EXPLORING ENTREPRENEURIAL ECOSYSTEM GROWTH THROUGH INTERMEDIARIES-ANCHOR ORGANISATION INTERACTIONS

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ABSTRACT

Agri-food technology can provide innovative solutions to the traditional agri-food sector in the face of increased demands from the environment, consumers, and policymakers. New Zealand is a global leader in agri-food commodity production and exports, however, several challenges exist in the nascent agri-food technology ecosystem such as the absence of key ecosystem actors, resource dependency and leakage. Anchor organisations are recognised as essential actors for fostering entrepreneurial ecosystem growth through knowledge sharing and spillovers and attracting and deploying resources. This research aims to understand anchor organisation's role and interactions within New Zealand's agri-food tech entrepreneurial ecosystem, and how intermediation can enhance the value they create for the ecosystem in which they are embedded. Specifically, how intermediary organisations can facilitate and broker greater interactions between anchor organisations and other ecosystem actors.

This qualitative study adopts an objective ontological view in a pragmatic paradigm. Abductive reasoning directed data collection and analysis as semi-structured interviews and visual methodology was collected as primary data. Ten anchor organisations from New Zealand's agri-food ecosystem were interviewed including universities, crown research institutes, co-operatives and private/investor-owned corporations.

Lower dependency on anchor organisations requires ecosystem actors to collaboratively address the gaps and opportunities in New Zealand's agri-food tech

entrepreneurial ecosystem. This includes greater independent generation and recycling of resources between actors. Furthermore, we would expect greater collaborations could increase entrepreneurial opportunities and promote the growth of the ecosystem.

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CHAPTER 1: Introduction

1.1 Background

The global population is expected to grow to 9.8 billion in 2050 along with increased demand for food (AgFunder, 2017). The current methods for growing, processing, and supplying food are straining under the increased demands from the environment, consumers, and policymakers, making the need for change in the Agri-food sector ever more important (AgFunder, 2017). Agri-food technology includes technology for harvesting crops and supporting livestock health, to the consumer end of novel ingredients and alternative foods. Agri-food technology can provide added value, sustainability, transparency, and agility to the traditional sector (AgFunder, 2022). New Zealand's Agri-food tech sector is relatively small due to the small and isolated local market, the history of commodity exports, and hesitancy for technology adoption (Ministry of Business, Innovation and Employment [MBIE], 2020). This research views New Zealand's Agri-food tech sector from an entrepreneurial ecosystem lens. Under the right conditions, entrepreneurial ecosystems can leverage resources and interactions to induce high rates of entrepreneurship, create rapid job opportunities, GDP growth and long-term regional productivity (Isenberg, 2010; Pohlmann, 2022; Spigel, 2020).

Past literature on entrepreneurship has focused on the individual entrepreneur rather than the connections and environmental conditions that shape entrepreneurial dynamics (Colombelli et al, 2019). More recently, a proliferation of research has been seen on understanding entrepreneurial ecosystems due to the successful ecosystem

examples globally (such as Silicon Valley) and the interest to replicate this success in other regions. An entrepreneurial ecosystem can be defined in many ways, but a common definition, and the one adopted in this study, is “the union of localised cultural outlooks, social network, investment capital, universities and active economic policies that create environments of supportive innovation-based ventures” (Spigel, 2017, p.49). Regardless of the many definitions, scholars agree that the entrepreneurial ecosystem concept involves connectivity and resource sharing which is determined by the actors present, factors, life cycle and context of the ecosystem (Isenberg, 2010; Spigel, 2020; Spigel & Harrison, 2018).

Anchor organisations are recognised as essential actors in entrepreneurial ecosystems for fostering entrepreneurship growth and regional development (Pisano, et al., 2016). Pohlmann (2022) suggests early entrepreneurial ecosystems are centralised around a trusted anchor organisation as they "bridge the structural holes" in the ecosystem (Pohlmann, 2022, p. 63). A common definition for anchor organisation, and the one adopted in this study, is large, regionally significant organisations that directly or indirectly create networks of local and external actors and promote entrepreneurial initiatives or ideas (Harris & Holley, 2016; Pisano et al., 2016). The function of 'anchoring' results from a complex collection of characteristics and resources held by the organisation (Pisano et al, 2016). This research focuses on four types of anchor organisations common in the Agri-food sector including Universities, Crown Research Institutes, Co-operatives, and Private/Investor-owned corporations.

1.2 Purpose and Research Question

This research aims to answer theoretical and practical research questions. This research aims to understand the role and interactions of anchor organisations in New Zealand's Agri-food tech entrepreneurial ecosystem to provide insights for intermediary organisations. Furthermore, how intermediaries can facilitate and broker interactions with anchor organisations to enhance the value they create for the entrepreneurial ecosystems in which they are embedded. The research aims to answer the following research question:

How can intermediary organisations facilitate interaction with anchor organisations within an entrepreneurial ecosystem?

To answer this question, the research was divided into the three main opportunities identified in the literature review, which leads to three sub-questions that shape the interview guideline:

- *Sub-question 1: Who do anchor organisations interact within an Agri-food tech entrepreneurial ecosystem?*
- *Sub-question 2: What value do anchor organisations provide to other actors in the ecosystem?*
- *Sub-question 3: What challenges do anchor organisations face when interacting within the ecosystem?*

1.3 Research Design

This study adopts an objective ontological view because the research's core aim is to understand anchor organisations within an ecosystem. Organisations, such as anchor or intermediary organisations, are understood to be social entities external to the actor with a reality of their own (Bell & Bryman, 2014). Adopting an objective ontological view directs the choice of epistemology, research approach and data collection methods for this study. The research was carried out from a pragmatic paradigm using abductive reasoning for data collection and analysis. This was implemented by the "back-and-forth" engagement with the research finding, as an empirical information source, and with literature (Bell & Bryman, 2014).

The primary data collection methods used in this research were semi-structured interviews and visual methodology. 11 participants from 10 different organisations were involved in this study, all of which are based in New Zealand, identified as anchor organisations, involved in Agri-food innovation or technology and key opinion leaders. The interview transcripts were coded using thematic analysis, focusing on interactions, values and challenges of the interviewed organisations. These themes were the basis of the discussion and conclusions of this study.

1.4 Main Findings and Contribution

Several studies explore the actors and factors of entrepreneurial ecosystems (Isenberg, 2010; Jolley & Pittaway, 2019; Spigel, 2020). There are few scholars who focus on anchor organisation's role in entrepreneurial ecosystems, and fewer more

who pursue an understanding of intermediary organisations' role in facilitating interactions and resource sharing of anchor organisations and the ecosystem. The research findings indicated several overarching themes in relation to the literature review.

First, the study identified that the common actors in New Zealand's Agri-food tech entrepreneurial ecosystem aligned with the literature by Spigel (2020) and Isenberg (2010). However, the study found the government, experienced entrepreneurs and later-stage investors were not present or not effective in New Zealand's Agri-food tech ecosystem. This is important in identifying knowledge and resource gaps for which intermediaries can mobilise and orchestrate necessary resources to create balance and growth for the ecosystem (Hern´andez-Chea et al., 2021).

Second, the value and challenges the participants perceived in their interactions within the ecosystem indicated the ecosystem's reliance on anchor organisations' resources (including capital, knowledge, research, and IP). The one-directional flow, dependency and recycling highlighted the nascent stage of New Zealand's Agri-food tech ecosystem (Spigel & Harrison, 2018; Brown & Mason, 2017).

Third, anchor organisations with functions or involvement in research and development demonstrated knowledge spillover through formal and informal interactions (Qian et al, 2013). Scholars relate knowledge spillovers to regional proximity, however, the findings suggest that agency is an important element for entrepreneurial impact over spatial immobility (Cantor et al., 2013).

Finally, from this research, it is clear that intermediary organisations have an important role in "filling the void" in nascent ecosystems. However, other actors may also take on an ecosystem builder role through their current functions and connections. Within the context of Agri-food tech, co-operatives demonstrate anchoring functions and intermediation following Yusef (2008) categories of intermediary organisations. Additionally, a collaborative approach to address the gaps in New Zealand's Agri-food tech ecosystem, could reduce resource dependency on anchor organisations, create greater independent generation and recycling of resources, in turn leading to a resilient ecosystem.

1.5 Thesis Structure

The research structure is as follows: Chapter 2 reviews the theoretical framework, considering current literature and industry reports on the global and New Zealand Agri-food sector and technology. Followed by a review of the current literature on entrepreneurial ecosystems including actors and evolution. The elements and types of anchor organisations are then defined, followed by the definition of intermediary organisations. Chapter 3 presents in detail the methodology and data collection process. Findings are illustrated in Chapter 4, while Chapter 5 presents the discussion of the findings and their relationship with the literature. Chapter 5 also concludes how findings relate to the research questions, considers their implications for research and industry, and suggests potential directions for future research.

CHAPTER 2: Theoretical Framework

2.1 Agri-food Technology

The Agri-food sector (including agriculture, horticulture, apiculture, and aquaculture) is considered one of the most important sectors for economic development in the world and contributes to a large proportion of the gross domestic product (GDP) of most countries (Miranda et al, 2019). However, the Agri-food sector is straining under the increased demands from the environment, consumers, and policymakers. As with all industries, science and technology plays a key role in the operation and growth of the Agri-food sector. Agri-food technology can provide added value, sustainability, transparency, and agility to the traditional sector (AgFunder, 2017).

"Agritech has the unique opportunity of providing solutions that concurrently improve productivity and sustainability" (MBIE, 2020)

Agri-food technology is defined as "technology companies that are creating product, service, and value chain solutions for the primary sector" (Technology Investment Network, 2021). Agri-food technology has broad applicability across many of the sector's value chains. Figure 1. shows the broad applicability of Agritech.

The global Agri-food technology market was valued at US $ 494.9 billion in 2022 and is expected to reach US $ 729.5 billion by 2028 with a CAGR of 8.1% between 2023 and 2028 (Market Data Forecast, 2023). 2021 saw rapid growth in the Agri-food technology investment landscape with US $51.7 billion invested in 3155 deals

globally (New Zealand Trade and Enterprise, 2021). The Covid-19 pandemic highlighted the importance of supply chain efficiency and food security, resulting in increased interest by technology investors in the traditional food and agriculture industry (Lezoche et al, 2020). However, the same trend did not continue in 2022 with global Agri-food tech funding totalling $29.6 billion, a 44% year-over-year decline (AgFunder, 2023). The rise and falls of the sector align with global market trends such as rising inflation, however, there are several sector-specific factors driving changes in the Agri-food sector. These drivers can be summarised in the following key areas:

- **Climate Change:** Food producers are facing new risks and challenges from rising temperatures, changing weather patterns, water and biodiversity issues. Governments, farmers, growers and scientists are seeking to mitigate climate change through innovative solutions (MBIE, 2020).
- **Food Insecurity:** The UN forecasts there will be an additional two billion mouths to feed globally by 2050, requiring a 70% increase in annual food production to ensure food security. However, with the growing labour gap and over 90% of staple crops including lettuce, avocados, apples, and broccoli still harvested and packaged by hand, the capacity to meet this demand appears increasingly unlikely (Miranda et al, 2019).
- **Supply Chain Efficiency and Disruptions:** The Agri-food sector often suffers from very low efficiency and productivity due to complex supply chains, sensitivity to weather, market disruptions and poor communication or links between supply chain stakeholders (Lezoche et al, 2020). A recent example is

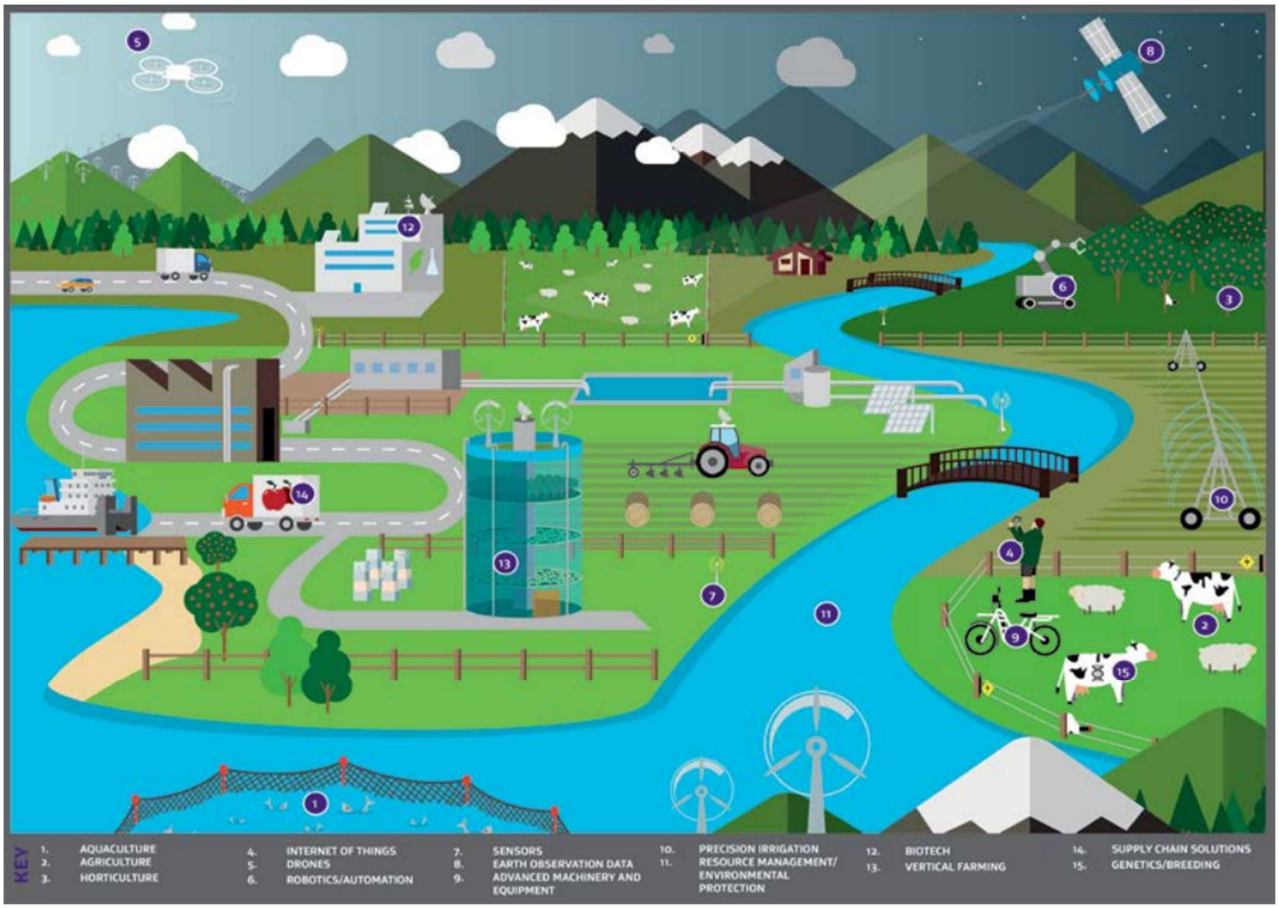
the significant impact and disruption of the Ukraine war on food supply chains, demonstrating the need for more innovative solutions.

