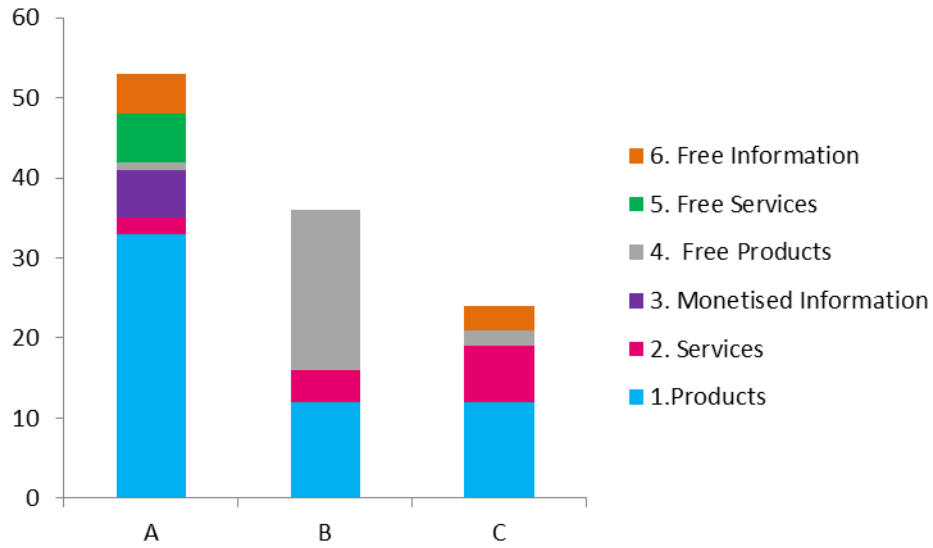
This is particularly clear in the case of Company B, whose critical value stream (free shots) is a free product transacted directly with the most important actor in the network (an associate), and which is the conduit through which its constantly innovating market leading capabilities are delivered to its network.

The similarity of the two HTB firms is very striking. Even though Company A has a much more copious set of monetised products than Company C, its monetised:non-monetised ratio is the same. Company A and C’s non-monetised streams are free services and free information, often with associates and independents. Company A is the only business using monetised information streams at the moment, and both Company A and Company C are considering monetising information streams which are currently free.



**Figure 12 Type of value streams by company**

**I and N value streams**



Source: NZIER

## 8. Conclusions

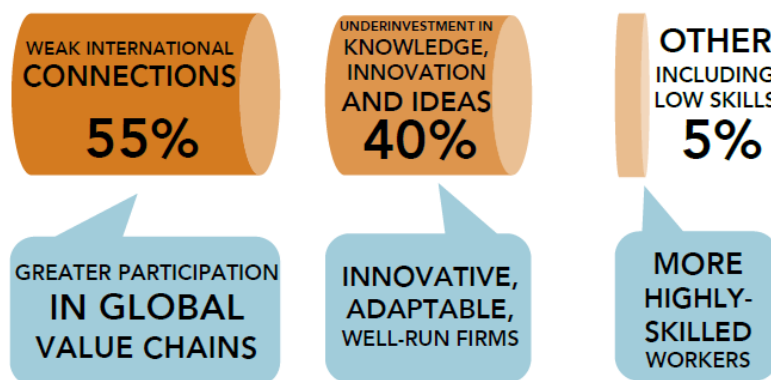
### 8.1. Framing the research problem

New Zealand's current challenge around the HTB and KIS industries is twofold:

- New Zealand has low productivity compared to other OECD countries. HTB and KIS industries' value creation stems from innovation, which is a key driver of productivity.
- New Zealand is seeking to increase its exports to 40% of GDP. The HTB and KIS sectors can lend powerful support to this aspiration, both in their own right, as enablers of other exports, and by being embedded in other products and services.