- **Labour Shortages:** Widespread agriculture labour shortages coupled with increasing labour costs have challenged farming and fieldwork practices for years (Lezoche et al, 2020). The Covid-19 pandemic has further intensified the situation, creating global labour shortages that have led to billions of dollars in crop losses and inflated the cost of fresh produce.
- **Consumer Preferences:** Consumers are shifting away from traditional drivers such as price and are focused on more sustainable, traceable, transparent, and ethical food products (MBIE,2020). Current consumer preferences include; how farmers prioritise animal welfare, technology adoption for traceability, alternative and sustainable food products.
- **Technology Progress:** Agri-food differs from other technology sectors as technology development and implementation are limited by seasonal growth cycles, constrained by the biological and physical processes of plants and animals, and impacted by exposure to weather and environmental risks (Fairbairn, 2022). This increases the time to market of novel technologies and long runways for investment.

The Agri-food tech sector is defined in many different ways with a variety of sub-categories including: "crop and livestock biotechnology; farm management software and big data analytics; in-field and remote farm sensors; farm robotics; vertical agriculture and other novel farming systems; food safety, traceability, and supply chain logistics; cultured meat, plant-based meat, and other alternative proteins;

electronic restaurant and grocery delivery apps; and robotic delivery" (Fairbairn et al., 2022, p.653). E-Grocery continues to be the most prominent Agri-food tech category and represents 17% of the global Agri-food tech funding in 2022.

Figure 1. Agritech's broad applicability adapted from MBIE (2020)



2.1.2 New Zealand's Agri-food Ecosystem

Agriculture is a major product and export industry in New Zealand, contributing NZ$13.5 billion to New Zealand's GDP in 2021 (Statista, 2022). The Agri-food sector employs one in every five New Zealanders and feeds New Zealand and tens of millions of consumers globally (Ministry of Primary Industries [MPI], 2022). The New Zealand Agri-food tech ecosystem is still young, however, New Zealand Trade

and Enterprise report (2021) highlights several strengths of the sector including originating from a strong university and research sectors (strong IP and technical expertise in science, technology, and engineering), knowledge on productive and effective agricultural practises, and deep financial support at early stages (through government grants and angel networks) (New Zealand Trade and Enterprise [NZTE], 2021). In comparison to other countries, Oceania (including Australia and New Zealand) showed the lowest total funding into Agri-food technology at US$317 million in 2022 (AgFunder, 2023). There are several factors at play driving the stark difference between regions:

- New Zealand's primary sector has traditionally focused on commodity trading. Dairy (particularly whole milk powder) accounts for approximately 20% of New Zealand's total export weight, followed by meat (including beef, veal and lamb) (19%) and Kiwifruit (7%) (MPI, 2022).
- New Zealand is a small and isolated market lending itself to low domestic competition, high structural costs, lack of incentive to scale up and low participation in global value chains (MPI, 2022). Additionally, New Zealand's food innovation system is complex and fragmented, with a significant lack of connection, low levels of collaboration and waste.
- Hesitancy by farmers and growers to adopt technology is a global challenge and is prominent in New Zealand's primary industry.
- Low availability of follow-on capital (NZTE, 2021)
- Limited affordable facilities available for commercial scale-up of complex technologies (NZTE, 2021)

New Zealand's Agri-food tech ecosystem includes several government organisations such as the Ministry of Business, Innovation and Employment (MBIE), the Ministry of Primary Industries (MPI) Callaghan Innovation and New Zealand Trade and Enterprise (NZTE). In addition, there are several government-supported industry groups such as AgriTech NZ, KiwiNet, and the Food Innovation Network. The Food Innovation Network is region-based and provides access to pilot and early-stage food production facilities, as well as, expert knowledge, equipment and connection for companies to scale products and innovation. MPI's Food and Beverage Industry Transformation Plan (2022) identified that early-stage businesses need more on the ground support for product-market-fit, a greater understanding of the industry and value chain, and access to capital (MPI, 2022).

Academic and industry research outputs are core to New Zealand's Agri-food tech ecosystem. Co-operatives and private/investor-owned corporations are leaders in New Zealand's research outputs for technology and innovation in the Agri-food sector with dedicated R&D facilities and national and international research collaborations (MBIE, 2020). Co-operatives are one of the largest players in New Zealand's Agri-food sector. Universities and Crown Research Institutes (CRIs) are also key contributors to the ecosystem's academic research and intellectual property.

The regulatory environment, including minimum standards, approval processes, verification and transparency, is critical to the Agri-food sector to ensure public safety and provide insurance for supply chain partners and consumers (MPI 2022). The regulatory setting, if adaptable, also allows the opportunity for the growth of new food types and practices such as cultivated proteins and food from indigenous

ingredients. New Zealand's current regulations are effective however, leave minimal room for adaption and novel thinking. The complex regulatory setting has also posed a challenge for start-ups to navigate resulting in inefficiencies and limited export growth outside of large companies (MPI, 2022).

MBIE's Agritech Transformation plan (2020) aims to accelerate the growth and success of the sectors with the goal of Agritech contributing $8 billion to the New Zealand economy by 2030 (MBIE, 2020). The New Zealand government has already invested significant money into targeted funds, research programmes, policies, and industry transformation plans to increase change towards a high-wage, low-emissions, and resilient economy (MBIE, 2020).

An outcome of the government priority and market need is Sprout Agritech. Sprout Agritech was founded in 2014 as a specialised accelerator programme. is the accelerator aims to provide commercial support and understanding to Agri-food technology-based start-ups. In 2020, Sprout Agritech's role expanded to incorporate pre-seed/seed stage investment functions. During the researcher's time working at Sprout Agritech, the company has focused on initiating and developing relationships with other actors in the Agri-food tech ecosystem such as universities, CRIs (Crown Research Institutes), government agencies/departments, VCs (venture capital firms), corporates and entrepreneurs. This thesis centres Sprout Agritech within an entrepreneurial ecosystem due to the identified key players (finance, entrepreneurs, research institutes, and intermediary organisations), focus on regional development, the importance of collaborative value, and the interwoven attributes forming the

ecosystem (Hakala et al, 2020; Spigel, 2017). The researcher interned at Sprout Agritech during this research.

2.2 Entrepreneurial Ecosystem

Past literature on entrepreneurship has focused on the individual entrepreneur rather than the connections and environmental conditions that shape entrepreneurial dynamics (Colombelli, et al 2019). Recently, there has been growing popularity in business literature to understand entrepreneurial ecosystems. A potential reason for this is the growth of successful ecosystem examples globally (such as Silicon Valley, Israeli and New York City) and the increased interest from public policy to replicate these examples within their regions (Jolley & Pittaway, 2019). The entrepreneurial ecosystem concept has developed within business literature and stems from a wide range of established business concepts including clusters, regional innovation systems, business ecosystems and industrial parks (Jolley & Pittaway, 2019).

An entrepreneurial ecosystem can be defined in several different ways, but a common definition is "the union of localised cultural outlooks, social network, investment capital, universities and active economic policies that create environments of supportive innovation-based ventures" (Spigel, 2017, p.49). Entrepreneurial ecosystems are said to induce high rates of entrepreneurship within a region, creating rapid job opportunities, GDP growth and long-term regional productivity (Isenberg 2010; Spigel, 2017).

Within literature, entrepreneurial ecosystems are connected to the concept of spatial boundedness, however, different levels of spatial boundedness are possible ranging

from city or region to country (Colombelli, et al 2019). Although this varies on the ecosystem, connectivity and knowledge sharing among actors are common features. The next sections identify the common actors present in entrepreneurial ecosystem and highlights the abundance of scholarly research aiming to identify the key elements for entrepreneurial ecosystem success.

2.2.1 Elements and Factors of Entrepreneurial Ecosystems

There is a proliferation of research to date that focuses on identifying the actors and factors of successful entrepreneurial ecosystems. A variety of names are used to describe the factors of an ecosystem including domains, elements, and attributes. Several consistent factors include "supportive culture, universities and research labs, large corporations, financial capital, business networks, support organizations, and public policy, all of which incentivize and support start-up creation" (Harima, 2020, p.31). Isenberg (2010), an early scholar of entrepreneurial ecosystems, established a model to describe the key domains relevant to the concept, shown in Figure 2, including i) policy, ii) finance, iii) culture, iv) supports, v) human capital and vi) market.

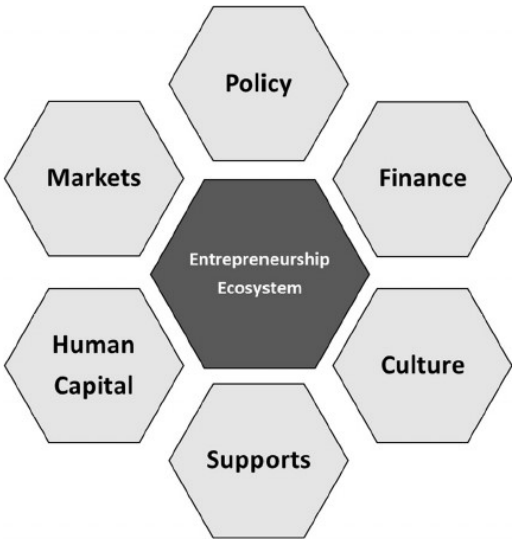


Figure 2. Model of Entrepreneurial Ecosystems adapted from Isenberg (2010)

Recent scholars argue that factors and domains of entrepreneurial ecosystems are fluid and vary depending on region, context and age. Brown & Mason (2017) suggest that the significance of an ecosystem is related to the actors present and the resources available for development and initiatives within the ecosystem. This aligns with the central assumption that local resources can be leveraged to help new ventures start-up and scale faster when entrepreneurial ecosystems are under the right conditions (Pohlmann, 2022).

2.2.2 Actors of Entrepreneurial Ecosystems

Actors are "individuals or organisations who possess agency within the ecosystem to in some way affect or contribute to high-growth entrepreneurship" (Spigel, 2020, p.46). Within an entrepreneurial ecosystem, actors have their own priorities and resources to enable innovation, growth and impact. By definition, entrepreneurs are essential actors in entrepreneurial ecosystems (Spigel, 2020). Besides entrepreneurs,

investors were a common actor identified by scholars within the ecosystem. Spigel (2020) suggests this is a reflection on the importance of finance firms for funding growth ventures, and research and development. Anchor firms and research organisations (such as Universities and Crown Research Institutes (CRIs)) were also common actors present in successful entrepreneurial ecosystem examples. Table 1 summarises the most common types of actors present in entrepreneurial ecosystems according to the literature.

Table 1. The Actors of Entrepreneurial Ecosystems adapted from Spigel (2020)

Actors	**Definition**
Entrepreneurs	Entrepreneurs and other actors who can provide collective leadership to identify and address challenges facing the startup and scale-up community
Investors	Private and public sources of startup capital including angel investors, venture capitalists, and public granting agencies
Skilled Workers	The presence of a highly skilled labour pool in the region that is accessible to startup and scale-up firms
Role Models	Successful entrepreneurs who mentor and advise younger entrepreneurs

Early Customers	The presence of early customers and low barriers of entry for new ventures to join local supply chains
Support Professions and dealmakers	Business service providers such as lawyers, accountants, and advisors that specialise in the unique needs of startup and scale-up firms
Universities	Universities conducting cutting-edge research that spills over to the local community
Anchor Firms	Large organisations such as branch offices, corporate headquarters, or universities create new opportunities for entrepreneurs and attract skilled migrants to the region
Incubators, accelerators, and support organisations	Public and private organisations that train and otherwise support startup and scale-up entrepreneurs, including incubators, accelerators, and networking groups

There are many adaptions and additions possible for actors present in an entrepreneurial ecosystem. Spigel and Harrison (2018) present groups of ecosystem actors including; anchor organisations, high-growth firms, and other ecosystem actors, shown in Figure 4. A common actor in many iterations of the entrepreneurial ecosystem concept is anchor organisations. Anchor organisations were identified as a catalyst for ecosystem evolution due to their ability to inject and attract resources into the ecosystem (Pisano et al., 2016).

As identified in section 2.2.1, Isenberg's model proposes 6 domains found in successful entrepreneurial ecosystems. Associated with these domains are key actors that provide infrastructure, resources and access such as investors proving access to finance and capital, incubators and accelerator infrastructure for supporting and generating an entrepreneurial culture, and anchor organisations providing access to human capital and market knowledge (Mason & Brown, 2014). Table 2 presents an expansion on Isenberg's model (2010) as proposed by Mason & Brown (2014).

Table 2. Domains, Key Actors, and Examples within an Entrepreneurial Ecosystem adapted from Mason & Brown (2014)

Domains	Key actors	Examples
Policy	Government, Regulatory bodies	Regulatory framework incentives, R&D incentives, Venture friendly legislation
Markets	Early customers, Multinational corporations	Early adopters for proof or concept, expertise in go to market, distribution channels
Human Capital	Entrepreneurs, Universities, Skilled workers	Specific entrepreneurship training, tertiary education
Support	Incubators, support services (i.e. accounting, legal).	Infrastructure (i.e. co-working spaces, clusters), conferences

Culture	Successful entrepreneurs (i.e. role models)	Success stories, social norms
Finance	Angel investors, VC, private equity	Grants, loans, equity investment

Spigel (2017) agrees that there are common factors and actors of entrepreneurial ecosystems, however, that they do not exist in isolation but are interconnected. The connection between the factors and actors drives the entrepreneurial processes and the evolution of the ecosystem over time. However, there is limited scholar discussion on the connectivity between actors and factors and how these interactions produce the concept of the ecosystem (Spigel, 2020). These interactions build a "holistic system which turbocharges venture creation and growth" (Isenberg, 2010, p.43).