The New Zealand Productivity Commission (De Serres, A., Yashiro, N., and Boulho (2014)) has demonstrated that over half of New Zealand's productivity gap relative to the OECD average can be explained by weaknesses in our international connections. Most of the rest of the gap reflects underinvestment in "knowledge-based capital". Investment in knowledge-based capital that is difficult to codify or replicate – such as highly sophisticated core technology or a complex integration of ICT and organisational structures – allows firms to capture much of the value created by global value networks.

**Figure 13 Why the productivity gap and how it could close**



Source: Productivity Commission

High technology business is a small component of all developed countries' economies. Yet, New Zealand's HTB sector is smaller than most, generating 0.7% of GDP in 2010 and employing 0.6% of the workforce. The sector is nevertheless one of the most export intensive in the economy, although less so than sectors such as Food & Beverage. It contributes 3% of total exports.

New Zealand ranks well in software investment and trademarks but poorly in R&D and, to a lesser extent, patents. R&D undertaken by the business sector is among the lowest in the OECD, reducing the capacity for "frontier innovation" and the ability of firms to absorb new ideas developed elsewhere ("technological catch-up").

Finally, services that are no longer affected by distance – i.e. that can be codified and traded electronically, have high information content and require limited local knowledge and face-to-face contact – are still rare in New Zealand.

## 8.2. Contribution of this research

This research consists of three case studies of successful highly innovative exporting firms. What has driven and maintained their success? What are defining factors?

The framework we have adopted in this study allows us to analyse:

- the international connections to understand how value is created in HTB and KIS industries
- the business models and value proposition to successfully commercialise innovation
- the tangible and intangible resources and capability (in effect the knowledge-based capital identified by the New Zealand Productivity Commission) that sustains the international presence of each firm
- the needs and constraints for each business to join, remain or upgrade within their respective value chain.

In essence, our framework enables us to examine and compare how New Zealand businesses have successfully commercialised innovation in their pasts. Our review of the resources, value streams and business models provide insights into the key factors to success and the major challenges to these firms.

## 8.3. How to succeed in business without worrying about scale, distance or thin markets

### Understand that it's a network not a chain

A shift in understanding from value chains to value networks could make a substantial contribution to improving the number and productivity of New Zealand's international connections, which the OECD has identified as a weakness. As noted above, the New Zealand Productivity Commission has demonstrated that over half of New Zealand's productivity gap relative to the OECD average can be explained by this weakness.

Value networks differ from value chains in that there are more actors carrying out a broader variety of functions in a value network than in a value chain, where producer-consumer-distributor relationships predominate.

Understanding the roles of the different actors in a value network allows participants to avoid commoditisation and harvest value from the entire value-creating system, and to benefit from the activities of actors with whom they have no value-chain or commercial relationship.

For two of the case study firms, the role of associate or independent actors in their value networks is as important as producer-consumer relationships. The role of independent consultants in Companies A and C are good examples. Company A's

success in extracting value from several points within its industrial automation network could serve as a template for business models in other sectors.

### Design value streams that track customer value dynamics

Value stream propositions should be designed to explicitly track, capture or create customer desired value. There is some tension between this conclusion and the complementary view which sees the market introduction process as one of commercialising research. All firms agreed that understanding the international value networks in which they participated was more important than building domestic scale.

### Use non-monetised value streams in value propositions to harvest value from the entire system

A firm's value proposition is the sum of its value streams. When designing value propositions, non-monetised value streams and information streams should be used alongside monetised product and service streams to keep the firm aligned to the value dynamics and to harvest value from the entire system.

Company B is rich in examples. Its primary relationship is distinct from its primary monetised relationship, it has created enduring digital assets from creative labour supplied to it as a free service, and the feedback on dailies free information stream is a vital underpinning of the constant quality improvements on which its market position depends.

But Company A's QDC, free prototypes and free information streams also play a vital role in sustaining Company A's position in the marketplace, as does Company C's free data analytic and information streams.