To further understand the complexity of entrepreneurial ecosystems, recent studies have focused on the evolutionary nature of the entrepreneurial ecosystems, from nascent to mature (Brown & Mason, 2017). This is discussed in section 2.2.3.

2.2.3 Evolution of Ecosystems

There is consensus in recent research that entrepreneurial ecosystems are complex evolving systems and strict domains do not encapsulate the complexity of the system. Mack & Mayer (2016) introduced an initial model of the evolution of entrepreneurial ecosystems spanning several stages from birth, growth, and

sustainment to decline. An adaption of Mack & Mayer's (2016) evolution life cycle is shown in Figure 3.

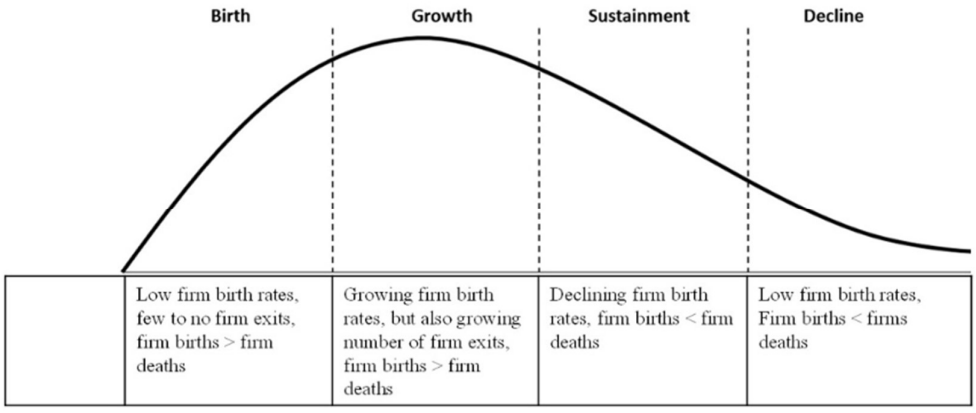


Figure 3. Evolution of an Entrepreneurial Ecosystem adapted from Mack & Mayer (2016)

The relatively simple evolution cycle from Mack & Mayer (2016) does not highlight the complexity of the ecosystem or the interconnective nature of the actors and factors. Brown and Mason (2017) introduced a more diverse thinking of the evolution of entrepreneurial ecosystems and proposed that resource recycling and diversity of ecosystem actors determine the level of ecosystem evolution. Spigel and Harrison (2018) proposed a different model with a focus on transformation stages and the process of resource creation and flow over time. Spiegel and Harrison (2018) highlight the importance of attracting, creating, and recycling resources for nascent ecosystems. For ecosystem growth, and to improve resource accumulation and strengthen competitiveness, ecosystems must have a high level of connectivity

between actors. Figure 4 shows the transformation, actors and process of entrepreneurial ecosystems.

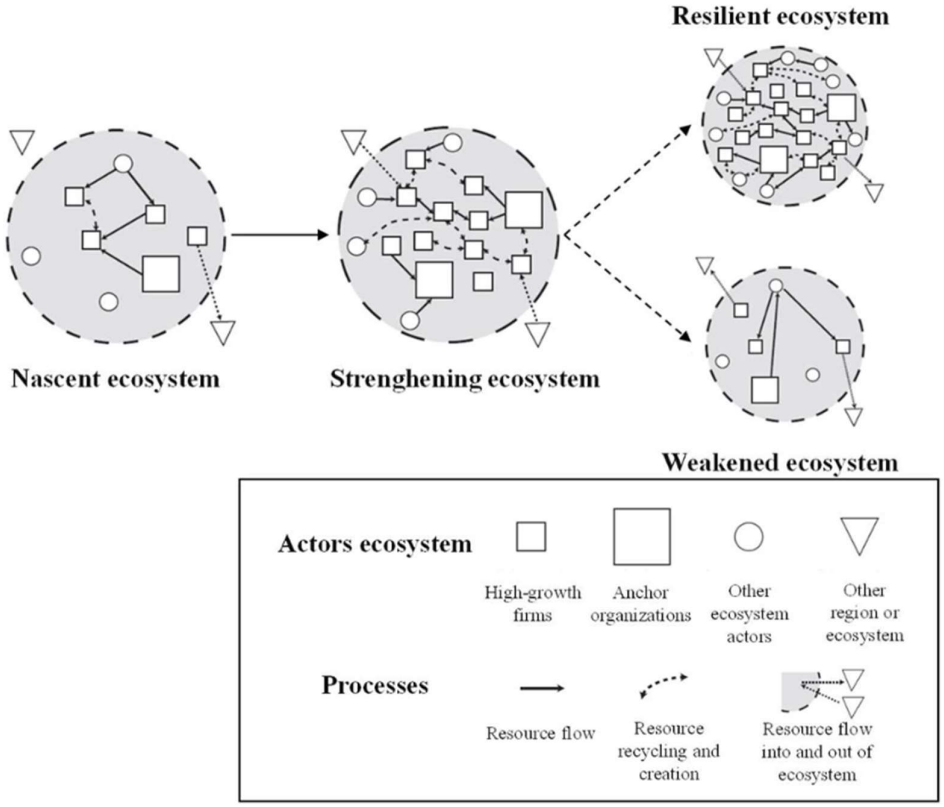


Figure 4. Transformation of Entrepreneurial Ecosystems adapted from Spigel & Harrison (2018)

The nascent ecosystem shows low levels of connectivity between actors and little recycling of resources as resources flow from anchor organisations rather than created internally by other actors (Spigel & Harrison, 2018). A nascent ecosystem also shows leakage of resources to other regions. Strengthening the ecosystem has higher levels of connectivity and greater numbers of actors. There is significant recycling and creation of resources from several actors and attraction of resources from other

regions. Scholars hypothesise how entrepreneurial ecosystems can evolve from nascent to resilient ecosystems, however, lack clear explanations on how to advance ecosystem evolution. Spigel and Harrison (2018) highlight the importance of developing a supportive entrepreneurial culture of networking, trust, mutual learning, innovation and risk-taking for ecosystem resilience.

In the next section, the researcher reviews the literature on the value of intermediation from intermediary organisations and what is known about the role of anchor organisations.

2.3 Intermediary Organisations

There is a growing stream of studies investigating the role of intermediaries who broker relationships and resources so that opportunities can be exploited. Intermediaries are important in science/technology-based start-ups where barriers to commercialisation are high (Clayton et al., 2018). The commercial use of science and technology and the industry linkage is becoming increasingly important to economic growth and policy (Hayter, 2016). Complex and novel knowledge is suggested to create advantages in global markets and generate sustainable economic growth (Suvinen, 2009). With this, an increase in intermediary organisations has been observed globally that fill the void between research generators and users.

Intermediation is a concept introduced in innovation research to describe brokering, facilitation and bridging knowledge transfer between research institutions and industry or government (Hern´andez-Chea et al., 2021). Within literature, intermediary organisations are demonstrated to have varying and several functions.

Functions include facilitating, brokering and promoting, as well as value added activities such as direct commercialisation support and investment (Hayter, 2016; Suvien, 2009). Intermediary organisations mobilize and orchestrate resources from resource providers to other actors in the ecosystem. Through these functions, intermediaries can minimise uncertainty and asymmetry between actors in an ecosystem (Ngongoni et al., 2017). Lubienski (2011) highlights that intermediary organisations do not conduct research themselves but play a decisive role in gathering, interpreting, and translating research for others. Intermediaries bridge the gap between solution seekers and solution providers (Ngongoni et al., 2017). A common definition of intermediary organisations in a science and innovation context, and the one adopted in this study, is an organisation that "support innovation by directly engaging with individual establishments through provision of services and access to resources that can enhance business development or expedite technology commercialisation" (Clayton et al., 2018, p.106).

2.3.1 Types of Intermediary Organisations

Along with varying functions, different types of organisations can act as intermediary organisations. Early research into intermediary organisations in an ecosystem identified four categories: 1) general purpose where the organisation translates and disseminates knowledge from research institutes; 2) specialised organisations that seek research and IP for commercialisation; 3) financial organisations that invest at high-risk early-stage and provide business know-how for start-up growth; 4) institutional organisations that offer incentives to interactions and shared knowledge and facilitated interactions (Ngongoni et al., 2017; Yusef, 2008).

Recent scholars have contributed to the understanding of intermediation in entrepreneurship and the actors who play this role. Clayton et al, (2018) summarises the common types of intermediary organisations in science and technology entrepreneurship and their role in the ecosystem.

Table 3. Intermediary Organisations and their Role in Scientific Entrepreneurship, adapted from Clayton et al. (2018)

Intermediary Type	**Role in Scientific Entrepreneurship**
University technology transfer/licensing offices	Provide incentives for invention disclosure, engage faculty in the development process, and work with businesses to license technology
Incubators	Offer affordable space, provide support services, generate revenue for incumbent firms
Accelerators	Offer intensive programming, accelerate milestones, invest in exchange for equity
Co-working spaces	Provide flexible, less structured programming, offer space for social interaction, facilitate networking and peer mentoring

Professional service firms and Other assisting organisations	Reduce transaction costs, advise on IP and business formation strategy, act as dealmakers, facilitate networking and mentoring, influence policy through agenda setting
Financial i.e. Venture Capital firms, angel investors, public funding programmes, crowdfunding platforms	Provide early-stage funding, offer business advice and mentoring, act as non-dilutive or dilutive sources of funding

2.3.2 Intermediation in Entrepreneurial Ecosystems

Ngongoni et al (2017) propose that ecosystem failure or stagnation is due to the lack of coordination and collaboration between actors. This implies that intermediation is critical to ecosystem survival. A challenge in the dynamics of entrepreneurial ecosystems is the different actors with different resources, agency and dependency on interactions. Frooman (1999) proposed resource dependency theory that argues "the degree of resources dependency an actor has on another organisation defines [their] strategies in interacting with that organisation" (Hern´andez-Chea et al., 2021, P. 4). This is important to intermediation as resource dependency will shape the interactions between actors and the process of resource sharing. Actors that are not self-sustaining rely on resource providing actors in an interdependent relationship in

order to survive (Hern´andez-Chea et al., 2021). Scholars agree that within nascent entrepreneurial ecosystems with limited entrepreneurial support structures, actors depends heavily on resource providers such as anchor organisation. Intermediary organisation's value is in providing an economic and strategic perspective and balance to an interdependent and nascent ecosystem (Hern´andez-Chea et al., 2021).

2.4 Anchor Organisations

Anchor Organisations are recognised as essential actors in fostering the growth of innovation and geographical development. Anchor organisations, which are sometimes referred to as anchor tenants, can act as central change agents in a territory by attracting resources, talent, and capital (Pisano et al., 2016). Scholars fail to definitively define the term 'anchor organisation', additionally, several names are used to describe an organisation with this 'anchoring' function; including anchor institution (Harris & Holley, 2016), anchor tenant firm (Agrawal & Cockburn, 2003), anchor organisation, and network orchestrator (Pisano et al., 2016). A classic example of an anchor organisation is a large department store in a retail shopping mall. The large department store generates traffic into the mall and indirectly increases sales to less known stores (Agrawal & Cockburn, 2003).

Harris and Holley (2016) define 'anchor institutes' as large, locally embedded, typically non-governmental public or civic organisations. Anchor institutes are rooted in their local community by a mission, invested capital and relationships with customers, employees and vendors (Porter et al., 2019). Anchor institutes align and deploy collective resources such as hiring, purchasing and investment, enabling their

"unique economic power to create wealth and improve opportunities for the people" in their region (Slay, 2022. p. 7). A differing approach by Agrawal and Cockburn (2003), who define anchor organisation as companies that are direct consumers or heavily engaged with R&D. Anchor organisations are large, locally present company with the ability to increase deal flow through a technology transfer process, supply workers and specialised skills and knowledge (Agrawal & Cockburn, 2003). Agrawal and Cockburn (2003) stress that "local university research is more likely to be absorbed by and to stimulate local industrial R&D" when anchor organisations are present (Agrawal & Cockburn, 2003, p. 1229). Additionally, anchor organisations can provide legitimacy to engage and work with other actors that facilitate extension of collective resources (Powell et al, 2012)

Yet, to date, scholars have overlooked how established organisations such as anchor organisations can perform in entrepreneurial ecosystems and the role that intermediaries can play in connecting those resources to the local ecosystem. In this study, the researcher defines anchor organisation as large, regionally significant organisations that directly or indirectly create networks of local and external actors, and promotes entrepreneurial initiatives or ideas (Harris & Holley, 2016; Pisano et al., 2016). This definition includes characteristics and elements consistent in the varying definitions in academic literature, as well, as highlights the critical role anchor organisation play in the early development of entrepreneurial ecosystems. In the next section, the researcher reviews the key elements of anchor organisations.

2.4.1 Elements of Anchor Organisation

As described above, anchor organisations vary in form, resource availability and capabilities. Established scholars in anchor organisations identified key elements consistent with the role; spatial immobility, size, and corporate status (Harris & Holley, 2016; Pisano, 2016).

i) Spatial Immobility

Spatial immobility refers to the place-based and/or regionally bound element of anchor organisations which is intrinsically tied to their role within a local economy (Cantor et al., 2013). The spatial immobility is often due to the organisation's significant investment and assets within a region. As previously mentioned, the concept of anchor organisations stems from academic literature of similar place-based hubs.

Research parks and innovation districts provide opportunities for collaboration and the creation of knowledge networks (Harris & Holley, 2016). A key driver of innovation and entrepreneurship growth within these knowledge networks is geographical proximity. Innovation districts are defined as geographic areas where established businesses (including service providers, incubators, accelerators) and start-ups group around an anchor organisation (Katz & Wagner, 2014). Anchors can "provide knowledge spillovers that benefit new technology-intensive firms in the region" (Feldman, 2005. p. 202). With the collective mission toward open innovation and research commercialisation, most innovation districts are located near or around universities or research institutes. Powell et al (2012) compare the emergence and

success of entrepreneurial regions with anchor organisations in the life science industry. The author found that successful life science regions (i.e. Boston, Bay Area and San Diego) are in result of anchor organisations presence but also inter-organisation interactions.Regions lacking regional inter-organisation interactions, despite possessing anchor organisation or external interactions were less developed and successful (Hayter, 2016; Powell et al, 2012). A large proportion of literature on anchor organisations is focused on their role in these geographical groupings, particularly innovation districts. A key difference in the research literature is the definition of a region. Some scholars refer to the regional economic impact of anchor organisations on a city or town. In contrast, other scholars refer to anchor organisations enhancing the regional innovation system, referring to a region much broader than a city or town. In this study, the anchor organisations of interest are not spatially immobile, however, do contribute significantly to their regional economy by deploying resources such as hiring, purchasing and investment (Slay, 2022). The regional benefits vary from a district such as Waikato and Manawatu, to New Zealand.

ii) Size

A key role of anchor organisations, in several settings, is the generation of jobs, business opportunities and developing human, social and cultural capital in their region (Harris & Holley, 2016). In order to satisfy these attributes, the organisation must be large in size. Small organisations would often lack the capital to significantly drive economic activity. The presence of an anchor organisation within an ecosystem provides the initial infrastructure to guide interactions and connections needed for

collective growth (Hayter, 2016). Due to an anchor's commitment to their region and their economic power, anchor organisations are uniquely positioned to stabilise local economies (Porter et al., 2019). There is limited qualitative research on assessing the size of an anchor organisation in relation to its economic impact. Therefore, in this research, the acceptable size for an organisation to be determined as an anchor will be dependent on observable qualitative measures such as involvement in regional entrepreneur or innovation community, the creation of jobs and regional capital invested. This information is collected through secondary data.

iii) Corporate Status

Corporation is defined as a legal entity that is separate and distinct from its owners (Donoso, et al., 2003). Under the law, corporations possess many of the same rights and responsibilities as individuals. Initial research into anchors organisations suggested that anchors are solnot-for-profitofit such as hospitals or public universities. This is because private organisations and corporations may not have the same long-term incentives to remain place-bound, nor do they share a social purpose mission (Slay, 2022). However, recent literature disagrees stating that "large firms may be a better anchor, in terms of economic success, for a developing industry" (Feldman, 2005. p. 217). This is supported by Walsh (2019), suggesting that multinational enterprises can also take on an anchoring role within entrepreneurial ecosystems (Walsh, 2019). The focus of this research is to understand the role and interactions of anchor organisations within entrepreneurial ecosystems. The element of corporate status is not key to the core focus of this research but rather provides an additional layer to compare different types of public and private organisations.

Stokes (1997) states that "interactions between public- and private-sector actors are often essential for bringing scientific discoveries to market" (Clayton et al, 2018).

2.4.2 Types of Anchor Organisations

There is a proliferation of research to date that focuses on identifying the actors and factors of successful entrepreneurial ecosystems. This is important for government and development agencies to design and implement system-level interventions such as promoting interactions with ecosystem actors and intermediary organisations (Hern´andez-Chea et al., 2021). Despite the increased interest and research, scholars remain uncertain on how entrepreneurial ecosystems can be formed and the dynamics of the interactions between key actors (Hernandez-Chea, 2021). Scholars suggest that the governance of entrepreneurial ecosystems and growth to a resilient ecosystem relies on the presence and role of anchor organisations (Colombelli, et al 2019). While most anchor organisations are large and regionally significant such as local authorities, universities, and large businesses, a variety of organisations can take on the role and attributes of an anchor. Powell et al (2012) identified non-for-profit institutes such as hospitals and museums as anchor organisations as they are rooted in their local community by a mission, significant assets and relationships with the region (Powell, et al., 2012; Porter et al., 2019).

This research focuses on four types of anchor organisations; universities, research institutes (i.e. crown research institutes and public research organisations), private/investor-owned corporations and co-operatives. These are discussed in further detail below:

i) Universities

Universities can fulfil the role of an anchor organisation due to their size and prominence in a region, but also by creating highly skilled workers, and knowledge spillovers. This induces increased rates of entrepreneurship and innovation in a region (Agrawal and Cockburn, 2003; Spigel, 2020). Spigel (2020) identifies universities performing four critical functions in an entrepreneurial ecosystem: "knowledge creators, promoters of academic entrepreneurship, talent producers, and ecosystem co-ordinators" (Spigel, 2020. p.61). This is supported by Audretsch (2014) who argues that outside the university's core functions, a university's role also lies in leadership in the entrepreneurial ecosystem.

Firstly, knowledge creation and generation of IP is innate in research organisations everyday functions. Knowledge sharing, particularly, knowledge spillovers are an output of research organisations functions and are beneficial to local, and regional economies (Qian and Acs, 2011). Audretsch (1995) and Acs et al. (2009) describe this as the knowledge spillover theory of entrepreneurship (Qian et al, 2013). The knowledge spillover theory "identifies new knowledge as one source of entrepreneurial opportunities and considers entrepreneurship as a conduit of transmitting knowledge spill over" (Qian et al, 2013, p. 563). Knowledge spill overs encourage entrepreneurship through formal and informal interactions (Spigel, 2020). An example of formal knowledge-sharing agreements is corporate sponsorship of university research, and informal is university graduates taking jobs at local firms (Spigel, 2020).

ii) Crown Research Institutes (CRIs)

Public investment in research and development is an important driver for economic growth and socioeconomic development (De la Torre, et al., 2021). Crown research institutes (CRIs) are crown-owned scientific research companies that focus on specific sectors of research (Ministry of Business, Innovation and Employment [MBIE], 2021). CRIs were established in New Zealand, however, similar models are found globally with differing names i.e. public research organisations (PROs). The unique benefit of CRIs is the sector-specific research aimed at addressing sector challenges and achieving economic growth (MBIE, 2021). This research groups CRIs and similar organisations together as there is limited academic research on public research organisations outside universities. Literature on entrepreneurial ecosystems and/or anchor organisations often groups universities and research organisations together due to the paucity of CRIs and reliable data (De la Torre, et al., 2021).

CRIs, alike to universities, act as anchor organisations due to their size and presence in a sector and region. CRIs have little to no teaching activities and a greater focus on mid-way research (in between fundamental research and commercial R&D) (De la Torre, et al., 2021). Therefore, it could be expected that CRIs have greater engagement with external stakeholders and industry actors for knowledge sharing.

iii) Co-operatives

Co-operative business models are seen all over the world and are a major part of New Zealand's economy. A commonly accepted definition of agricultural co-operatives is "an agricultural producer organisation that is user-owned, user-controlled and user-benefited" (Donoso et al., 2003, p. 2). Within the New Zealand Agri-food context, co-operatives are the largest actor in the ecosystem in terms of assets, financial returns, employees and sector-specific R&D capabilities (Donoso, et al., 2003). Within academia, there is minimal research on co-operatives role as an anchor organisation or within entrepreneurial ecosystems. Agrawal and Cockburn (2003), define anchor organisations as companies that are direct consumers or heavily engaged with R&D. Co-operatives have the size, resources, and R&D engagement to be defined as an anchor organisation (Donoso, et al., 2003; Harris & Holley, 2016; Pisano, 2016). Co-operatives can induce economic growth, increase innovation within a region, and supply workers with specialised skills and knowledge.

i) Private/investor-owned corporations

A like to co-operatives, large organisations such as private/investor-owned corporations are significant in size, corporate status and regional impact to be described as anchor organisations, therefore, are included in this research (Harris & Holley, 2016; Pisano, 2016). Scholars are non-conclusive on the purpose and motive of multinational and private organisations as anchors. Some scholars argue that anchor organisation's purpose and mission should be directly related to regional impact and growth, whereas, large private organisations are focused on financial returns for the company and their investors (Harris & Holley, 2016). Private/investor

corporations have different levels of agency compared to other ecosystem actors such as entrepreneurs. Large organisations are limited in decision making and involvement due to corporate or political considerations (Spigel, 2020).

CHAPTER 3: Research Design and Methods

3.1 Objectives

This research aims to understand anchor organisation's role and interactions in New Zealand's Agri-food tech entrepreneurial ecosystem to provide insight to intermediary organisations and how intermediaries can cooperate with anchor organisations to enhance the value they create for the entrepreneurial ecosystems in which they are embedded. This chapter introduces the research question, followed by the three sub-questions that will be used to address the current literature on the topic. Secondary and primary data was collected with ethical considerations. The primary data was collected from semi-structured interviews and visual methodology with senior leadership in a variety of agri-food anchor organisations. Abductive thematic analysis was used to analyse the research findings. This chapter finishes with the limitations, and considerations of the research.

The research aims to address the following research question:

How can intermediary organisations facilitate interaction with anchor organisations within an entrepreneurial ecosystem?

To answer this question, the research was divided into the three main opportunities identified in the literature review, which leads to three sub-questions that shape the interview guideline:

- *Sub-question 1: Who do anchor organisations interact within an Agri-food tech entrepreneurial ecosystem?*

- *Sub-question 2: What value do anchor organisations provide to other actors in the ecosystem?*

- *Sub-question 3: What challenges do anchor organisations face when interacting within the ecosystem?*

3.2 Research Design

Bell and Bryman (2014) state "ontology is concerned with theorizing about the nature of reality" (P.27). Ontology is associated with what the researcher considers as reality. Key consideration of ontology is whether the phenomena studied is understood as existing objectively or subjectively. Subjectivism is concerned whether the social phenomenon and its meaning exists through the activities of humans and the meaning which observers attach to them. Objectivism "asserts that social phenomena and their meanings have an existence that is independent of social actors", therefore, the objective reality is independent of the researchers role as an observer (Bell & Bryman, 2014. P. 27). This study adopts an objective ontological view because this research aims to understand anchor organisations within an ecosystem. Organisations, such as anchor or intermediary organisations, are understood to be social entities external to the actor with a reality of their own (Bell & Bryman, 2014).

Adopting an objective ontological view directs the choice of epistemology, research approach and data collection methods for this study. The research was carried out from a pragmatic paradigm. Pragmatism "holds that the value and meaning of opinions and 'facts' captured in research data are assessed through examination of

their practical consequences" (Kelly & Coreiro, 2020, p. 3). This means that knowledge is directly based on experience and that individuals have different experiences, therefore, unlikely to share identical worldviews. There is a debate between classical and modern pragmatists, where modern pragmatic inquiry recognises that "individuals and organisations within social settings can experience action and change differently", therefore, research should be flexible in methodology and approach (Kelly & Coreiro, 2020, p. 1). Kelly & Coreiro, (2020) defines key principles for the modern pragmatic paradigm as "emphasis on actionable knowledge, recognition of the interconnectedness of experience, knowing and acting, and inquiry as an experimental process" (p.3-4). This influenced the researchers desire to contribute useful and actionable knowledge based on the participant's experiences.

Based on the nature of the research purpose and questions, a qualitative study using abductive reasoning was implemented. Abductive reasoning has become popular among business scholars and overcomes limitations associated with other forms of theorizing (Bell & Bryman, 2014). Abductive reasoning seeks to identify conditions that would reduce complexity to form an understanding of a phenomenon (Bell & Bryman, 2014). This study uses abductive reasoning through the "back-and-forth" engagement with the research findings as an empirical information source and with literature to provide discussion and conclusions (Bell & Bryman, 2014). Abduction is limited by the researcher's ability to think rationally and selecting the 'best' explanation from interpretation of the data (Bell & Bryman, 2014). This aligns with a

master's level thesis as an abductive approach enables the researcher to remain open to the outcomes of the research and limit pre-understandings or conclusions.

The data collection methods used in this research are semi-structured interviews and visual methodology. The main areas to be covered were established in the interview schedule before the data collection process started. 11 participants from 10 different organisations were involved in this study, all of which are based in New Zealand. The participating organisations have a direct connection with the Agri-food entrepreneurial ecosystem in New Zealand. Selection criteria for the participants included:

- Identified as an Anchor Organisation as described in Section 2.4
- Organisation involved in Agri-food innovations and/or technology
- Identified as key opinion leaders in their organisation, business unit, or peers

Represented organisations include universities, crown research institutes, private/investor-owned corporations and co-operatives.

3.3 Data Collection

Data was collected using the following methods to enable comparison and triangulation. A summary of the data sources is presented in Table 4.

Table 4. Data Sources

Method	Description
Semi-structured exploratory interviews	11 participants from 10 organisations in New Zealand. They hold the CEO, strategy & innovation manager/director to commercial specialist/advisor
Visual Methodology	Participants were asked to draw/visualise the key actors and their interactions in the NZ Agri-food Entrepreneurial Ecosystem.
Secondary Data	Market, Industry, Government, and Company Strategy and Financial reports

3.3.1 Semi-Structured Interviews

Participants that met the inclusion criteria were interviewed using the Interview Schedule detailed in Appendix A, and interviews were conducted in person or via video conference. 11 participants from 10 anchor organisations were interviewed. The interviews lasted between 30 minutes to an hour. Participants' roles in their organisation varied from CEO, strategy & innovation manager/director to commercial specialist/advisor. This variation in roles across the organisations is discussed in Section 3.5 as a limitation of this research. Participants have been anonymised to preserve confidentiality.

Table 5. Participant Details

Type of Anchor Organisation	Role	Pseudonym
University 1	CEO	Interviewee 1
University 2	Commercial Specialist	Interviewee 2
Crown Research Institute 1	General Manager- Business Development	Interviewee 3
Crown Research Institute 2	Director of Strategy and Communication	Interviewee 4
Crown Research Institute 3	Commercialisation Director	Interviewee 5
Investor-owned/private corporation 1	Global Strategy and New Ventures Manager	Interviewee 6
Investor-owned/private corporation 2	Global Head of Agribusiness	Interviewee 7
Co-operative organisation 1	Director of Strategy and Innovation	Interviewee 8
Co-operative organisation 2	Innovation and Transformation Advisor	Interviewee 9
Co-operative organisation 2	Commercialisation Manager	Interviewee 9
Co-operative organisation 3	Innovation Manager	Interviewee 10

3.3.2 Visual Methodology

Participants were asked to visually represent the actors, such as organisations, groups, bodies, that their organisation interacts with within the New Zealand Agri-food entrepreneurial ecosystem. The aim of utilising visual methodology was to enable the participant to reflect on their organisation and their external interactions with entrepreneurship and innovation. This process aimed to capture the organisations and groups working within the NZ Agri-food ecosystem and collate the diagrams to create a concept map of the key actors. The participants were also asked to visually represent the interaction with the different actors.