### Your presence in the network depends on your dynamic capabilities

Not all value streams within the value proposition are equally effective in sustaining the firm in the network. Sustaining the presence of particular value streams in value networks is an competitive process in which the only sure recipe for success is offering the value network an element that cannot be substituted or easily imitated.

Firms who wish to sustain their participation in value networks must therefore develop internal capabilities which are imperfectly imitable or non-substitutable. From the perspective of the individual firms, these capabilities confer competitive advantage: sustainable competitive advantage in the case of imperfectly imitable capabilities, and permanent competitive advantage in the case of non-substitutable capabilities. The strategic imperative for the firm is to deliver these capabilities into the network through value streams.

The competitive advantage conferred by imperfectly imitable or non-substitutable capabilities only holds if the capability remains aligned to the value that end-customers wish to extract from the value network. Changing customer preferences can strand a value stream, and render the underlying capability obsolete. This lifts the importance of market intelligence at a very detailed product/customer level, which can be a challenge for small firms in New Zealand.

## Immaterial assets: the basis of your value proposition

The New Zealand firms differed widely in their capability profiles, but all had significant imperfectly imitable or non-substitutable capabilities in the category of immaterial assets. Examples of immaterial assets include intellectual property, processes that ensure high but constantly evolving quality and trust relationships.

It seems that developing immaterial assets is an effective strategy for New Zealand firms who wish to succeed in global value networks.

## Focus strategies can neutralise the drawbacks of scale, distance and thin markets

In his influential book, *Competitive Strategy* (Porter, 1980) Michael Porter identified three generic strategies: cost leadership, differentiation, and focus, and demonstrated that a company's internal resources were most efficiently used when only one strategy was pursued. A fuller description of Porter's work on generic competition strategies can be found in section 4.4 of this study.

The New Zealand firms studied all pursued focus strategies, that is they limited their competitive scope to a few market segments. They all competed on attributes other than price, so we can identify differentiation focus rather than cost differentiation as the specific strategy pursued by all three firms. Cost leadership is unlikely to be a viable strategy unless the company enjoys efficient scale, and pure differentiation is unlikely to be a viable strategy unless the company enjoys significant scope economies.

New Zealand's thin markets make it difficult to achieve efficient scale or scope benefits except at low levels of output, and its distance from the thicker markets that might optimise output mean that physical products incur costs which producers located nearer thick markets do not incur. Pursuing focus strategies are therefore a reasonable response to these circumstances.

In view of these considerations, it is worth recalling that two of the firms studied did not build scale in New Zealand before entering the international market. The third had a long history in New Zealand before engaging internationally but did not feel that its international success depended on this history.

All firms agreed that understanding the international value networks in which they participated was more important than building domestic scale.

## Don't be the next Google. Learn to love iterative innovation

Innovation paths in value networks are the outcome of the constant alignment and realignment of firms' capabilities with changing customer value preferences (business concept innovation). It follows that most innovation is iterative rather than disruptive, although disruptive innovation can emerge from this system as well.

Iterative innovation is better aligned to customer value dynamics and therefore lower risk than disruptive innovation. In the ideal case, firms should develop operating models that enable iterative transactions between the bearers of customer value and the bearers of firms' capabilities. In such a case these transactions become the R&D process for the firm.

This is an important commercial consideration. An innovation path which is determined by customer value and relationships already established is inherently less

risky than one which depends on the commercialisation of pure research. It is also better able to keep pace with the market.

Under the value network construct, innovation takes place at the level of the business concept, and takes the form of realigning transactions and resources (mostly people, human capital) to match changing customer value. It follows that developing and maintaining agile human capital is critically important to the ability to firms to continue to harvest value from networks.

New Zealand's distinctive local variety of agile human capital is embodied in the Rutherford effect: we need to do everything we can to protect this national capability and deliver it to global value networks through value streams.

### Maximise touchpoints with customers

Focus strategies are not necessarily high-touch, but it is nonetheless true that all of the New Zealand firms studied took pains to create commercial and operating models which maximised the frequency of touchpoints with a variety of actors in their value networks.