An iterative process was used as the information gathered from the first 3 interviewees shaped the structure of the remaining interviews. From the initial interviews, it was found that the visual exercise was more important in initiating the participants thought process and creating an open conversation, rather than a tool continually added to during the conversation. Appendix B includes diagrams developed by the participants.

3.3.3 Secondary Data

Market, industry and government reports were gathered to understand the different organisations and participants important to the research. Secondary data was particularly relevant to identifying organisations that suit the selection criteria of anchor organisations and involvement in the Agri-food ecosystem.

3.4 Data Analysis

The audio of each interview was recorded and initially transcribed by software Otter.AI followed by editing from the primary researcher into a Word document, without removing unnecessary or irrelevant words. The use of this auto-tool, enabled for time saving in this data collection process, but it was important for the primary researcher to listen to the recordings to check for accuracy and highlight areas of interest. Transcripts were then sent to the relevant participants to allow them to review and edit the accuracy and content of the transcript, as well as removing any other information they deemed confidential. The transcripts were stored on a secure server and only the primary researcher and academic supervisor had access to the files. Finalised transcripts were imported to NVivo 12, a qualitative data analysis software.

Thematic analysis is a common data analysis method used in qualitative research by identifying patterns and creating structure across raw data into meaningful themes (Thompson, 2022). The content of the interviews was analysed using abductive reasoning. The transcripts were initially coded by categories shown in the interview schedule: Interaction, Value and Challenges. This initial coding enabled condensing and separating section of the transcript relevant to the interview questions. Coding is an iterative and cyclical process, therefore, further 2 round of coding was completed (Thompson, 2022).

3.5 Limitations

3.5.1 Reliability and Validity

Reliability requires reviewing how appropriate is the method taken to reach the conclusions of the research (Noble & Smith, 2015). Reliability is "the consistency of the analytical procedure, including accounting for personal and research method biases that could influence the findings" (Noble & Smith, 2015, p. 34). Validity is "the precision in which the findings accurately reflect the data" (Noble & Smith, 2015, p. 34). To ensure reliability and validity in the study, despite the interview schedule being semi-structured, the same schedule was used for all participants. A large and varied sample of participants relevant to the research question, as well as the participant selection criteria enhance the validity of the research in this field. Finally, triangulation by using different research methods, such as interviews, visual methodology and secondary data was used to gather findings from different and impartial perspectives.

3.5.2 Limitations

As mentioned prior, the participants interviewed had varying roles within their organisations from CEO, strategy & innovation manager/director to commercial specialist/advisor. This large and varied sample of participants contributes to the validity of the research, however, creates limitations in data analysis. Depending on the participant's role restricted their ability to speak or have knowledge on all aspects in this research, particularly, the total interactions of their organisation. Potential future research in anchor organisation's role in entrepreneurial ecosystems

could take a case study approach and focus on opinions from variety of roles within one organisation.

It was intended to interview 3-4 participants per each of the 4 groups of anchor organisations (universities, CRIs, co-operatives and private/investor-owned). However, due to availability and time restrictions a total of 10 organisations were interviewed (2 universities, 3 CRIs, 3 Co-operatives and 2 private/investor-owned). 2 investor-owned anchor organisations were interviewed, however, after the interview the researcher identified that one of the organisations did not fit within the scope or definition of an anchor organisation, therefore was excluded in the findings and discussion.

Since the majority of interviews were conducted via video call, not all participants were able to provide visual diagrams to support their understanding of the ecosystem. For participants where video conference interviews were conducted, the primary researcher asked them to draw the ecosystem and narrate their drawings. The researcher found that the visual concept maps were beneficial to initiate conversation and engage with the participant. Often the diagram was not referred back to during the interview. This directed the data analysis and discussion section of this study to focus on data sourced from the semi-structured interviews over the visual concept maps.

3.5.3 Ethical Considerations

The research was conducted complying with the ethical standards set by the University of Auckland Human Participants Ethics Committee (UAHPEC),

considering voluntary participation, informed consent and the right to withdraw from being recruited as a participant. The research findings are presented with personal and company names removed, to respect both participant confidentiality and confidential company information.

Additionally, the interviews were transcribed only by the researcher without external involvement to ensure anonymity and confidentiality. Furthermore, all the data collected in the form of audio recordings and transcripts were stored electronically on a locked computer. At the conclusion of this study, the audio recordings and the transcripts were permanently deleted, and any remaining information will be stored on the University of Auckland secured network and deleted after six years. The ethics protocol reference is UAHPEC20382.

CHAPTER 4: Findings

4.1 Introduction

This chapter will start by reporting what types of anchor organisations operate in New Zealand's Agri-food ecosystem, distinguishing between universities, CRIs, co-operatives and private/investor-owned anchor organisations. Additionally, this chapter will report on the perceived value of the organisation and the types of interactions that support this value. For research anchor organisations, perceived value included expertise, novel inventions and co-generation of knowledge and intellectual property. For industry anchor organisations, scale was the perceived value of the organisation which is further distinguished as access to knowledge, customers and market, and availability capital. Furthermore, this chapter reports what actors anchor organisations focus their interactions on and the challenges of these interactions. Finally, collaboration including the challenges and factors encouraging collaboration is discussed as a key similarity between the four types of anchor organisations. The findings are summarised into concept maps in Section 4.5

4.2 Anchor Organisations in New Zealand Agri-food Ecosystem

Research outputs produced from academic and industry research are core inputs for Agri-food innovation as established in the literature review (see Section 2.1). In New Zealand, universities and crown research institutes (CRIs) are essential actors in research production, along with industry actors who partner with them. As discussed in Section 2.4.2, CRIs and universities are summarised as research anchor organisations due to their similar core functions. Other key actors in New Zealand's

Agri-food ecosystem are co-operatives and private/investor-owned corporations who are summarised as industry anchor organisations in this research. Co-operatives are a major part of New Zealand's economy and within an Agri-food context, New Zealand co-operatives are the largest actor in the ecosystem (see Section 2.4.2). The next section distinguishes research and industry anchor organisations including the perceived value, interactions and challenges of both groups.

4.2.1 Research Anchor Organisations

Participants from universities and CRIs identified that the core value their organisation provides to an interaction is the generation of research and intellectual property (IP). The research and IP generation summarises several types of interactions of the interviewed universities and CRIs. First, expertise in specific topics accessed through contracting research services. Secondly, the creation of novel inventions which is accessed by licensing or purchasing IP rights. Furthermore, novel inventions were also spun out of research anchor organisations and were accessible to actors through investment opportunities. Finally, the co-generation of knowledge and IP demonstrates collaboration between actors. In addition, research anchor organisations also identified sharing of knowledge facilitated by networks and events with industry groups, or through interpersonal interactions with other universities and CRIs. Knowledge shared included industry and academic insights, and experiences from other interactions such as deal or partnership negotiations.

An additional aspect of research anchor organisations is who the interactions target. As shown in Tables 6 and 7 of who Universities and CRIs interact with respectively,

there are many similarities including; CRIs, Universities, Co-operatives, Investors, Industry Groups, and Government Agencies. Somewhat unique to research anchor organisations were the interactions with indigenous organisations and regional groups such as Māori businesses and Iwi (refer to Table 6c & 7c). The value of interacting with Māori organisations was perceived by participants as the sharing of knowledge, research and technology testing/validation with Māori assets (i.e. land and water assets) and the Māori organisations' significant economic power for co-investment. As shown in Table 8, other anchor organisations did not feature Māori organisations and Iwi within New Zealand's entrepreneurial ecosystem.

"We're doing quite a lot at the moment with local Iwi and local Māori owned companies. One because they're really important stakeholders in the Nelson region, and part of who we are, but they have assets in the marine contexts and mussel farms and we have research and technology that we want to apply in that context. So there's this really good mutually beneficial relationship"- Interviewee 5

The final aspect of research anchor organisations were the challenges the participants envisaged when interacting with other actors. As shown in Tables 6 and 7, the challenges of research anchor organisation were similar. First, competition towards the same objectives such as funding, market access, and advisors was faced when research anchor organisations interacted with one another. Procurement of funding was a particular challenge for research anchor organisations as the organisations heavily rely on government funding mechanisms to support research efforts. Second, an asymmetry of size when interacting with large co-operatives in the Agri-food industry despite interacting with several other large organisations. The asymmetry

of size created difficulty for the research organisation in negotiating on deal terms for licensing/purchasing IP or investing in spinouts, and contract terms for research on specific topics. Third, business alignment and differing agendas when interacting with investors, particularly negotiations on equity and terms for spin-outs. Finally, lack of governance and collaborative direction inhibited interactions with government agencies.

4.2.2 Industry Anchor Organisations

Industry anchor organisations including co-operatives and private organisations perceived scale as the core value the organisation can provide to an interaction. As a result, industry anchor organisations can act as first customers or provide access to first customers via shareholding (for co-operatives) or existing distribution channels. Furthermore, industry anchor organisations innately hold extensive knowledge and resources of their industry. Participants highlighted that the scale of their organisation enables the access and sharing of knowledge and the availability of significant capital.

Firstly, knowledge such as creating a product-market fit, understanding value chains, and the industry was accessed by reports/media or alternatively inter-personal interactions. As shown in Tables 6 and 7 actors such as start-ups, government agencies and CRIs were perceived as valuing this innate knowledge. Lastly, the availability of resources such as distribution and sale channels, and capital was accessed through mechanisms set by the organisation or alternatively inter-personal interactions. Mechanisms included facilitated workshops, Sprout

Agritech and accelerators/incubators. A novel mechanism described by participants to access resources was corporate venture. Corporate venturing models have shown large organisations to invest in a risk portfolio higher than the organisation would usually. Participants agreed that key drivers behind implementing this novel mechanism was a change in executive leadership, financial performance, market conditions, customer demand for sustainability and traceability.

"We need to find people who have creative solutions that align with where the business is going to be in 20, 30, 40 years. And then we need to look at how we can help accelerate those ideas. So working with start-ups or different accelerators, or whatever is something that we've never really stepped into before, provides potentially an interesting and alternative way for us to realize the value from innovation without us having to do it ourselves."

- Interviewee 10

Industry anchor organisations highlighted many interaction targets within New Zealand's Agri-food ecosystem. A consensus of industry anchor organisations identified global actors and interactions core to not only the organisation's everyday functions but also to their role in Agri-food entrepreneurial ecosystem. Participants identified that global actors enabled greater regional interactions as regional actors were interested in understanding global industry insights and trends. Table 8 shows other actor industry anchor organisations' target. The next section highlights the different findings from universities, CRIs, co-operatives and private anchor organisations in particular what types of interactions support their activities, what actors the anchor organisations focus on in those interactions and unique challenges.

4.3 Anchor Organisation Types

4.3.1 Universities

Technology Transfer Offices (TTO) act on behalf of universities to aid in the commercialisation of research and act as a connector to industry (see Section 2.4). Two participants were interviewed from two University TTOs. As identified in Section 2.4, the generation of IP and research was the core value research anchor organisations provided to many interactions, including interactions with investors, co-operatives, and government agencies. Table 6 identifies the actors, the envisioned value and the challenges of interacting with universities.

Table 6. Actors, Value, and Challenges of Universities

Note	Actors	Core value actors envision from interactions	Challenges actors say they face
a	**CRIs**	Sharing of knowledge	Competition for funding
b	**Universities**	Sharing of knowledge	Competition for funding
c	Industry Groups	Sharing of knowledge and funding for commercialisation	-
d	Māori Organisation	Sharing of knowledge, technology and market validation, and funding.	-

e	**Co-operatives**	Novel Inventions for licensing/purchasing IP, or spinouts for investment	Asymmetry of size
f	Investors	Novel Inventions from spinouts for investment	Business Alignment i.e. Equity negotiations
g	Government Agencies	Industry insights and funding directing research on specific topics	Lack of co-ordination i.e. regular change in staff, change in priorities
h	Regional groups	University Capability Gaps i.e. engineering, market validation, product design for proof-of-concept and prototype development	

There are several differences in the actors identified when comparing university participants to CRIs. A core actor not identified by university participants was private organisations. Within New Zealand Agri-food ecosystem, private organisations are very similar to co-operatives. However, a key difference is private organisations may have limited research and development capabilities and potentially less interest in interacting with universities for academic research outputs. The difference in actors may also be a reflection on the lack of ecosystem engagement of the universities interviewed.

In comparison to CRIs, university research and IP was often generated internally and licensed to large corporates or spun out into start-ups (Ref Table 1.a). An exception to this was an example by interviewee 1 of the co-development of research between the university and a co-operative.

Example 1: *Interviewee 1 described a joint venture partnership with a large co-operative. The interviewee's organisation completed research with direction and funding from the co-operative.*

Core actors identified by universities was industry groups, such as KiwiNet and Callaghan Innovation. Participants from universities highlighted that in their role at TTO, they would primarily interact with other universities or with CRI through these industry groups.

> *"[The benefit of interacting is] the collegial aspect of KiwiNet, where you get to spend time with your peers and colleagues from other institutions and exchange information, best practice experiences about you know, what's worked and what hasn't."- Interviewee 1*

4.3.2 Crown Research Institutes

Crown research institutes (CRI) often have an internal innovation and/or investment team that identify and support commercial opportunities for the organisation's research. Three participants were interviewed: one from a private research organisation and two from a Crown Research Institute. CRIs demonstrated a range of activities for the ecosystems' access to CRIs knowledge and IP. First, expertise in specific topics, such as horticulture, seafood and methane mitigation, was accessible

to other actors through contracting research services. Co-operatives, private organisations and start-ups were recognised as interacting with CRIs through contract research. Secondly, the creation of novel inventions is accessed by licensing/purchasing IP rights, or accessed through investment when novel inventions are spun-out. Novel inventions are core for driving interactions with investors, accelerators and incubators. Finally, the co-generation of knowledge and IP demonstrating collaboration between actors was more frequent in CRIs than in universities. Example 2 demonstrates an interaction with a start-up developing from contracting research to co-generation.

Example 2: *Interviewee 5 described an example of their organisation completing contract research for a start-up due to their expertise in algae and food technology. The start-up had business and commercialisation expertise but required technical support. Over the period of the interaction, the relationship developed from contract research to the co-development of intellectual property as the start-up invested in an internal lab and research facilities.*

Table 7 shows the actors CRIs identified as interacting with within the ecosystem, the value envisioned from the interactions and the challenges the actors say they face.

Table 7. Actors, Value, and Challenges of CRIs

Note	Actors	Core value actors envision from interactions	Challenges actors say they face
a	**CRIs**	Sharing of knowledge	Competition for funding
b	**Universities**	Sharing of knowledge	Competition for funding
c	Industry Groups	Sharing of knowledge and funding for commercialisation	-
d	Māori Organisation	Sharing of knowledge, technology and market validation, and funding.	-
e	**Co-operatives**	Novel Inventions for licensing/purchasing IP, or spinouts for investment	Asymmetry of size
f	Investors	Novel Inventions from spinouts for investment	Business Alignment i.e. Equity negotiations
g	Government Agencies	Industry insights and funding directing research on specific topics	Lack of co-ordination i.e. regular change in staff, change in priorities

h	External start-ups	Generation of IP and Research	-
i	Service providers e.g. IP attorney	Capability Gaps	-
j	**Private Organisations**	Market and Technology Validation	-
k	Customers/end users	Market and Technology Validation	Unwilling to share information due to competition
l	Council	Funding, Market Validation, Customer i.e. research grants, market validation and as potential first customers	Strategic Alignment i.e. no focus on scalability of innovation
m	Accelerator/Incubators	Funding	Strategic Alignment, Commercial Acumen

Different to universities, CRIs engaged with additional actors including external start-ups (as described in example 2), service providers (i.e. IP attorneys, financial advisors), private organisations, customers/end users, and regional councils. In particular, CRIs interacted with regional councils for research grants, market

validation and as potential first customers. Although, a misalignment was often seen between regional councils and CRIs as described in example 3.

Example 3: *Interviewee 5 described developing a tool to monitor fresh water with several councils. The regional councils provided small grants, data, and access to waterways. When the tool was available, the regional council were resistant to pay due to their involvement in developing the technology. This led to the product having no first customer and losing operational costs and inability to scale.*

The final aspect of CRIs is the challenges faced. Participant 4 talked about the barrier to interacting and collaborating with others is the organisation's focus on profit, financial returns to stakeholders and retaining employees. This translates to the lack of priority and constraints of research commercialisation for CRIs including unclear ownership over IP, non-entrepreneurial scientists, and lack of commercial team members.

"We operate much more on a team-based culture compared to universities… here it's often around individual academics, we can then build up teams behind them… [however] then we are going to have to grapple with who were the founders of this particular technology, how much of a percentage? What's your ongoing role if you do kind of spin out or do some capital raise?."- Interviewee 4

4.3.3 Co-operatives

4 Participants from 3 co-operatives were interviewed for this research. In contrast to the research anchor organisations, scale was identified as a core value brought by co-

operatives to interactions. Scale is a key attribute of anchor organisations as established in the literature review (see Section 2.4.2). Co-operative demonstrated scale by providing capital, sharing of knowledge and access to customers. First, capital or funding from large co-operatives into the Agri-food ecosystem was used to generate research and IP, and to support the commercialisation of research and IP. Different to private organisations who as well inject capital into the ecosystem, co-operatives showed an interest in funding academic research and development. Funding was accessed through contracted services, collaborations including partnerships or joint ventures, and mechanisms such as corporate venturing models and incubators. Universities, CRIs and start-ups were the interaction target for co-operative funding.

Second, scale provided access and sharing of knowledge between co-operatives and other actors such as government agencies, services providers (such as financial services) and industry groups. Knowledge shared included industry and market trends, achieving product-market fit, understanding the value chain, and distribution and sale channels. Co-operative knowledge was accessed through facilitated events/workshops, industry immersion programmes, reports, and unsolicited or interpersonal interactions. *"The biggest importance is aligning the product design to fit and can get distributed at scale"- Interviewee 9*

Finally, co-operatives have easy and direct access to market and customer validation through shareholders (i.e. farmers, and growers), unlike private organisations. Table 8 shows the actors co-operatives identified as interacting with within the ecosystem,

the value envisioned from the interactions and the challenges the actors say they face.

Table 8. Actors, Value, and Challenges of Co-operatives

Note	Actors	Core value actors envision from interactions	Challenges actors say they face
a	**Universities**	Sharing of knowledge, investment, co-generation of research	Commercial acumen and limited access
b	**CRIs**	Sharing of knowledge, investment, co-generation of research	Commercial acumen and limited access
c	External start-ups	Investment, first customers/ path to market	Limited access and time, entrepreneurial personalities
d	Government Agencies	Sharing of Knowledge	Lack of co-ordination i.e. regular change in staff, change in priorities

e	Service Providers and Industry Groups	Sharing of knowledge	-
f	Shareholder	Customers, sharing knowledge	-
g	**Co-operatives**	Sharing of Knowledge, co-development of research	Strategic alignment, same shareholders
h	**Private Organisations**	Sharing of Knowledge, co-development of research	Strategic alignment
i	Accelerators/Incubators	Investment, sharing of knowledge, generation of research and IP	Strategic alignment

A further aspect of co-operative anchor organisations is who the interactions target. Despite their size, co-operatives were observed to show regular interactions within the entrepreneurial ecosystem. Co-operatives identified interacting with external start-ups, however, the majority of these interactions were unsolicited and ad-hoc. The interactions with start-ups were often one-off and not continued. The value in interacting with start-ups for the co-operative was access to innovative solutions, a positive reputation and viewing technologies first.

Another aspect of co-operatives is the challenges the participants say they face when interacting with other actors. A common challenge co-operatives faced was the

commercial acumen when interacting with research institutes. Due to their traditional academic focus, universities were recognised as being significantly challenging to interact and collaborate with. This was represented in the limited number of interactions with universities and other actors. Participants from co-operative organisations speculated that these challenges stem from the university's higher strategic priorities and research success metrics based on papers published rather than commercial or societal impact.

Due to the size of co-operatives, they are inherently slow and risk averse. The value of interacting within the entrepreneurial ecosystem does not outweigh the co-operative's everyday functions. This was another challenge for co-operatives when interacting with other co-operatives and private organisations. There was often a misalignment with timing and strategic priorities. Co-operatives in New Zealand often had the same shareholders, who preferred profit and return to the shareholders rather than collaboration for future investment. Co-operative commitment and interaction with the entrepreneurial ecosystem were shown to be dependent on the company's financial situation, strategic priorities, customer and shareholder demands and state of the market.

"I suspect all big companies, probably care about EBIT, profit and particularly profit for shareholders, whatever those might be. And then probably reputation second, and their reputation is quite a long bow so reputation to be seen to be helping out little plucky New Zealand start-ups is pretty far down compared to I want to make sure I don't create a food safety incident. I want to make sure that I'm not getting in political trouble. "- Interviewee 8

Despite the restrictions of co-operatives, it was interesting to note that the co-operatives implemented a variety of mechanisms to be an actor in the entrepreneurial ecosystem. Examples include internal accelerator/incubator programmes (Example 4) and corporate venturing models.

***Example 4**. Interviewee 8 described an incubator programme for employees across the globe to generate business ideas and develop them within the programme. The organisation would provide financial support and mentorship for the start-ups.*

Corporate venturing was a common example discussed by co-operative interviewees. Corporate venture capital (CVC) is not a new mechanism, however, the high-risk and fast-changing nature of early-stage investment does not innately align with the slow and risk-averse nature of co-operatives. Within New Zealand's Agri-food ecosystem, there are limited co-operatives or anchor organisations with substantial finance to build a corporate venture business in their own right *" You're buying into a portfolio of risk" (Interview 7).*

"I think the constraints outside really the ability for us to make decisions quickly. And the ability for us to front up with cash to invest is has been constrained. But for a really traditional sector, business. This is a new kind of way of thinking. So writing that willingness to explore something new sometimes can be really hard work. And so we're just really getting our heads around it. In this the ambition of the executive team level." Interviewee 10

4.3.4 Private Organisation

As highlighted in Section 3.5, only one private organisation was interviewed, therefore, limited information was gathered on the value of the organisation, what types of interactions support the organisation's value and what actors the anchor organisation targeted for their interactions. However, the interview highlighted the fact that private organisations within New Zealand Agri-food sector act similarly to co-operatives. This included similar value and interactions, with the main difference being the lack of shareholders. The interviewee noted that the speed to change strategy or focus is significantly faster than co-operatives. Ensuring their organisation's future and creating regional and global impact are two key drivers for the private organisations' involvement in the Agri-food tech sector. Interviewee 6 described their organisation's recent change to accepting open innovation and expanding from the company's original value proposition.

"We used to be really good at core innovation, so really incremental innovation, but to get to the next level we're going to have to look at that real radical, disruptive innovation… We have embraced open innovation. Now we're very deliberate around the needs of the business and we are much more structured and how we look at that technology landscape"- Interviewee 6

4.4 Key Similarities between Anchors

As established in the literature review, connectivity relates to the frequency, types and quality of interactions between actors within an entrepreneurial ecosystem (see Section 2.2.3). The next section identifies collaboration as a type of connectivity and

as a common theme between anchor organisations. This section highlights how interpersonal interaction, regional proximity and intermediary organisation initiate and facilitate collaboration. Collaboration examples reported by participants include the co-generation of knowledge and the co-development of novel inventions.

4.4.1 Interpersonal Interactions

All participants identified challenges to collaboration with other actors, including anchor organisations, in the ecosystem. Negative experiences between individuals were a driver limiting collaboration at an organisational level. This was an interesting theme consistent in the interview responses. The hesitancy or even inhibition of collaboration was not only the result of negative experiences but also individual personalities, feeling of competition or threat, and strategy/value misalignment.

"Well if you're using my information to develop a tool that's going to benefit my competitor, I don't want you using my information, because you might share it even though a rising tide lifts all boats"- Interviewee 5.

This was particularly poignant for start-ups and entrepreneurs. Poor interactions or mismatch of personalities of entrepreneurs was a common example of why anchor organisations prefer not to interact directly with start-ups.

"Some companies may have a good idea and may have a good idea that benefits [the organisation] or any other company, but actually their personalities for lack of a better term

may not be a good match. And so the way they approach things may not align with the way [the organisation] would approach things."- Interviewee 8

Several participants mentioned they do not solely interact within the entrepreneurial ecosystem through their organisations but also through personal interest such as acting as an advisor, board member, or mentor. These personal interactions stem from connecting with others at conferences, networking events, and/or overseas travel. Participants often described collaborating with a particular person or a group of people rather than an organisation. This was prominent in collaborations with research institutes. This is a reflection of the challenges of interacting with research institutions at an organisational level.

"What we tend to do is we partner with specific scientists or professors. At universities, we kind of identify people who can work with because they're really good that they just happen to be in a university."- Interviewee 9

4.4.2 Regional Proximity

Regional proximity was one such factor and shown to generate greater interactions and collaborations between different anchor organisations because of the ability to meet frequently and share knowledge in person. As discussed in Section 2.4.1, a key element of anchor organisation is their regional economic impact and spatial immobility. The regional aspect not only induced collaborations with anchor organisations but with other actors. An example of Interviewee 2 regional impact was the several interactions with regional groups and organisations to fill capability gaps. Examples included engineering, market validation, product design for proof-

of-concept and prototype development for research generated by the universities. Regional hubs (developed around anchor organisations) such as Ruakura Innovation Park and Manawatu Innovation Hub also facilitated joint projects and co-generation of knowledge through the ability for shared assets including shared laboratory space and field-testing areas. However, the value from regional proximity was related to the anchor organisations agency and motivation to interact.

4.4.3 Intermediary Organisations

Intermediary organisations were shown to be key facilitators to collaborations. Either through facilitating interpersonal relationships (through events, conferences etc), brokering industry-focused interactions (providing resources or direction to an industry) or sharing knowledge (such as creating frameworks for a strategic change). Examples of intermediary organisations identified in New Zealand's Agri-food ecosystem were Callaghan Innovation, Te Hono, Kiwi Innovation Network (KiwiNet), Return on Science, AgriTech NZ and FoodHQ. Additionally, there appears to be a desire from industry-focused anchor organisations, in particular co-operatives, to have a structured entry point for start-ups to make contact, *"and so actually having someone in the middle that's a trusted adviser, for lack of a better term, could actually make quite a difference." (Interviewee 8).* There is potential opportunity for intermediary organisations to facilitate greater interaction between these actors.

4.5 Chapter Summary

The purpose of the chapter was to report what types of anchor organisations interact within New Zealand's Agri-food entrepreneurial ecosystem, distinguishing between

research anchor organisations such as universities and CRIs, and industry anchor organisations such as co-operatives and private organisations. Furthermore, in order to answer the proposed research question and sub-questions. The findings aimed to distinguish the perceived value of the anchor organisations, the types of interactions that support this value and the challenges faced by anchor organisations.

The overall findings suggest anchor organisations readily interact within New Zealand's Agri-food entrepreneurial ecosystem. The reported experiences lead the researcher to theorise that the type of interactions that anchor organisations use was dependent on the value they believe they can provide to the other party. Research-focused anchor organisations' core value to the ecosystem was the generation of research and intellectual property. However, the traditional academic mindsets and limited priority for research commercialisation led to significant constraints in industry collaborations. Industry anchor organisations often rely on interpersonal relationships to initiate collaborations with CRIs or Universities. Interpersonal interaction stemmed from connecting with others through events, conferences and intermediary organisations. Organisations such as Callaghan Innovation, Te Hono, Kiwi Innovation Network (Kiwinet), AgriTechNZ and Sprout Agritech were recognised as key facilitators of these interpersonal interactions.

Universities and CRIs are known to drive innovation. However, in New Zealand's Agri-food sector, co-operatives and private anchor organisations are leading research and innovation in the Agri-food tech sector. Ensuring their organisation's future and creating regional and global impact are two key drivers for industry-focused anchor organisations' involvement in Agri-food technology.