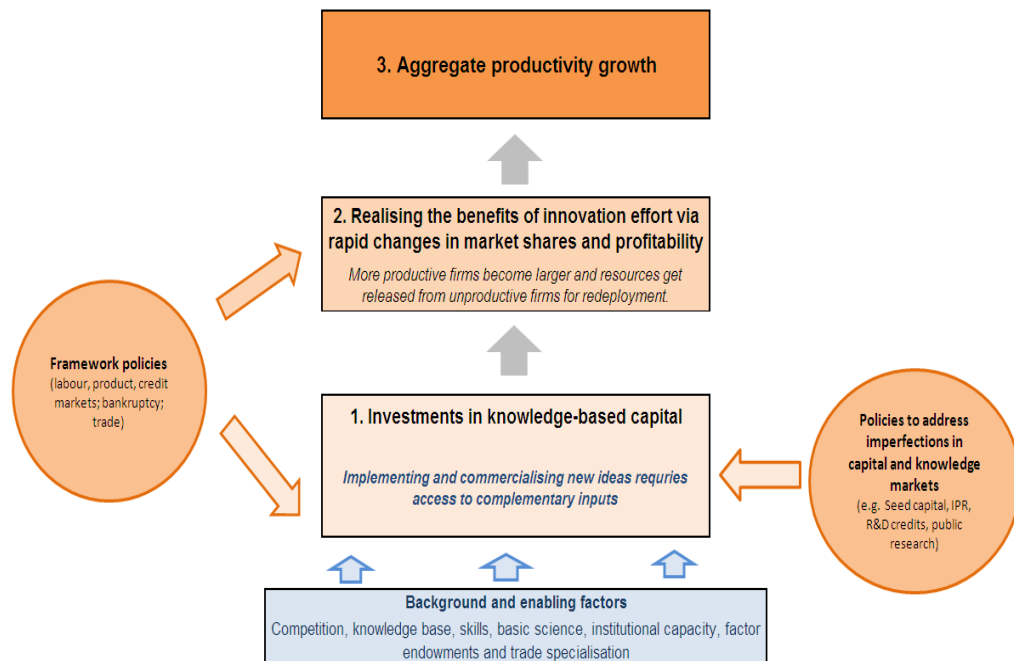
The strategies deployed to do this included intricate revenue models, highly iterative quality processes and constant engagement on planning and information-sharing streams. These strategies also optimise the potential for iterative innovation, and intensify the firm's engagement with the network.

# 9. Policy implications

## 9.1. Generic policies need further targeting

Figure 14 summarises the generic understanding of what policies can do to support HTB and KIS industries.

**Figure 14 Generic policies to support knowledge industries**



Source: OECD (2013)

Examples of such policies include:

- **Enhancing knowledge diffusion** – Support for innovation will need to be broadened from ‘mission-oriented’ science and technology projects to ‘diffusion-oriented’ programmes. This includes providing the framework conditions for university-industry-government collaborations, promoting the diffusion of new technologies to a wide variety of sectors and firms, and facilitating the development of information infrastructures.
- **Upgrading human capital** – Policies will be needed to promote broad access to skills and competencies and especially the capability to learn. This includes providing broad-based formal education, establishing incentives for firms and individuals to engage in continuous training and lifelong learning, and improving the matching of labour supply and demand in terms of skill requirements.
- **Promoting organisational change** – Translating technological change into productivity gains will necessitate a range of firm-level organisational changes to increase flexibility, particularly relating to work arrangements,

networking, multi-skilling of the labour force and decentralisation. This point is clearly closely linked to the previous one: effective organisational change ultimately rest on soft skills and adaptability. Governments can provide the conditions and enabling infrastructures for these changes through appropriate financial, competition, information and other policies (OECD, 1996).

All of these policies are valuable, but they do not address specific features of the commercialisation-innovation cycle (the value cycle) examined in this study. To understand and generalise these specific features, we turn to some recent work by the OECD which establishes a taxonomy of innovation modes and networks.