Unique to New Zealand is the number of large and successful Agri-food co-operatives. Co-operatives generate value to interactions through scale, capital, enabling access to distribution channels and paths to market. Similar to all large organisations, co-operatives are inherently slow and risk averse. However, a variety of high-risk mechanisms were implemented by co-operatives and private anchor organisations including corporate venture capital and internal incubators. An enabler of these high-risk mechanisms were collaborations with other anchor organisations and intermediary organisations such as Sprout Agritech.

Section 5 discusses how anchor organisations can better lead New Zealand's Agri-food entrepreneurial ecosystem through intermediary organisations brokering interactions.

4.5.1 Concept Map for the Value and Challenges in New Zealand's Agri-food Ecosystem

After interviewing eleven participants to understand New Zealand's current Agri-food entrepreneurial ecosystem, a summary of the core value and challenges between key actors was created. This summary is depicted in a concept map shown in Figure 5 and Figure 6.

Note: All actors provide a variety of different values and challenges to an interaction. Depicted in Figures 5 and 6 are the most common value and challenges identified by research participants. Arrowheads indicate who is receiving the value i.e. the core value of accelerators interacting with co-operatives is the availability of pipeline and deals, or who the challenge is related to i.e the core challenge for private anchors when interacting with the government is the lack of governance

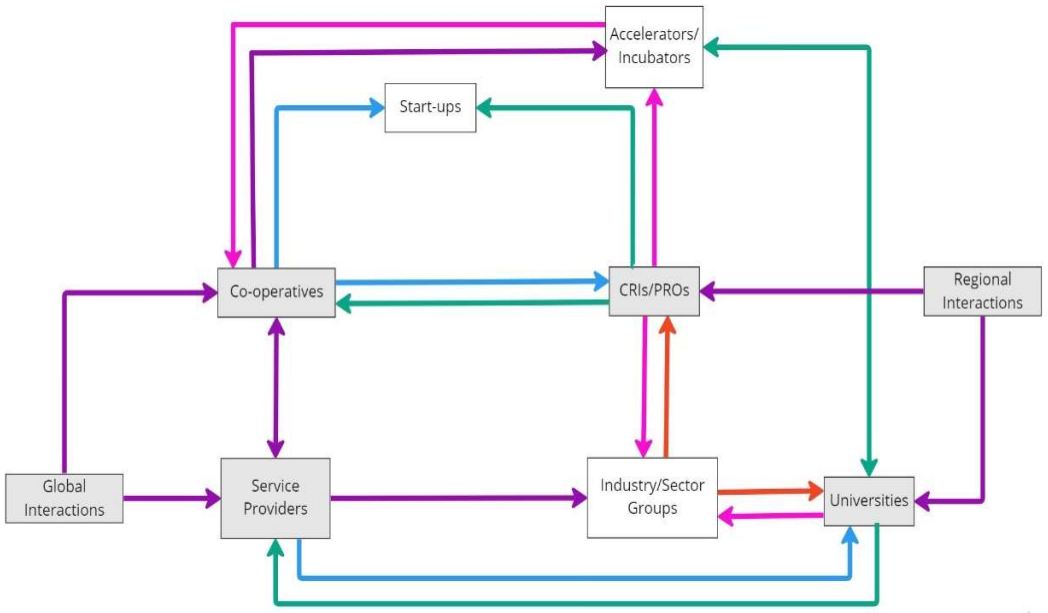


Figure 5. Core Value Provided to an Interaction by Actors in New Zealand's Agri-food Ecosystem

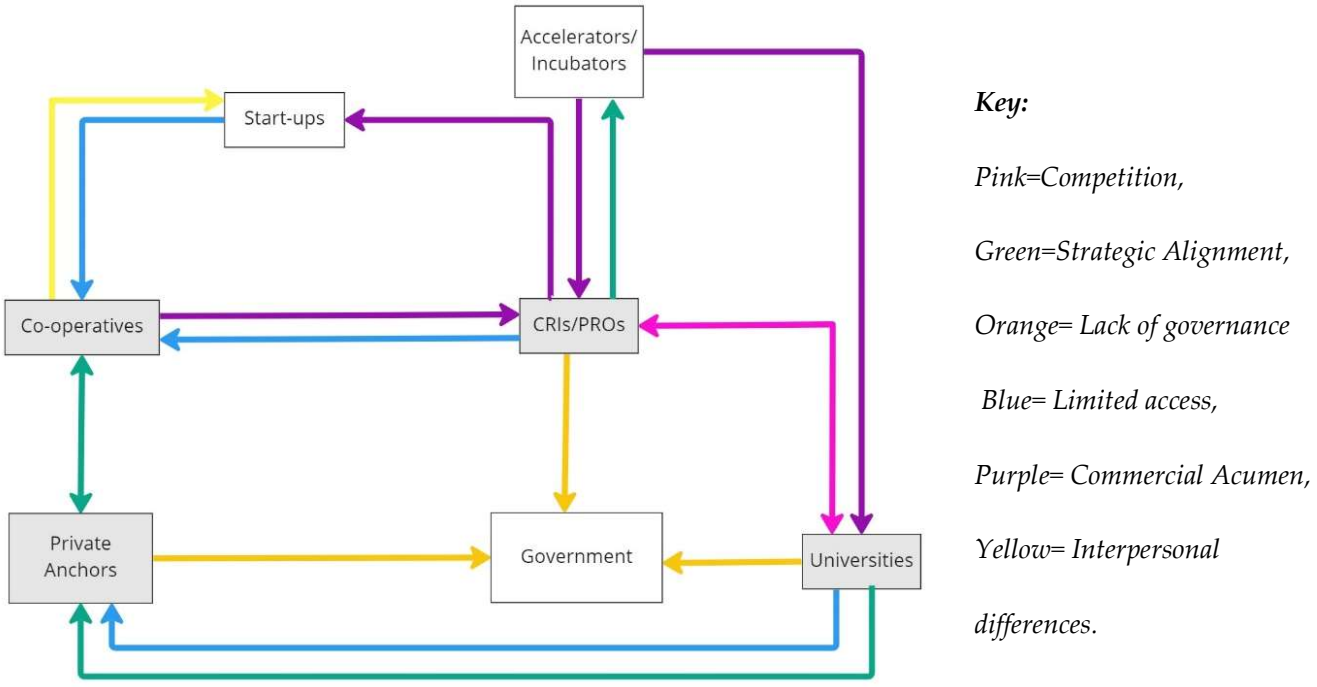


Figure 6. Challenges of Interactions by Actors in New Zealand's Agri-food ecosystem

CHAPTER 5: Discussion & Conclusion

5.1.1 Overview

This chapter relates the findings of the study with the current literature around anchor organisations within an entrepreneurial ecosystem and intermediary organisations brokering their interactions. The research question is:

How can intermediary organisations facilitate interaction with anchor organisations within an entrepreneurial ecosystem?

This chapter addresses the three sub-questions developed to answer the overall research question, followed by the conclusions and implications of the study.

- *Sub-question 1: Who do anchor organisations interact within an Agri-food tech entrepreneurial ecosystem?*
- *Sub-question 2: What value do anchor organisations provide to actors in the ecosystem?*
- *Sub-question 3: What challenges do anchor organisations face when interacting within the ecosystem?*

Findings from the research indicate that there are five overarching themes surrounding the data collection process:

- Actors in New Zealand's Agri-food tech entrepreneurial ecosystem, and Spigel (2020) and Isenberg (2010) actors and domains of entrepreneurial ecosystems

- Resource flow, dependency, and recycling in nascent entrepreneurial ecosystems (Brown & Mason, 2017; Spigel & Harrison, 2018)
- Anchor organisation's formal and informal interactions facilitating knowledge spillover theory by Audretsch (1995) and Acs et al. (2009)
- Agency as an important element for anchor organisations entrepreneurial impact (Cantor et al., 2013).
- Co-operatives as an anchor and an intermediary organisation following Yusef (2008) categories of intermediary organisations.

5.1.2 Main Contributions

The literature shows there is interest in identifying the actors in entrepreneurial ecosystems to understand the success and life cycle of an ecosystem (Jolley & Pittaway, 2019). The type of actors directs the interactions and resource sharing in an ecosystem (Spigel, 2020). Sub-question one aims to identify the actors present in New Zealand's Agri-food tech entrepreneurial ecosystem through the interactions of anchor organisations. The existing literature on entrepreneurial ecosystems identifies common types of actors including entrepreneurs, investors, skilled workers, early customers, role models, support professions, deal makers, universities, anchor firms and incubators/accelerators (Spigel, 2020). The findings from this research reconfirm what is known about the actors present in the entrepreneurial ecosystem, however, the research identified several actors not active in the context of New Zealand's Agri-food technology. This research proposes a concept map, as an adaption of Isenberg (2010) domains of an entrepreneurial ecosystem, of the actors present and absent in New Zealand Agri-food tech entrepreneurial ecosystem, shown in Figure 7.

Common actors identified as absent or currently not active in the ecosystem are late-stage investors, role model (i.e. successful entrepreneurs) and government.

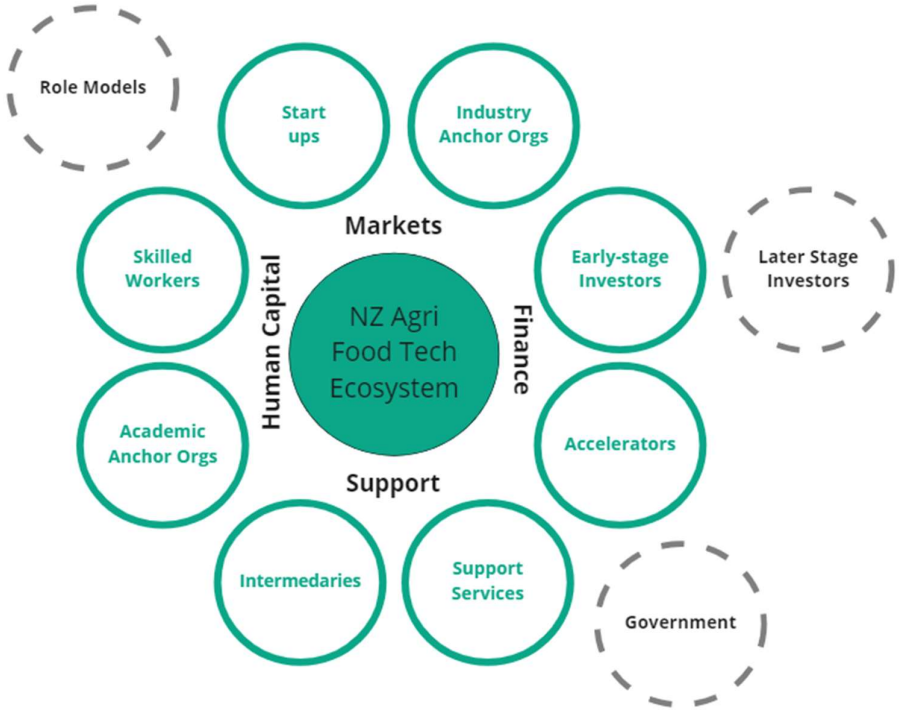


Figure 7. Proposed concept map of New Zealand's Agri-food Tech Entrepreneurial Ecosystem in adaption of Isenberg (2010) model and Spigel (2020).

The research suggests that research anchor organisations' core value provided to the ecosystem is the generation of research and intellectual property. This value was most often accessed by other actors in the ecosystem through contract research services, licensing/purchasing or via investment into spin-outs. There were limited examples of research collaborations within the ecosystem. The literature described a key value of anchor organisations, in addition to others, as the deployment of resources (Slay, 2022). Entrepreneurial ecosystem scholars identified resources and the flow of these resources as critical to ecosystem transformation (Spigel & Harrison, 2018; Brown & Mason, 2017). The research findings identify the generation

of research and IP as the resources discussed in the literature. Furthermore, the findings highlight that resource flow was most often one directional, from the resource provider (in this case universities and CRIs) to other actors. These findings confirm that resource dependency theory is present in nascent entrepreneurial ecosystems as actors rely on anchor organisations for resources (Frooman, 1999; Spigel & Harrison, 2018). Additionally, resource recycling and creation such as research collaborations is limited in nascent entrepreneurial ecosystems (Spigel & Harrison, 2018). In the context of New Zealand's Agri-food tech sector, the literature found IP and technical expertise in science, technology and engineering as a strength (New Zealand Trade and Enterprise, 2021). The research findings suggest that this strength is not translating into the transformation of the ecosystem. This is important for intermediary organisations in this context to orchestrate resource recycling and resource generation via incentivising more research collaborations.

Anchor organisations can provide knowledge spillovers benefiting the region and local firms (Feldman, 2005). University knowledge spillovers induce increased rates of entrepreneurship and innovation in a region (Agrawal and Cockburn, 2003; Spigel, 2020). The knowledge spill over theory of entrepreneurship by Audretsch (1995) and Acs et al. (2009) centres universities everyday function, as a generator of knowledge and research, as one source of entrepreneurial opportunity. Additionally, the theory proposes entrepreneurship as a facilitator of knowledge spillover (Qian et al, 2013). The findings showed research anchor organisations shared knowledge through formal interactions, such as research contracts, and informal interactions, such as networking events organised by KiwiNet or Sprout Agritech. These formal

and informal knowledge sharing interaction were also observed in industry anchor organisations, such as market/industry reports and media, and interpersonal relationships or ad-hoch interactions with entrepreneurs. The findings confirm what is known in the literature that anchor organisations demonstrate knowledge spill over, particularly, if involved in research and development such as universities, CRIs but also co-operatives and private organisations. The role of both formal and informal sharing of knowledge is important for intermediary organisations to consider in their intermediation approach.

Literature on entrepreneurial groups such as clusters, innovation parks and entrepreneurial ecosystems, as well, as anchor organisations identify spatial boundness or immobility as a key element (Cantor et al., 2013; Harris & Holley, 2016; Porter et al., 2019). Spatial immobility is often due to significant investment and assets within a region (Cantor et al., 2013). The findings showed industry anchor organisations such as co-operative and private/investor-owned corporations were commonly not spatially bound with sites in different regions nationally and globally. The findings challenge what is known about the core elements of anchor organisations in relation to entrepreneurial growth. The research findings propose that the agency of anchor organisations has a greater impact on fostering growth of innovation compared to spatial immobility. This was demonstrated by the industry anchor organisations deployment of resources at a national and global level, and implementation of a variety of non-region specific mechanisms such as accelerators, incubators and corporate venturing models. Within the context of New Zealand's Agri-food tech ecosystem, research anchor organisations are spatially bound to their

respective regions. These organisations showed less agency to interact and share resources with the wider entrepreneurial ecosystem, in turn limiting their impact on entrepreneurial growth.

The literature review identified intermediary organisations having varied and several functions such as facilitating and brokering interactions as well as value-added activities such as direct investment and commercialisation support (Suvien, 2009; Hayter, 2016). Several actors identified by the research participants would be described as intermediary organisations due to their role in the ecosystem. Industry groups, such as KiwiNet and AgriTech NZ, facilitated interpersonal interactions between research anchor organisations and translated information from research institutes to industry actors and government agencies. Incubators and accelerators, such as Sprout Agritech, invest in high-risk early-stage companies and provide industry connections and business know-how for start-up growth. The findings expand on what is known by showing anchor organisations can also act as intermediaries. Yusef (2008) identified four categories and attributes for intermediary organisations. From the research findings, co-operatives i) translate research and industry knowledge to other actors through reports and immersion programmes, ii) seek research and IP for commercialisation through collaborations and contract research with universities and CRIs, iii) invest in high-risk early-stage start-ups through corporate venturing models, and iv) share knowledge on product-market fit, industry trends, sale channels through facilitated interactions such as workshops and events. Therefore, the findings propose that co-operatives within the context of Agri-food tech can act as intermediaries in addition to their anchoring functions.

5.1.3 Practical Implications and Future Study

The Agri-food technology sector makes a significant contribution, not only to the economy, but to overcoming climate change and creating a sustainable future. The global Agri-food technology market was valued at US $ 494.9 billion in 2022 and is expected to reach US $ 729.5 billion by 2028 with a CAGR of 8.1% between 2023 and 2028 (Market Data Forecast, 2023). The New Zealand Agri-food tech ecosystem is still young, in comparison to other countries. Oceania (including Australia and New Zealand) showed the lowest total funding into Agri-food technology at $317 million in 2022. This research is beneficial for the New Zealand Agri-food technology sector as it aims to understand anchor organisation's role in the entrepreneurial ecosystem and to provide insight for intermediation between actors. Thereby, promoting entrepreneurial opportunities and growth of the ecosystem, and further contributing to the economy and creating a sustainable future in the face of climate change.

The study found three actors common to entrepreneurial ecosystems not present or not effective in New Zealand's Agri-food tech ecosystem (Spigel, 2020). The actors were; government, role models and later-stage investors. This is important to intermediary organisations as mapping the actors within an ecosystem can identify knowledge and resource gaps (such as culture and policy as establish by Isenberg (2010)) for which intermediaries can mobilise and orchestrate necessary resources to create balance and growth for the ecosystem (Hern´andez-Chea et al., 2021). The findings showed these gaps implicated the collaboration of the ecosystem actors. From this research, it is clear that intermediary organisation have an important role in "filling the void", however, other actors may also take on an ecosystem builder

role through their current functions and connections. For example, early-stage investors could actively attract later-stage investors to New Zealand, and successful entrepreneurs could be more vocal in sharing their journey and challenges in support of up and coming entrepreneurs. By collaboratively addressing the gaps in the ecosystem, there is lower dependency on resources from anchor organisations, greater independent generation, and recycling of resources between actors, leading to a resilient ecosystem.

5.1.4 Summary

This research aims to understand anchor organisations' role and interactions in New Zealand's Agri-food tech entrepreneurial ecosystem to provide insight to intermediary organisations. Furthermore, how intermediaries can facilitate and broker greater interactions with anchor organisations to enhance the value they create for the entrepreneurial ecosystems in which they are embedded. The thesis aims to answer the following research question:

How can intermediary organisations facilitate interaction with anchor organisations within an entrepreneurial ecosystem?

This research aims to answer theoretical and practical research questions. Theoretically, this research aims to develop a deeper understanding of anchor organisation role in entrepreneurial ecosystems within an Agri-food context. Few scholars study anchor organisation's role in entrepreneurial ecosystems and fewer more who pursue an understanding of intermediary organisations' role in facilitating interactions and resource sharing with anchor organisations and the ecosystem

(Jolley & Pittaway, 2019; Isenberg, 2010). First, the study identified common actors present and absent in the New Zealand's Agri-food tech entrepreneurial ecosystem which aligned with scholars Spigel (2020) and Isenberg (2010). Second, the value and challenges the anchor organisations perceived in their interactions within the ecosystem indicated the ecosystem's reliance of anchor organisations' resources (including capital, knowledge, research and IP). The one-directional flow, dependency and recycling highlighted the nascent stage of New Zealand's Agri-food tech ecosystem (Spigel & Harrison, 2018; Brown & Mason, 2017). Third, anchor organisations with functions or involvement in research and development demonstrated knowledge spillover through a variety of interactions (Qian et al, 2013).

From the practical point of view, the research provided insight to identifying knowledge and resource gaps for which intermediaries can mobilise and orchestrate necessary resources to create balance and growth for the ecosystem (Hern´andez-Chea et al., 2021). The study also highlighted the important role of both intermediary and anchor organisations within the ecosystem, however, a collaborative approach to address the gaps in New Zealand's Agri-food tech ecosystem is needed, to reduce resource dependency on anchor organisations, create greater independent generation, and recycling of resources between actors. Thereby, promoting entrepreneurial opportunities and growth of the ecosystem, and further contributing to the economy and creating a sustainable future in the face of climate change.

APPENDIX A: INTERVIEW SCHEDULE

Entrepreneurial Ecosystem

{Provide definition of Entrepreneurial Ecosystem as described in Section 2.2}

Visual Methodology: Concept Mapping

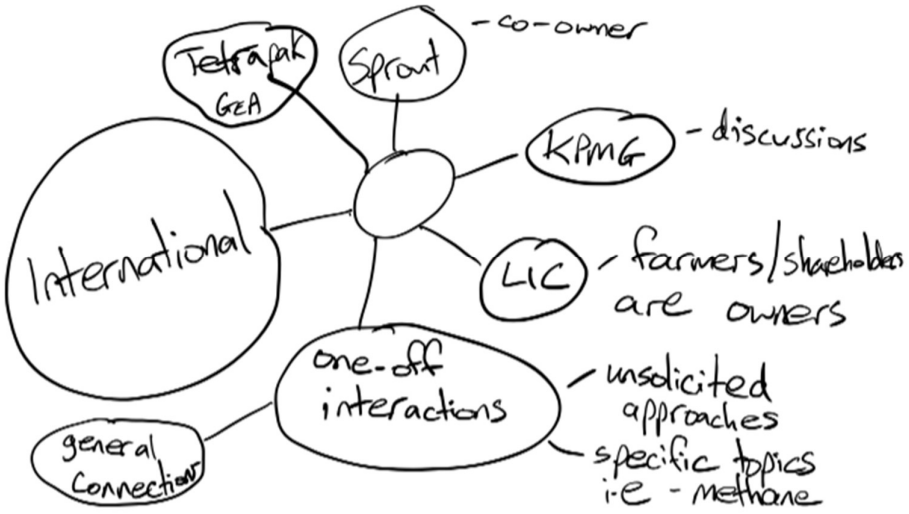
{Provide resource for participant to visually represent the NZ Agri-food entrepreneurial ecosystem as the participant sees it}

{Ask participant to visually represent the interactions between the actors shown in the diagram/drawing}

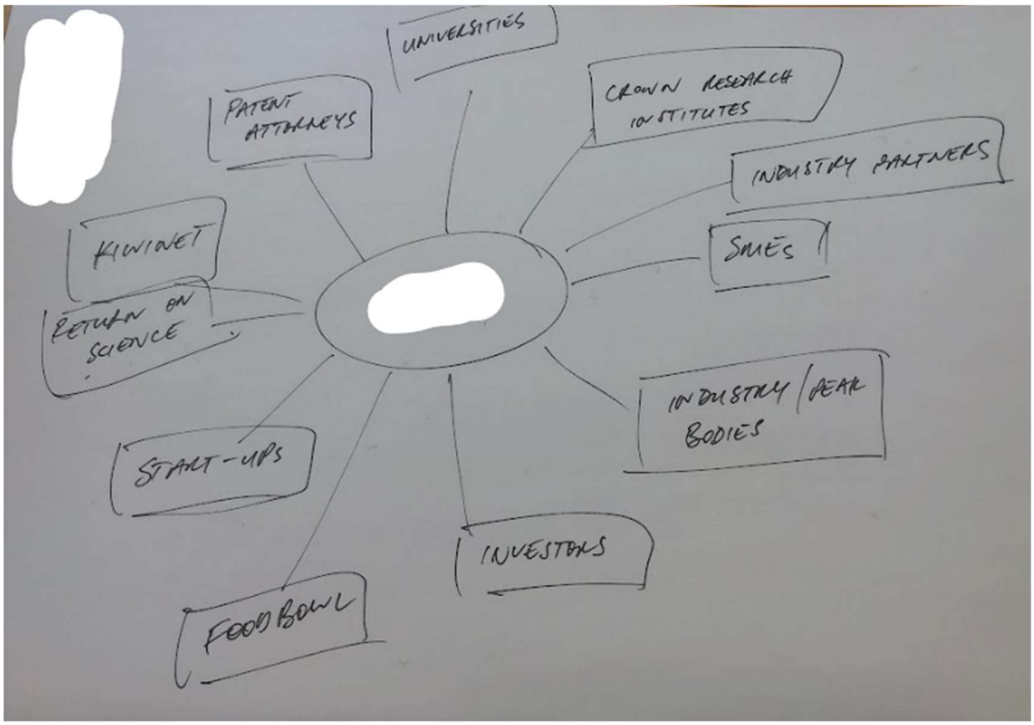
- Can you describe the interactions your organisation has with the different groups within the ecosystem?
    - Can you provide an example of the interaction with this organisation/group/person?
- What value does your organisation provide to these interactions? And vice versa?
- What are the constraints or challenges of interacting with this organisation?
    - What are the constraints or challenges of interacting with your organisation?

APPENDIX B: EXAMPLE ENTREPRENEURIAL ECOSYSTEM MAPS

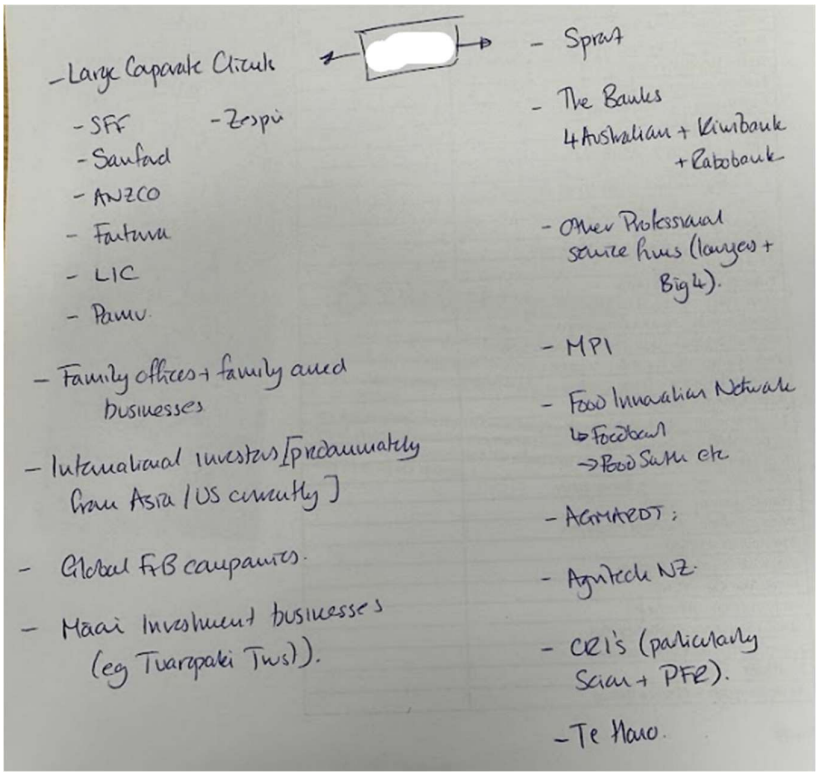
Interviewee 8



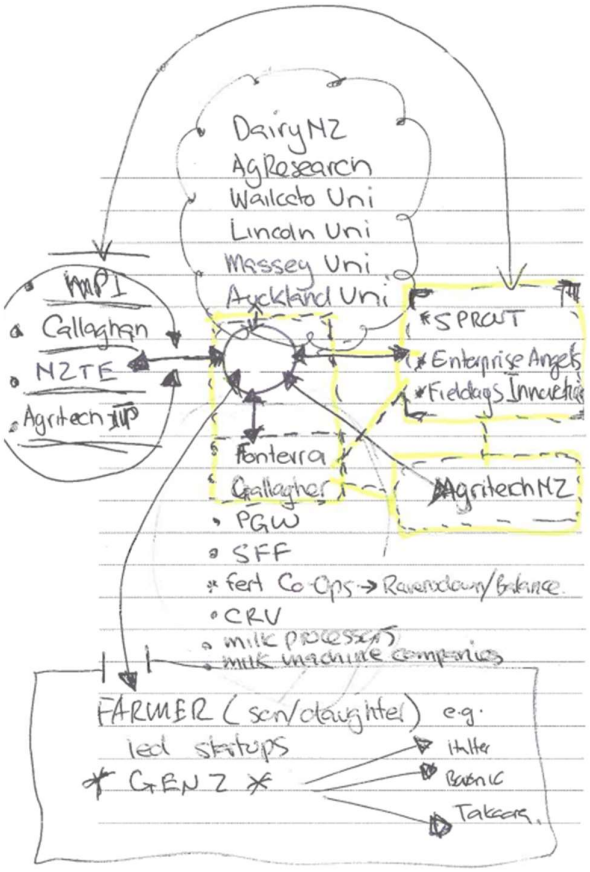
Interviewee 3



Interviewee 7



Interviewee 9



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