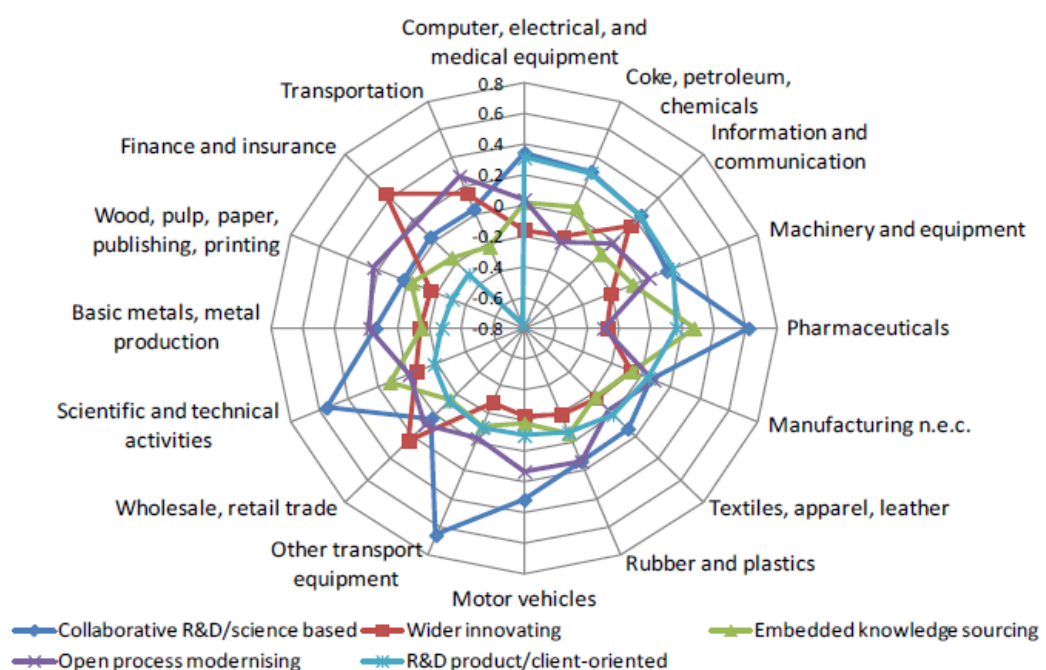
## 9.2. The different HTB and KIS networks

In a recent study the OECD surveyed a large number of innovative businesses across Europe and grouped the businesses into categories based the most frequent modes observed within the industry. This established that each industry does seem to have a predominant type of innovation network.

Figure 15 shows the result of their modelling. The three businesses surveyed in our research fit under R&D product/client-oriented mode (Companies A and C fall under the *Computer, electrical and medical equipment* classification; Company B under the *Information and communication* classification).

**Figure 15 The incidence of innovation modes, by sector of activity**

Result from factor analysis



Source: OECD (2013a)



Table 24 summarises the differences in the types of innovation networks the OECD identified.

**Table 24 Modes of knowledge sourcing and innovation**

Networks (Innovative mode)	R&D	Knowledge sources	Collaboration	Innovation activities / investment	Innovation outcomes
R&D product/client oriented	Yes	High on clients and competitors	Low, mainly clients and customers	Intramural R&D, other activities including design	Goods, marketing, partly services
Collaborative R&D/science-based	Yes	High on labs, universities, government	High on all, including institutional	Intramural and extramural R&D	New products (goods and services)
Embedded knowledge sourcing	No	High, most sources	Low	Capital acquisition	Low, only production process
Open process modernising	No	Market sources, principally suppliers	Market sources, principally suppliers	Training and capital and knowledge acquisition	Process
Wider innovating	No	Low, consultants	Low	No systematic activity	Services, marketing, organisation

Source: OECD (2013a)

Due to the different factors which feed into the GVN, policies which are effective in one mode may be less effective in another. This supports the view that GVNs and GVCs are highly heterogeneous.

The official innovation system in New Zealand is focused on the second row in the table above (Collaborative R&D/science based): the first row – the innovation networks exemplified by the case firms in this study – receives scant attention or policy support.

The case study firms in our study have few links with universities or centres of research, so investment in R&D through these channels will have little impact on them. Clearly R&D product/client oriented networks stand to benefit from different forms of policy support.

### 9.3. Rationale for value network oriented policies

The OECD's work provides a useful basis for developing a rationale for policy intervention to create and support value networks.

In the absence of government funding, the sustainability of networks depends on their ability to finance operations in return for the services provided. This may occur through the charging of prices, membership fees and bundling free services. In light of this, the OECD observes that exploiting economies of scope and scale in providing services for

knowledge exchange can be particularly difficult in some narrowly-defined knowledge domains (OECD, 2013a).

The OECD concludes that:

*“The costs of setting up and running a market or network tend to fall primarily on the organisations actively promoting it. They stem from the process of finding the right partners, negotiating, creating behavioural rules for cooperation and building the necessary shared resources” (OECD, 2013a).*

The OECD observes that the benefits of an efficient network tend to accrue to all of its members. This is also true for the costs of actually running a network. Actors within a network may want to free-ride on transaction costs borne by the co-ordinators or promoters of a network and thus networking has a public good or externality dimension (OECD, 2013a).

Our analysis lends support to the OECD position: the presence of network actors who do not or have not borne a proportionate share of the costs of establishing or sustaining the networks *does* appear to enable value-creation or value-capture within the network.

The private benefits from network formation may not cover the private costs for some partners, although the social benefits may be substantial. A firm will only engage in developing that network if the perceived private benefits exceed its private costs. Therefore, there may be room for efficiency-enhancing government intervention to address the aforementioned awareness, information, search and transaction cost problems associated with networking (OECD, 2013a).

## 9.4. Possible policy interventions

Our current policies support the Collaborative R&D/science oriented mode of innovation. R&D funding is directed to the development and commercialisation of pure research in the hope of eventually finding customers for the innovation.

However, for the case study firms in this study, innovation is iterative, and consists of transactions which take place directly between actors embodying the firm’s capabilities and actors embodying customer value dynamics.

The idea of engaging in pure research which is then commercialised in the hope of eventually finding customers seems a highly protracted and speculative venture to them, and one beyond the commercial realities which constrain them. Creating supply in the hope that demand will come carries the obvious risk that demand will not come.

None of this diminishes the importance of pure research or of ensuring that pure research has ample public support. We merely point out that such policies address only part of the commercialisation-innovation cycle, and that attention should also be devoted to policies which support iterative business concept innovation within value networks.

A possible framework could be developed around the different stages of the networking process, using the stages identified by the OECD. The stages include:

- developing awareness of a networking possibility

- searching for partners
- building trust and a shared knowledge base
- organising the network
- ensuring complementary resources
- active co-operation (OECD, 2013a).

Market failures can occur at each stage in the process, but are frequent in the early stages of network formation and operation (search, setting-up, trust formation, etc.). Network actors are better placed than government to deal with challenges in the later stage of the process, so government intervention can usefully be concentrated in the earlier stages: developing awareness, searching for partners, and building trust and a shared knowledge base. (OECD, 2013a).

Finally we offer some tentative suggestions of specific interventions prompted by the conclusion of our study and the framework above. These include:

- Encouraging **New Zealand trade bodies to track customer value dynamics** and disseminate the information to New Zealand firms. All three case study firms stressed the difficulty of remaining abreast of developments in world markets at the detailed level, which is commercially important. If, for example, NZTE were used to aggregate such information and disseminate it successfully it could become an effective associate in the innovation paths for New Zealand firms. Foreign industry bodies are already carrying out this function for Company A.
- **Increasing the sophistication of New Zealand firms' understanding of dynamic capabilities and focus strategies.** The Rutherford effect is a precious national capability: think how powerful it could be if an understanding of the extent to which our products and services embody unique capabilities, the value of which can be optimised by applying the most effective market introduction strategies were added to our innate gifts for problem-solving and trouble-shooting. Business schools and industry bodies could take the lead in disseminating this information more widely.
- Generalising an **understanding of the effectiveness of immaterial assets** in sustaining business from New Zealand. This could encompass an IP protection system which determined when IP was best protected, when it was best treated as a business secret, and when it was best treated as a commons. This is considered more fully in the following section.
- Trade missions could be focused around **generating specific relational assets**, and setting up actor relationships within potential networks.
- Country experts could be employed in working with New Zealand firms to develop culture-specific immaterial assets for target markets.
- Universities and business schools could devote attention to value proposition design, in particular the role of non-monetised streams within them, making their findings available to the commercial community within New Zealand.
- Common platforms for knowledge-sharing and information-exchange could be developed for specific networks.

## 9.5. Immaterial assets

Much of the success of the case study firms is linked to their achievements in creating immaterial assets, so we close by offering a few thoughts on what should be taken into account when considering policy in this area.

It is clearly in New Zealand's national interest to preserve and extend its success in creating immaterial assets, including intellectual property (IP). The only one of the case study firms that devoted much effort to protecting its IP through patents or trademarks was Company A. The more recently founded companies did not seek formal protection for IP, treating it as a business secret, or even a free good.

The effect of protecting IP by patent or licence is often to transform it into a tradeable good from which rents can be generated in the short term, but which is more freely available to actors within the network. This can be a way of opening the IP to innovation within the network, but in other circumstances could have the effect of transforming a capability that was formerly imperfectly imitable or non-substitutable into one that is merely valuable. The risk of impairing the non-substitutability of a capability (thereby weakening New Zealand's competitive position within value networks) needs to be balanced against the opportunity for value creation provided by making the capability tradeable.

The position in respect of business secrets is similarly nuanced. Business secrets keep innovation at home and do not therefore automatically support capability building or technology transfer beyond the confines of the firm. National interest and individual firm interests may not be perfectly aligned.

# Appendix A Detailed firm profiles

Table 25 summarises NZPECC’s research requirement and how NZIER’s framework and approach provide the required findings.

**Table 25 Research requirement and research method**

<i>What?</i>	<i>How?</i>	<i>Report section</i>
The full breadth of the GVC is described	Value Network maps	6.2.6; 6.2.7;6.2.8; 6.3.5; 6.4.5.
The position of the New Zealand firms relative to the positions of other participants is clear	Value network maps Value network actor identification	6.2.6; 6.2.7;6.2.8; 6.3.5; 6.4.5 6.2.4; 6.3.4; 6.4.4
The way in which New Zealand firms participate in the value creating system is identified	Value network maps Value network actor identification Value stream identification Dynamic capability analysis	Chapters 5 and 6.
Evolutional elements are exposed	Case study firm profiles Value dynamics analysis	Chapter 4 6.2.1; 6.3.1; 6.4.1
The environmental dynamics that lead firms to participate in the value-creating system are examined	Case study firm profiles	Chapter 4
The value captured by New Zealand firms participation is identified	Case study firm profiles Value network maps	Chapter 4 6.2.6; 6.2.7;6.2.8; 6.3.5; 6.4.5
Value constraints and strategies to address these are identified, including policy implications	Case study firm profiles Value dynamics analysis Dynamic capabilities analysis Policy implications	Chapter 4 6.2.1; 6.3.1; 6.4.1 5.3; 5.4; 5.5 Chapter 9
Value captured from GVCs is quantified in actual and relative terms	Case study firm profiles	Chapter 4,
Factors that are common to many firms or the sector as a whole are distinguished from those that are specific to a firm or particular value-creating system	Case study firm profiles	Chapter 4,

Source: NZIER

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